Fact Sheet

The U.S. Environmental Protection Agency (EPA) Proposes to Reissue a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants Pursuant to the Provisions of the Clean Water Act (CWA) to:

Hecla Limited Lucky Friday Mine

Public Comment Start Date: February 25, 2019
Public Comment Expiration Date: March 27, 2019

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The EPA Proposes To Reissue an NPDES Permit
The EPA proposes to reissue the NPDES permit for the facility referenced above. The draft permit places conditions on the discharge of pollutants from facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility.

This Fact Sheet includes:
- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions for the facility
- a map and description of the discharge location
- technical material supporting the conditions in the permit

State Certification
Upon the EPA's request, the Idaho Department of Environmental Quality (DEQ) has provided a draft certification of the permit for this facility under CWA § 401. The draft is included in this Fact Sheet as Appendix D. Comments regarding the certification should be directed to:

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, Idaho 83814

Public Comment
Persons wishing to comment on, or request a Public Hearing on the draft permit for this facility may do so in writing by the expiration date of the Public Comment period. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearings must be in writing and should be submitted to the EPA as described in the Public Comments Section of the attached Public Notice.

After the Public Notice expires, and all comments have been considered, the EPA's regional Director for the Office of Water and Watersheds will make a final decision regarding permit issuance. If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit can become effective upon issuance. If substantive comments are received, the EPA will address the comments and issue the permit. The permit will become effective no less than 33 days after the issuance date, unless an appeal is submitted to the Environmental Appeals Board within 30 days pursuant to 40 CFR 124.19.

Documents are Available for Review
The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting the EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday at the following address:

US EPA Region 10
1200 Sixth Avenue, Suite 155, OWW-191
Seattle, Washington 98101
(206) 553-0523 or
Toll Free 1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The draft permit, fact sheet, and other information can also be found by visiting the Region 10 NPDES website at https://www.epa.gov/npdes-permits/idaho-npdes-permits

The fact sheet and draft permit are also available at:

EPA Coeur d'Alene Field Office
1910 NW Boulevard
Coeur d'Alene, Idaho 83814
(208) 664-4588

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, Idaho 83814 (208) 769-1422

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Acronyms

1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
ACR	Acute-to-Chronic Ratio
AML	Average Monthly Limit
BAT	Best Available Technology economically achievable
BCT	Best Conventional pollutant control Technology
BLM	Biotic Ligand Model (for copper)
BOD_5	Biochemical oxygen demand, five-day
BMP	Best Management Practices
BPT	Best Practicable Control Technology
°C	Degrees Celsius
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CV	Coefficient of Variation
CWA	Clean Water Act
DEQ	Idaho Department of Environmental Quality
DMR	Discharge Monitoring Report
EFH	Essential Fish Habitat
ELG	Effluent Limitation Guideline
EPA	U.S. Environmental Protection Agency
gpd	Gallons per day
HUC	Hydrologic Unit Code
IC	Inhibition Concentration
ICIS	Integrated Compliance Information System
LA	Load Allocation
lbs/day	Pounds per day
LC	Lethal Concentration
LC_{50}	Concentration at which 50% of test organisms die in a specified time period
LOEC	Lowest Observed Effect Concentration
LTA	Long Term Average
mg/L	Milligrams per liter
ml	Milliliters
ML	Minimum Level
µg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit or Method Detection Limit
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observable Effect Concentration

NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
OWW	Office of Water and Watersheds
O&M	Operations and maintenance
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
RWC	Receiving Water Concentration
SIC	Standard Industrial Classification
SPCC	Spill Prevention and Control and Countermeasure
SS	Suspended Solids
su	Standard Units
TBEL	Technology-based Effluent Limitation
TRC	Total Residual Chlorine
TRE	Toxicity Reduction Evaluation
TSD	Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
TSS	Total suspended solids
TU_a	Toxic Units, Acute
TU_c	Toxic Units, Chronic
USFWS	US Fish and Wildlife Service
WET	Whole Effluent Toxicity
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limitation
WQS	Water Quality Standards

I. Background Information

A. General Information

This fact sheet provides information on the draft NPDES permit for the following entity:

Table 1. General Facility Information	
NPDES Permit #:	ID0000175
Applicant:	Hecla Limited Lucky Friday Mine
Type of Ownership	Private
Physical Address:	397 Friday Avenue Mullan, ID 83846
Mailing Address:	PO Box 31 Mullan, Idaho 83846
Facility Contact:	Lance Boylan Environmental Supervisor LBoylan@hecla-mining.com (208) 744-1833
Facility Location:	47.472174°N, 115.785752°W
Receiving Water	SF Coeur d'Alene (SFCdA) River
Facility Outfall	001: 47.4636°N, 115.8053°W 002: 47.4689°N, 115.7897°W 003: 47.4714°N, 115.7614°W

B. Permit History

The EPA first issued a National Pollutant Discharge Elimination System (NPDES) permit for the Lucky Friday Mine in 1973. That permit was reissued by the EPA on September 30, 1977, and expired on December 31, 1980.

The most recent NPDES permit was issued on August 12, 2003, and became effective on September 14, 2003. The permit was modified twice during its term with the modifications becoming effective on February 1, 2006, and August 1, 2008. The permit expired on September 14, 2008. An NPDES application for permit reissuance was submitted by the permittee on March 19, 2008. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6, the permit has been administratively extended and remains fully effective and enforceable. Subsequent revisions to the application have been submitted since 2008 with the most recent submission received March 29, 2018, incorporating all previous versions.

C. Tribal Consultation

On December 6, 2018, the EPA sent a letter to the Coeur d'Alene Tribe to inform them that a new draft permit is being prepared and to offer the opportunity to request government to government consultation on this permitting action. To date, the EPA has not received a request to consult on the permit.

II. Idaho NPDES Authorization

In 2014, the Idaho Legislature revised the Idaho Code to direct DEQ to seek authorization from the EPA to administer the NPDES permit program for the State of Idaho. On August 31, 2016, DEQ submitted a program application pursuant to CWA § 402(b) and 40 CFR 123.21.

DEQ was authorized to issue NPDES permits under a phased NPDES permit program that began July 1, 2018. Authority to permit industrial facilities will transfer to DEQ on July 1, 2019. At that point in time, all documentation required by the permit must be sent to DEQ rather than to the EPA and any decision under the permit stated to be made by the EPA or jointly between the EPA and DEQ will be made solely by DEQ. Permittees will be notified by DEQ when this transition occurs.

III. Facility Information

Hecla Limited's Lucky Friday Unit (LFU) is a deep, hard rock underground mine located just east of Mullan, Idaho (see Appendix A). Historic mining activities at the LFU began with the location of claims in 1889. Sporadic exploration, mining, and milling occurred until 1958, at which time Hecla acquired a 38% interest in the property. In 1964, Hecla acquired 100% interest in the property via a merger with Lucky Friday Silver-Lead Mines Company. Subsequent land purchases and acquisitions occurred to support the mine's operation.

The site is comprised of two underground accesses, support facilities, surface mill, two water treatment facilities, and four tailings impoundments; two of which have been closed in accordance with the State of Idaho's Mine Tailings Impoundment Structures Rules, IDAPA 37.03.05, and one is undergoing closure planning with input from Idaho Department of Water Resources (IDWR) and DEQ.

The site has three outfalls, Outfalls 001, 002, and 003, which discharge treated water to the SFCdA River. Only two of the three outfalls discharge at any one time. Description of outfall water sources are summarized as follows:

- Outfall 001 – Historically, overflow from Tailings Impoundment No. 1 was discharged via Outfall 001. Tailings Impoundment No. 1 has been closed under a Superfund Consent Decree with the EPA, necessitating diversion of these flows to Outfall 002. To maintain ongoing flexibility in water management practices, Hecla would like to retain the authorization to discharge treated water from Water Treatment Plant 2 (WTP2) via Outfall 001, should it be needed for best water management purposes in the future.
- Outfall 002 – WTP2 currently discharges from Outfall 002. Hecla requested the renewed Permit reflect that treated site waters from WTP2 be discharged via Outfall 002. WTP2 collects and treats mine water, mill water, ground water and captured storm water.
- Outfall 003 – Water Treatment Plant 3 (WTP3) currently discharges from Outfall 003. Water from the Mill is no longer routed to Tailings Impoundment No. 3 (ceased fourth quarter 2010) and is now routed to Tailings Impoundment No. 4 or directly to WTP3. WTP3 collects and treats mine water, mill water, ground water and captured storm water.

Table 2: NPDES Outfalls			
Outfall	**Receiving Water**	**Description of Wastewater Source**	**Flow Rate**[1]
002[2]	SFCdA River	Collects and treats mine water, mill water, ground water and captured storm water	avg. discharge = 0.629 cfs = 0.41 mgd 99th percentile = 0.874 cfs = 0.56 mgd max. discharge = 0.914 cfs = 0.59 mgd
003	SFCdA River	Collects and treats mine water, mill water, ground water and captured storm water	avg. discharge = 1.041 cfs = 0.67 99th percentile = 1.658 cfs = 1.07 mgd max discharge = 2.005 cfs = 1.3 mgd

Footnote:
1 Outfall 002 and 003 flows are based on data from 2013 through 2017
2 The discharge from WTP 002 is usually discharged through Outfall 002 but the draft permit allows this wastewater to be routed to Outfall 001 under the same effluent limitations as Outfall 002

Since the 2003 Permit was issued, the LFU has put forth much effort to improve both management of water used on site and effluent quality. The LFU has implemented numerous water management changes and upgrades for more effective water recycle and treatment that have resulted in significant improvements to effluent quality and effective water management. Those changes are detailed in the following sections.

Sanitary Sewer Project

In 2010, to improve tailing impoundment water quality and resolve potentially problematic algae growth in the impoundment, the sanitary sewer water source was isolated from all site process water, and was instead collected and separately routed to the South Fork Sewer District. The sanitary sewage has been completely isolated by completely breaking all connections from the piping that delivered the sanitary wastewater to the impoundments. Therefore, there is no longer a discharge of sanitary wastewater.

Construction of Water Treatment Plants (WTPs)

Hecla constructed and installed two WTPs to better manage site water and improve treated water quality discharged to SFCdA River. WTP2, which discharges treated water to SFCdA River via Outfall 002, was installed in 2008. WTP2 can also be piped to allow for discharge via Outfall 001, if operations require discharge through that location. WTP2 also allows for water reuse and recycling by sending water back for use in the Mill. WTP3, which typically discharges treated water to SFCdA River via Outfall 003, was originally installed in 2008 with upgrades completed in 2011.

Treatment technologies installed at both WTPs consist of chemically aided clarification through slant plate clarifiers, followed by filtration through multi-media filtration vessels filled with sand and anthracite. Wastewater is collected in an equalization/surge tank and then pumped to a flash mix and flocculation tank where a coagulant is first injected; followed by a flocculant. The conditioned water then flows by gravity to the inclined plate clarifier where the solids are settled out. The clarified water then overflows to a transfer tank where the water is then pumped to the multi-media filtration vessels prior to discharge to the SFCdA River. Water treatment diagrams are provided in Appendix A, Form 2C Figures 10, 11 and 12.

Since their construction, the water treatment facilities not only allowed for better water management by providing treatment, flow leveling, water reuse and recycling, but have also dramatically improved the quality of the effluent; for example, reducing the concentration of Lead and Zinc in the effluent by 98% and 97% at 002, respectively, and 95% and 98% at 003, respectively. Furthermore, quarterly instream monitoring, as required by the current permit, has shown consistent attainment of applicable water quality criteria.

Closure of Tailings Impoundments 1 and 2

Tailings Impoundments Nos. 1 and 2 have been closed in accordance with the State of Idaho's Mine Tailings Impoundment Structures Rules, IDAPA 37.03.05.

Outfall 002 located adjacent to Impoundment 2 is still active. Outfall 001, located adjacent to Impoundment 1, is currently authorized to discharge water from Impoundment 1 but since its closure, Outfall 001 is currently inactive. As explained previously, Hecla would like to retain authorization to discharge water via Outfall 001 as an alternate discharge location option should operations require it. Should it be utilized, Outfall 001 would discharge treated water from WTP 2.

Tailings Impoundment 3 has not received any tailings water since 2010 but is still used for water management purposes related to the operation of WTP3. The LFU is currently working towards isolating the impoundment from all process water flows in preparation for closure and reclamation, which is being conducted with input from DEQ, and IDWR. Once closed, the impoundment will be capped and graded to prevent the infiltration of stormwater per IDWR rules at IDAPA 37.03.05.

Disc Filter Project

Beginning in January of 2017 the LFU initiated a full-scale pilot test of a disc filter at WTP3 to determine the feasibility of replacing the multi-media filters (MMFs). The improvements of the disc filter over the multi-media filtration units specific to the WTP3 location are as follows:

- Increased flow capacity;
- Increased reliability;
- Reduced capital cost;
- Minimal operational and maintenance costs;
- Minimal energy demands;
- Ease of operation,
- Minimal square footage requirements.

The disc filter was plumbed between the WTP3 inclined plate clarifier and existing MMFs. The disc filter did not discharge directly to the river at any time during the test. The system

and flow pattern remained unchanged during the project; the discharge from the disc filter was filtered again by the MMFs prior to discharge through Outfall 003 during the test to ensure that the effluent water quality met permit effluent limitations.

Throughout the test period, 24-hour composite samples were collected weekly from the disc filter effluent. To remain consistent with existing Permit requirements the sample protocol, QA/QC, collection time-frame, and analytical procedures remained identical to the methods used to collect the Site's weekly compliance samples. Whole Effluent Toxicity (WET) tests were also collected from the disc filter effluent and analyzed consistent with the Site's NPDES Permit.

The performance test includes 12 months of continuous full-scale testing during the spring run-off, summer, fall, and winter periods. This time frame includes periods of the year which have historically presented challenges such as significant increases in flow rate and increases in loading to the water treatment facilities.

In summary, the disc filter's performance met all the Site's NPDES Permit requirements, mirroring the performance of the existing MMFs while exceeding other expectations such as ease of operation and maintenance. The test has been determined to be a success and therefore the disc filter will be permanently installed along with a second redundant filter at WTP3. Once the disc filters are installed, the MMFs will be removed. A relocation of the MMFs would be required anyway as a closure component for Tailings Impoundment 3. Disc filters may be considered for installation at WTP2 in the future. The water treatment strategy is expected to remain consistent, with clarification followed by filtration prior to discharge. In July 2018, LFU notified EPA that the disc filters were being placed on-line to replace the MMFs.

Future Adjustment of the Outfall 003 Discharge Location

As the LFU continues to look for opportunities for improving management of water, Hecla is requesting authorization to relocate Outfall 003 to the opposite side (north side) of the SFCdA River. Outfall 003 is currently located on the south side of the SFCdA River, adjacent to the toe of Tailings Impoundment 3. As mentioned above, this Impoundment is undergoing closure planning. The closure design requires the closure and reclamation of the entire Tailings Impoundment 3 footprint, and therefore the LFU needs to both adjust the location of Outfall 003, by moving it to the north side of the river, and removal of the MMFs.

The new location will be in the same vicinity as the old outfall so all of the surface water monitoring that has been done under the current permit will apply to the new outfall. The effluent limitations proposed in the draft permit will be the same for both locations. Furthermore, moving the outfall to the north will improve facility water management by improving safety considerations for personnel.

Effluent Characterization

To characterize the effluent, the EPA evaluated the facility's application form, discharge monitoring report (DMR) data, and additional data provided by the Permittee. The effluent quality is summarized in Table 3. Data are provided in Appendix B.

Table 3: Effluent Characterization				
Parameter	**Outfall 002**		**Outfall 003**	
ug/L unless noted	Maximum	Minimum	Maximum	Minimum
Copper	13.1	0.5*	2.79	0.5*
Lead	46.2	2.5*	9.13	2.5*
Zinc	69.2	5.0*	299	5.0*
Cadmium	1.3	0.05*	0.3	0.05*
Mercury	0.0031	0.00005*	0.0026	0.00005*
Silver	0.1	0.1	0.18	0.05*
pH, standard units (su)	10.0	6.6	9.9	6.9
Temperature	31.8	8.1	30.4	1.4
TSS, mg/L	5.0	0.1	37.3	2.5
WET, TUc**	2.28	< 1.0	9.37	< 1.0
Hardness, mg/L	489	84.7	262	67.3

* Non-detect at the concentration listed.
** Over 60% of the WET tests for 002 and over 75% for 003 were reported as < 1.0. Retests during the subsequent month for higher results at 003 came back as < 1.0.
Source: Data provided by Hecla January 2013 through October 2017.

Compliance History

An effluent violation (299 mg/L) for the Maximum Daily Zinc limitation (260 mg/L) was documented at Outfall 003 in March 2014. Additional compliance information for this facility, including compliance with other environmental statutes, is available on the Enforcement and Compliance History Online (ECHO). The ECHO web address for this facility is:

https://echo.epa.gov/detailed-facility-report?fid=ID0000175&sys=ICP

The EPA conducted an inspection of the facility in May 2017. It encompassed the wastewater treatment process, records review, operation and maintenance, and the collection system. No areas of concern were identified.

IV. Receiving Water

In drafting permit conditions, the EPA must analyze the effect of the facility's discharge on the receiving water. The details of that analysis are provided later in this Fact Sheet. This section summarizes characteristics of the receiving water that impact that analysis.

A. Receiving Water

This facility discharges to the SFCdA River near Mullan, Idaho.

B. Surface Water Use Designations (*IDAPA 58.01.02.100)*

Waterbodies are designated in Idaho to protect water quality for existing or designated uses. The designated use of a waterbody does not imply any rights to access or ability to conduct any activity related to the use designation, nor does it imply that an activity is safe. The designated beneficial uses for SFCdA River are found in IDAPA 58.01.02.110.09 and are as follows:

AQUATIC LIFE.
Cold water (**COLD**): water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species.

RECREATION.
Secondary contact recreation (**SCR**): water quality appropriate for recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur.

The Water Quality Standards further state that all waters of the State of Idaho are protected for industrial and agricultural water supply, wildlife habitats and aesthetics (IDAPA 58.01.02.100.03.b and c, 100.04 and 100.05). In addition to the designated uses, salmonid spawning is an existing use in the vicinity of the outfalls as documented by DEQ's Beneficial Use Reconnaissance Monitoring in 2014.

C. Water Quality

The water quality for the receiving water is summarized in Table 5.

Table 5: Receiving Water Quality Data

Parameter ug/L unless noted	# Above Detection[1]		Percentile	SFCdA River Values[2]	
	002	003		Above 002	Above 003
Cadmium	1	0	95th	0.05	0.053
Copper	14	2	95th	2.0	2.0
Lead	0	0	95th	2.5	2.5
Mercury, ng/L	0	18	95th	1.4	1.4
Zinc	6	9	95th	17.1	18.4
Temperature, °C	20	20	95th	0.4 – 14.1	0.3 – 13.9
pH, su	20	20	5th – 95th	7.6 – 8.3	7.5 – 8.2
Hardness, mg/L	20	20	5th – 95th	5.1 – 75.1	17.2 – 66.3

1 - out of 20 total samples
2 - Values were determined using ½ the detection level when reported as less than that value
3 – When all values are below an adequate detection level, zero is used as the background value
Source: Data collected by permittee 2012-2016

D. Water Quality Limited Waters

The SFCdA River between Canyon and Pine creeks is listed as impaired by cadmium, lead, zinc (Category 5) and Sedimentation/Siltation (Category 4a). The SFCdA River between Daisy Gulch and Canyon is impaired by an unknown cause but metals are suspected.

A Sedimentation/Siltation TMDL was prepared by DEQ and approved by the EPA on August 21, 2003. The TMDL contains a TSS concentration limit (20 mg/L) as well as an allowable tons/year loading limit. The Wasteload Allocation (WLA) for Outfall 001 is 45.1 tons/year and for Outfall 003, it is 3.9 tons/year. See below for TSS effluent limitation determinations. The TMDL does not contain an allocation for Outfall 002 but since LFU will only discharge from either Outfall 001 or Outfall 002 at any one time, the allocation will be applied to both.

To prevent further degradation of the downstream metals impairment of the SFCdA River, effluent limits for cadmium, lead, and zinc were not allowed to increase beyond the limits in the 2003 permit. Unlike nutrients, metals are not pollutants that dissipate; nor are metals assimilated into other processes that render them less harmful; and, because the

SFCdA River has a pronounced seasonal high flow, settling of particulate bound metals and retention at the point of the outfalls are unlikely. For these reasons, no mixing zone is authorized for cadmium, lead, and zinc. DEQ adopted site specific criteria (SSC) for cadmium, lead and zinc for the SFCdA River and the EPA approved them on February 28, 2003. They are the applicable criteria for the SFCdA River.

E. Low Flow Conditions

Critical low flows for the receiving water are summarized in Table 6. The previous permit required the facility to monitor flow upstream of both outfalls. These flows were used to determine the critical low flows.

Table 6: Critical Flows in SFCdA River

Flows (cfs)	002	003
Minimum (1Q10)	10.9	3.7
Minimum$_7$ (7Q10)	11.46	5.3
30Q5*	13.2	5.7
Harmonic Mean	27.0	16.7

1. The 1Q10 represents the lowest one day flow with an average recurrence frequency of once in 10 years.
2. The 7Q10 represents lowest average 7 consecutive day flow with an average recurrence frequency of once in 10 years.
3. The 30Q5 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 5 years.
4. The harmonic mean is a long-term mean flow value calculated by dividing the number of daily flow measurements by the sum of the reciprocals of the flows.

Source: Data submitted by the permittee for January 1, 2007 through December 31, 2017
* Data from January 1, 2013 through December 31, 2017 used for 30Q5 calculation.

The previous permit contained limits based on flow tiers. This allowed for different limits based upon the flow of the receiving water. This method is appropriate for permitting facilities that do not have more than basic treatment facilities (e.g. simple settling) and depend on increased dilution to achieve compliance with WQS. With the installation of wastewater treatment plants at both outfalls, it is expected that these treatment plants will be tuned to treat to the most stringent effluent limitations and, as such, tiered limitations are no longer necessary. Figures below show how the discharge of copper and mercury has decreased at Outfalls 002 and 003 with the installation of treatment. Numbers shown as less than zero actually reflect results that were below the detection level.

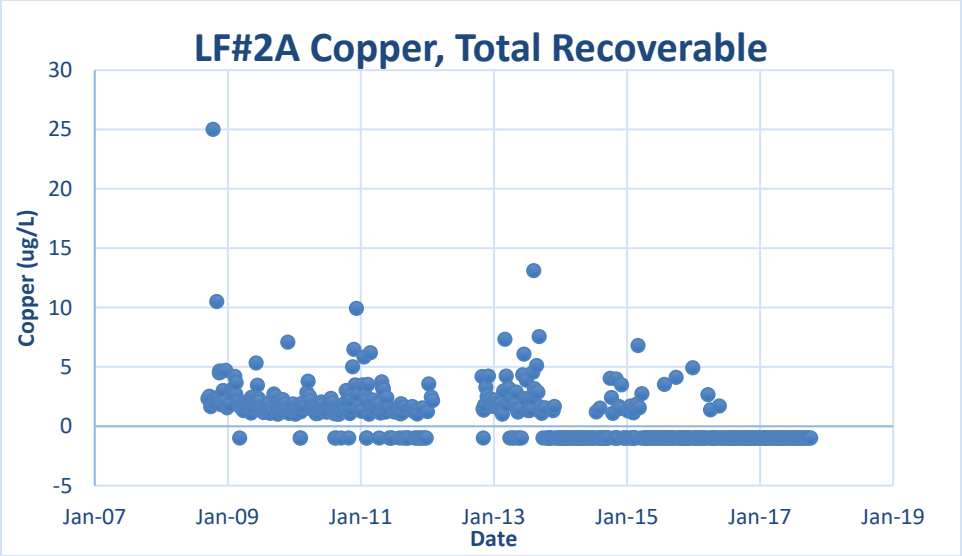


Figure 1: Copper reductions at Outfall 002

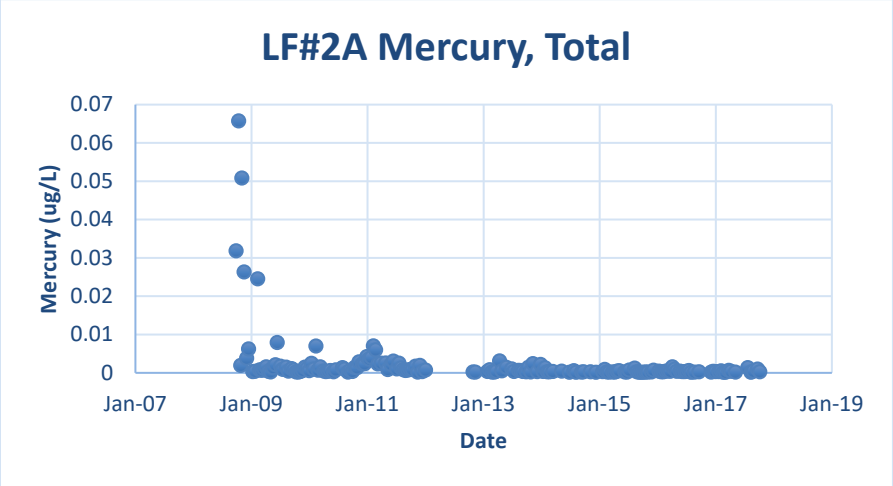


Figure 2: Mercury reductions at Outfall 002

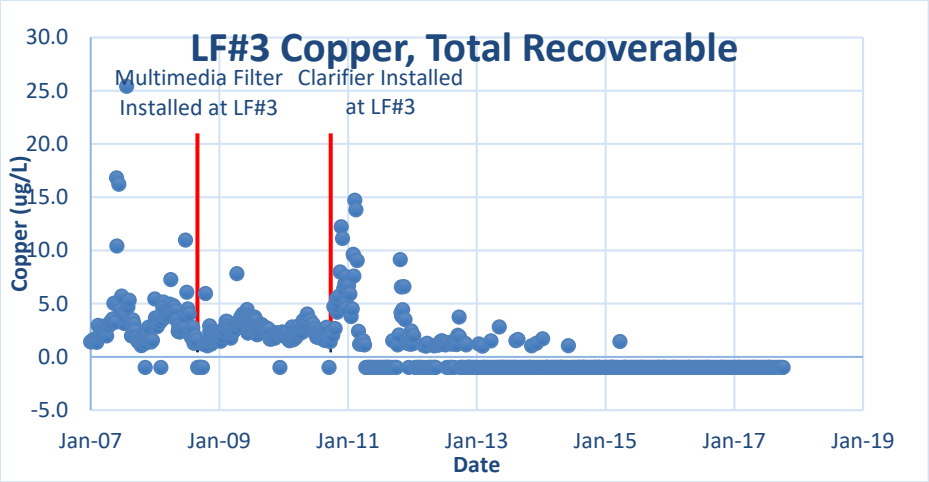


Figure 3: Copper reductions at Outfall 003

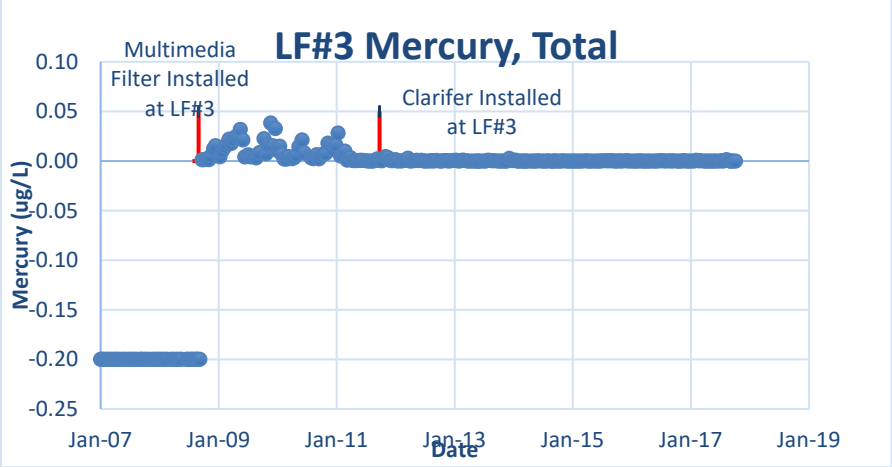


Figure 4: Mercury reductions at Outfall 003

Mixing zones have been authorized by DEQ for some parameters based on the critical flows for each outfall.

V. Effluent Limitations and Monitoring

Tables 7 through 10, below, present the current effluent limits and monitoring requirements from the 2003 Permit.

Table 7 – Current Effluent Limitations and Monitoring Requirements for Outfall 001

Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
cadmium	Not dependent on river flow	1.8	0.025	0.70	0.0098	weekly	24-hour composite
lead		50	0.70	30	0.43		
zinc		190	2.66	71	0.99		

Table 7 – Current Effluent Limitations and Monitoring Requirements for Outfall 001							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
copper	< 14 cfs (tier 1)	28	0.39	12	0.17	weekly	24-hour composite
	≥ 14 to < 32 cfs (tier 2)	26	0.36	11	0.15		
	≥ 32 to < 113 cfs (tier 3)	38	0.53	17	0.24		
	≥ 113 to < 194 cfs (tier 4)	73	1.0	32	0.45		
	≥ 194 cfs (tier 5)	63	.88	28	0.39		
mercury	< 14 cfs (tier 1)	0.073	0..10	0.036	0.00050	2/month	grab
	≥ 14 to < 32 cfs (tier 2)	0.99	0.0014	0.050	0.00070		
	≥ 32 to < 113 cfs (tier 3)	0.2	0.0028	0.10	0.0014		
	≥ 113 to < 194 cfs (tier 4)	.066	0.0092	0.32	0.0046		
	≥ 194 cfs (tier 5)	1.1	0.015	0.56	0.0078		
silver	< 14 cfs	3.7	0.052	2.2	0.031	weekly	24-hour composite
	> 14 cfs	--	--	--	--	monthly	24-hour composite
total suspended solids (TSS)	Not dependent on river flow	30 mg/l	See note below Table 10	20 mg/l	See note below Table 10	weekly	24-hour composite
pH, su	Not dependent on river flow	Not less than 6.5 nor greater than 10.0				weekly	grab
outfall flow, cfs	--	--		--		continuous	recording
Temperature, °C	--	--		--		weekly	grab
E.coli, #/100 ml	--	--		--		monthly	grab
hardness as $CaCO_3$, mg/L	--	--		--		monthly	grab
whole effluent toxicity(WET), TU_C	--	--		--		quarterly	24-hour composite
SFCdA River flow directly upstream of the outfall, cfs	--	--		--		daily	recording

Table 8 – Current Effluent Limitations and Monitoring Requirements for Outfall 002 when the Outfall 001 Waste Stream is discharged through Outfall 002							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
cadmium	Not dependent on river flow	1.8	0.025	0.70	0.0098	weekly	24-hour composite
lead		50	0.70	30	0.42		
zinc		190	2.66	71	0.99		
copper	< 8.6 cfs (tier 1)	20	0.28	8.6	0.12	weekly	24-hour composite
	≥ 8.6 to < 20 cfs (tier 2)	26	0.36	11	0.15		
	≥ 20 to < 69 cfs (tier 3)	28	0.39	12	0.17		
	≥ 69 to < 117 cfs (tier 4)	49	0.68	22	0.31		
	≥ 117 cfs (tier 5)	46	0.64	20	0.28		
mercury	< 8.6 cfs (tier 1)	0.052	0.00072	0.026	0.00036	2/month	grab
	≥ 8.6 to < 20 cfs (tier 2)	0.069	0.00096	0.034	0.00048		
	≥ 20 to < 69 cfs (tier 3)	0.13	0.0018	0.067	0.00094		
	≥ 69 to < 117 cfs (tier 4)	0.41	0.0057	.021	0.0029		
	≥ 117 cfs (tier 5)	0.68	0.0095	0.34	0.0048		
silver	< 8.6 cfs	2.7	0.38	1.6	0.022	weekly	24-hour composite
	≥ 8.6 to < 20 cfs	3.2	0.045	1.9	0.027		
	≥ 20 cfs	--	--	--	--	monthly	
total suspended solids (TSS)	Not dependent on river flow	30 mg/l	See note below Table 10	20 mg/l	See note below Table 10	weekly	24-hour composite
pH, su	Not dependent on river flow	Not less than 6.5 nor greater than 10.0				weekly	grab
outfall flow, cfs	--	--		--		continuous	recording
Temperature, °C	--	--		--		weekly	grab
E.coli, #/100 ml	--	--		--		monthly	grab
hardness as $CaCO_3$, mg/L	--	--		--		monthly	24-hour composite
WET, TU_C	--	--		--		quarterly	24-hour composite

Table 8 – Current Effluent Limitations and Monitoring Requirements for Outfall 002 when the Outfall 001 Waste Stream is discharged through Outfall 002							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
SFCdA River flow directly upstream of the outfall, cfs	--	--		--		daily	recording

Table 9 – Current Effluent Limitations and Monitoring Requirements for Outfall 002 when the Outfall 003 Waste Stream is discharged through Outfall 002							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
cadmium	Not dependent on river flow	2.1	0.040	1.1	0.21	weekly	24-hour composite
lead		75	1.4	45	0.85		
zinc		260	4.9	150	2.8		
copper	< 8.6 cfs	20	0.38	7.4	0.14	weekly	24-hour composite
	≥ 8.6 to < 20 cfs	23	0.43	8.6	0.16		
	≥ 20 to < 69 cfs	25	0.47	9.3	0.18		
	≥ 69 to < 117 cfs	39	0.73	15	0.28		
	≥ 117 cfs	35	0.66	13	0.24		
mercury	< 8.6 cfs	0.043	0.00081	0.022	0.00041	2/month	grab
	≥ 8.6 to < 20 cfs	0.056	0.0011	0.028	0.00053		
	≥ 20 to < 69 cfs	0.10	0.0019	0.052	0.00098		
	≥ 69 to < 117 cfs	0.31	0.0058	0.16	0.0030*	2/month	grab
	≥ 117 cfs	0.51	0.0096	0.26	0.0049		
silver	< 8.6 cfs	3.2	0.060	1.9	0.036	weekly	24-hour composite
	≥ 8.6 to < 20 cfs	3.4	0.064	2.0	0.038		
	≥ 20 to < 69 cfs	4.3	0.081	2.6	0.049		
	≥ 69 to < 117 cfs	5.6	0.11	3.3	0.062		
	≥ 117 cfs	4.0	0.075	2.4	0.045		

Table 9 – Current Effluent Limitations and Monitoring Requirements for Outfall 002 when the Outfall 003 Waste Stream is discharged through Outfall 002							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
total suspended solids (TSS)	Not dependent on river flow	30 mg/l	See note below Table 10	20 mg/l	See note below Table 10	weekly	24-hour composite
pH, su	Not dependent on river flow	Not less than 6.5 nor greater than 10.0				weekly	grab
outfall flow, cfs	--	--		--		continuous	recording
Temperature, °C	--	--		--		weekly	grab
E.coli, #/100 ml	--	--		--		monthly	grab
hardness as $CaCO_3$, mg/L	--	--		--		monthly	24-hour composite
WET, TU_C	--	--		--		quarterly	24-hour composite
SFCdA River flow directly upstream of the outfall, cfs	--	--		--		daily	recording
* The value listed in the current permit of 0.030 is likely a typographical error							

Table 10 – Current Effluent Limitations and Monitoring Requirements for Outfall 003							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
cadmium	Not dependent on river flow	2.1	0.040	1.1	0.21	weekly	24-hour composite
lead		75	1.4	45	0.85		
zinc		260	4.9	150	2.8		
copper	< 8.0 cfs	20	0.38	7.4	0.14	weekly	24-hour composite
	≥ 8.0 to < 18 cfs	23	0.43	8.6	0.16		
	≥ 18 to < 63 cfs	29	0.55	11	0.21		
	≥ 63 cfs	30	0.56	11	0.21		
mercury	< 8.0 cfs	0.042	0.00079	0.021	0.00040	2/month	grab
	≥ 8.0 to < 18 cfs	0.054	0.0010	0.027	0.00051		

Table 10 – Current Effluent Limitations and Monitoring Requirements for Outfall 003							
Parameter	Upstream River Flow Tier	Effluent Limitations				Monitoring Requirements	
		Maximum Daily		Average Monthly		Sample Frequency	Sample Type
		ug/l	lb/day	ug/l	lb/day		
	≥ 18 to < 63 cfs	0.096	0.0018	0.048	0.00090		
	≥ 63 to < 108 cfs	0.29	0.0055	0.14	0.0026	2/month	grab
	≥ 108 cfs	0.48	0.0090	0.24	0.0045		
silver	< 8.0 cfs	3.2	0.060	1.9	0.036		
	≥ 8.0 to < 18 cfs	3.3	0.062	1.9	0.036		
	≥ 18 to < 63 cfs	3.2	0.060	1.9	0.036	weekly	24-hour composite
	≥ 63 to < 108 cfs	3.9	0.073	2.3	0.043		
	≥ 108 cfs	3.3	0.062	2.0	0.038		
total suspended solids (TSS)	Not dependent on river flow	30 mg/l	See note below Table 10	20 mg/l	See note below Table 10	weekly	24-hour composite
pH, su	Not dependent on river flow	Not less than 6.5 nor greater than 10.0				weekly	grab
outfall flow, cfs	--	--		--		continuous	recording
Temperature, °C	--	--		--		weekly	grab
E.coli, #/100 ml	--	--		--		monthly	grab
hardness as $CaCO_3$, mg/L	--	--		--		monthly	24-hour composite
WET, TU_C	--	--		--		quarterly	24-hour composite
SFCdA River flow directly upstream of the outfall, cfs	--	--		--		daily	recording

The TSS loading limitations are based on the WLA in the SFCdA River TMDL. The limitations from the current permit are listed below:

Table 7: when no portion of outfall 001 is discharged through outfall 002:
+ maximum daily limit = 469 lbs/day
+ average monthly limit = 247 lbs/day when all or a portion of the outfall 001 waste stream is discharged through outfall 002:
+ maximum daily limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 469 lbs/day
+ average monthly limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 247 lbs/day

Table 8:

+ maximum daily limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 469 lbs/day
+ average monthly limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 247 lbs/day

Table 9:

+ maximum daily limit = lbs/day from outfall 003 + lbs/day from outfall 002 must not exceed 346 lbs/day
+ average monthly limit = lbs/day from outfall 003 + lbs/day from outfall 002 must not exceed 188 lbs/day

Table 10: when no portion of outfall 003 is discharged through outfall 002:

+ maximum daily limit = 346 lbs/day
+ average monthly limit = 188 lbs/day when all

or a portion of the outfall 003 waste stream is discharged through outfall 002

+ maximum daily limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 346 lbs/day
+ average monthly limit = lbs/day from outfall 001 + lbs/day from outfall 002 must not exceed 188 lbs/day

Draft Permit - Effluent Limits and Monitoring Requirements

Tables 11 and 12, below, contain the proposed effluent limitations and monitoring requirements for Outfalls 001, 002 and 003, respectively.

Table 11 - Proposed Effluent Limitations and Monitoring Requirements for Outfall 001 or 002

Parameter	Effluent Limitations				Monitoring Requirements	
	Maximum Daily		Average Monthly		Sample Frequency	Sample Type
	ug/l	lb/day	ug/l	lb/day		
Cadmium	1.6	0.008	0.6	0.003	Weekly	24-hour composite
Lead	40.7	0.191	15.1	0.071		
Zinc	163.0	0.768	64.5	0.304		
Copper	48.7	0.23	17,5	0.08		
Copper (BLM)	1.0	0.005	0.4	0.002		
The copper effluent limitation will be based on the criteria that are in effect at the time the permit is issued.						
Mercury	0.09	0.0005	0.03	0.0002	2/month	Grab
Total Suspended Solids (TSS)	30 mg/L	--	20 mg/L	--	Weekly	24-hour composite
TSS, loading	Annual Average not to exceed 247 lbs/day				Annual	Calculation
pH	see pH discussion below				Weekly	Grab

Table 11 - Proposed Effluent Limitations and Monitoring Requirements for Outfall 001 or 002

Parameter	Effluent Limitations				Monitoring Requirements	
	Maximum Daily		Average Monthly		Sample Frequency	Sample Type
	ug/l	lb/day	ug/l	lb/day		
Outfall Flow	report in cfs		report in cfs		Daily	Measured
Hardness, as $CaCO_3$	--		report in mg/l		Monthly	Grab
Temperature,	Report		--		Weekly	Grab
WET, TU_C	Report		--		Quarterly	24-hour composite
SFCdA River flow directly upstream of the outfall, cfs	Report		--		Daily	Recording

Table 12 - Proposed Effluent Limitations and Monitoring Requirements for Outfall 003

Parameter	Effluent Limitations				Monitoring Requirements	
	Maximum Daily		Average Monthly		Sample Frequency	Sample Type
	ug/l	lb/day	ug/l	lb/day		
Cadmium	1.4	0.01	0.8	0.01	Weekly	24-hour composite
Lead	27.4	0.24	20.5	0.18		
Zinc	163.0	1.46	52.4	0.47		
Copper	8.1	0.07	4.9	0.04		
Copper (BLM)	0.9	0.008	0.5	0.005		
The copper effluent limitation will be based on the criteria that are in effect at the time the permit is issued.						
Mercury	0.04	0.0003	0.01	0.0001	2/month	Grab
Total Suspended Solids (TSS)	30 mg/L	--	20 mg/L	--	Weekly	24-hour composite
TSS, loading	Annual Average not to exceed 188.5 lbs/day				Annual	Calculation
pH	see pH discussion below				Weekly	Grab
Outfall Flow	report in cfs		report in cfs		Daily	Measured
Hardness, as $CaCO_3$	--		report in mg/l		Monthly	Grab
Temperature,	Report		--		Weekly	Grab

Table 12 - Proposed Effluent Limitations and Monitoring Requirements for Outfall 003						
Parameter	Effluent Limitations				Monitoring Requirements	
	Maximum Daily		Average Monthly		Sample Frequency	Sample Type
	ug/l	lb/day	ug/l	lb/day		
WET, TU_C	Report		--		Quarterly	24-hour composite
SFCdA River flow directly upstream of the outfall, cfs	Report		--		Daily	Recording

Summary of changes for Outfall 002 (or alternatively, Outfall 001)

In comparison to the most stringent effluent limitations from the current permit, the AML and MDL concentration effluent limitations for copper increased. The AML and MDL concentration effluent limitations and loading limitations for mercury increased. The rest of the concentration effluent limitations either decreased or remained the same. The effluent limitation based on the copper BLM is new and is dependent on whether the criteria is approved by the EPA prior to permit issuance. If the new copper criteria is approved by the EPA prior to permit issuance, then the tiered copper effluent limits will be replaced with the copper (BLM) effluent limitation. The TSS loading limitation is similar to the previous permit but is an annual average rather than a monthly average.

Summary of changes for Outfall 003

All concentration and loading effluent limitations either decreased or remained the same. The effluent limitation based on the copper BLM (see above) would be more stringent than the previous hardness based effluent limitations. The TSS loading limitation is similar to the previous permit but is an annual average rather than a monthly average.

A. Basis for Effluent Limits

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based effluent limitions (TBELs) are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limitation (WQBEL) is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than TBELs.

B. Pollutants of Concern

Pollutants of concern are those that either have TBELs or may need WQBELs. The EPA identifies pollutants of concern for the discharge based on those which:

- Have a technology-based limit
- Have an assigned wasteload allocation (WLA) from a TMDL
- Had an effluent limit in the previous permit

- Are present in the effluent monitoring. Monitoring data are reported in the application and DMR and any special studies
- Are expected to be in the discharge based on the nature of the discharge

In determining the Pollutants of Concern, the EPA reviewed the requirements of the previous permit and the permit application. Based on this analysis, pollutants of concern are as follows:

- Cadmium
- Lead
- Zinc
- Copper
- Mercury
- Total Suspended Solids (TSS)
- pH
- Temperature
- Whole effluent toxicity (WET)

C. Technology-Based Effluent Limitions (TBELs)

On December 3, 1982, the EPA published Effluent Limitation Guidelines (ELGs) for the mining industry (found in 40 CFR 440). Within these guidelines, Subpart J, titled Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory, applies to the Lucky Friday mine discharges. The BPT (40 CFR 440.102) and BAT (40 CFR 440.103) ELGs within this subcategory have been considered and the most limiting are provided in Table 13.

TABLE 13: TBELS for the Lucky Friday Unit

Parameter ug/L unless noted	Daily Maximum	Monthly Average
Cadmium	100	50
Copper	300	150
Lead	600	300
Mercury	2	1
Zinc	1,000	500
TSS, mg/l	30	20
pH, su	within the range 6.0 - 10.0	20

The General Provisions found in Subpart L of the ELGs allow the permit issuer to include a pH limit higher than the ELG maximum limit under certain conditions. Specifically, the "pH adjustment provision" of the ELGs states (40 CFR 440.131(d)(1)): "Where the application of neutralization and sedimentation technology to comply with relevant metals limitations results in an inability to comply with the pH range of 6 to 9, the permit issuer may allow the pH level in the final effluent to slightly exceed 9.0 so that the copper, lead, zinc, mercury, and cadmium limitations will be achieved."

Hecla requested that the EPA modify the Lucky Friday permit to allow for a higher pH limit according to 40 CFR 440.131(d)(1). The permit was modified in 2008 with an upper pH

limit of 10.0 s.u. DEQ proposes to authorize a mixing zone that utilizes up to 25% of the critical low flow volumes of SFCdA River to accommodate an effluent pH of up to 10 s.u. for Outfall 001 or 002 and up to 9.9 s.u. for Outfall 003.

Hecla installed additional neutralization and filtration technology and demonstrated that neutralization and sedimentation (as well as filtration) at a pH level of up to 10.0 s.u. is needed to comply with the metals limits. The EPA determined that an upper pH limit of 10.0 s.u., per 40 CFR 440.131(d)(1), continues to be warranted and is included in the draft permit.

Water Quality-Based Effluent Limits (WQBELs)

Statutory and Regulatory Basis

CWA § 301(b)(1)(C) requires the development of limitations in permits necessary to meet water quality standards. Discharges to State waters must also comply with limitations imposed by the State as part of its certification of NPDES permits under CWA § 401. The NPDES regulation at 40 CFR 122.44(d)(1), implementing CWA § 301(b)(1)(C), requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including narrative criteria for water quality.

The regulations require the permitting authority to make this evaluation using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation for the discharge in an approved TMDL. If there are no approved TMDLs that specify wasteload allocations for this discharge; WQBELs are calculated directly from the applicable water quality standards.

Reasonable Potential Analysis and Need for Water Quality-Based Effluent Limits

The EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (*TSD*) to determine reasonable potential. To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit.

In some cases, a dilution allowance or mixing zone is permitted. A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and within which certain water quality criteria may be exceeded (EPA, 2014). While the criteria may be exceeded within the mixing zone, the use and size of the mixing zone must be limited such that the waterbody as a whole will not be impaired, all designated uses are maintained and acutely toxic conditions are prevented.

The Idaho Water Quality Standards at IDAPA 58.01.02.060 provides Idaho's mixing zone policy for point source discharges. In the State CWA § 401 Certification, DEQ proposes to authorize mixing zones for copper and mercury. The proposed mixing zones are summarized in Table 14. The EPA also calculated dilution factors for critical flow

conditions. All dilution factors are calculated with the effluent flow rate set 0.87 cfs for Outfall 002 and 1.66 cfs for Outfall 003**.**

Table 14. Mixing zones

Criteria Type	Critical Low Flow (cfs)	Mixing Zone (% of Critical Low Flow)	Dilution Factor
Outfall 002			
Acute Aquatic Life, 1Q10	10.9	25	4.12
Chronic Aquatic Life, 7Q10	11.46	25	4.28
Human Health Carcinogen, Harmonic Mean	27.0	25	8.72
Human Health Non-carcinogen, 30Q5	13.2	25	4.78
Outfall 003			
Acute Aquatic Life, 1Q10	3.7	25	1.56
Chronic Aquatic Life, 7Q10	5.3	25	1.80
Human Health Carcinogen, Harmonic Mean	16.7	25	3.53
Human Health Non-carcinogen, 30Q5	5.7	25	1.86

The reasonable potential analysis and WQBEL calculations were based on mixing zones shown in Table 14. If DEQ revises the allowable mixing zone in its final certification of this permit, reasonable potential analysis and WQBEL calculations will be revised accordingly.

Reasonable Potential and WQBELs

The reasonable potential and WQBEL for specific parameters are summarized below. The calculations are provided in Appendix C.

The reasonable potential analyses for those parameters included in an ELG are calculated based on a discharge at the level of the ELG. Since these values are much less stringent than the WQS, there is always reasonable potential for these parameters. Based on this, the EPA assumes there is reasonable potential for cadmium, lead, zinc, copper, mercury, pH and TSS.

The calculations shown in Appendix C show that the maximum expected concentrations (MEC) at the end-of-pipe for silver and manganese do not exceed the most stringent applicable criteria. Therefore, there is no reasonable potential for these parameters to cause or contribute to a violation of the WQS.

<u>pH</u>

The water quality criteria specifies a maximum pH limit of 9.0 s.u. DEQ has included in its draft certification a mixing zone for pH. The dilution provided by the authorized mixing zone ensures that water quality criteria for pH are met at the edge of the mixing zone when the discharge pH is at the technology-based upper pH limit of 10.0 s.u.

DEQ previously certified this mixing zone on May 16, 2008, for the proposed modification of the permit: "*A discharge into the South Fork Coeur d'Alene River of pH =10 s.u. at 7Q10 design flows was modeled by DEQ to have an allowable mixing zone of no greater than six meters in length in the downstream direction. Based on DEQ modeling, Idaho Water Quality Standards are met at the edge of this mixing zone and ultimately the pH of the river was increased by no more than 0.3 s.u. Based on this analysis, DEQ authorizes*

a mixing zone for pH pursuant to the Idaho Water Quality Standards, IDAPA 58.01.02.060. With a mixing zone, there is a reasonable assurance a discharge of pH of 10 s.u. will comply with the applicable provisions of the CWA and Idaho Water Quality standards."

E. coli

The sanitary wastewater discharge, which was the source of *E. coli*, has been removed as an input to the impoundments, so no limitation or monitoring is proposed in the draft permit for *E. coli*.

Copper

Current Criteria

The current dissolved copper criteria are hardness based and listed in IDAPA 58.01.02.210.02(a) and (b):

Acute criterion = $0.960*e^{(0.9422*\ln(H)-1.464)}$

Chronic criterion = $0.960*e^{(0.8545*\ln(H)-1.465)}$

The effluent limitations for copper have changed from the previous permit because new data collected during the permit cycle have a different coefficient of variation than the previous data set and different flows were used for the flow tiered effluent limitations. The previous permit used the effluent hardness to calculate water quality criteria. To be consistent with the Idaho Water Quality Standards (IDAPA 58.01.02.210.03.c.ii) the receiving water hardness is used to calculate water quality criteria (see Hardness discussion in Appendix C). Also, water treatment plants have been installed that make the need for tiered limitations unnecessary.

DEQ adopted Copper BLM criteria

The toxicity of metals to aquatic life is highly variable and depends on physical and chemical factors within a waterbody. Hardness has long been acknowledged as one such factor and is reflected in the DEQ's current hardness-dependent criteria, whereby the acute and chronic criteria are determined based on the total hardness of the receiving waterbody.

Hardness-dependent copper criteria do not take into account the effects of other physicochemical properties that affect toxicity, leading to hardness-dependent copper criteria being either overprotective or under protective of aquatic life. The biotic ligand model (BLM) based criteria outline in the EPA's revised national recommended freshwater aquatic life criterion for copper takes into consideration copper toxicity influenced by a wide variety of water characteristics. DEQ has updated the copper criteria for aquatic life to the EPA-recommended 304(a) criteria and adopted the BLM criteria. The EPA received the criteria for review on January 28, 2019. It is expected that EPA's action could occur prior to the issuance of the final permit so both the hardness-dependent and BLM criteria are used to develop effluent limitations for the draft permit. The criteria that are in effect for CWA purposes at the time of permit issuance will be used to determine the final effluent limitations.

The hardness-dependent criteria only account for competitive binding at biotic ligand sites (e.g., the gill surfaces of a fish) by calcium and magnesium cations (i.e., hardness).

The BLM also accounts for binding by other cations, as well as metal speciation and complexation with dissolved organic carbon (DOC) and other inorganic ligands. The BLM incorporates copper speciation and complexation in addition to competitive binding at biotic ligand sites by cations so it better predicts the toxic effects of exposure to dissolved copper in the aquatic environment than the hardness-dependent criteria equations. The BLM produces more accurate predictions of toxic effects from copper in a variety of natural waters. While the BLM does provide more accurate and precise predictions of toxic effects from a given copper concentration, it is important to note that the BLM does not always provide more stringent criteria.

In the "*Implementation Guidance for the Idaho Copper Criteria for Aquatic Life*" DEQ has provided potential conservative criteria estimates to use if there is insufficient data to produce site specific BLM criteria. Since there is insufficient data for the BLM input parameters for the receiving waters, Table 2 from this Guidance was used to estimate the applicable criteria. The Guidance contains several different regional classifications to determine the criteria to use. Hecla Lucky Friday is located in the Pandhandle Basin which has the most stringent criteria except for Mountains Stream site class. SFCdA River is classified as a mountain stream so the acute and chronic criteria will be 1.0 and 0.6 ug/L, respectively.

Cadmium, Lead and Zinc

IDAPA 58.02.01.284 contains site specific criteria for cadmium, lead and zinc. The following criteria are to be met dependent upon the hardness, expressed as mg/l of calcium carbonate, of the water. Criterion maximum concentrations (CMC), one (1) hour average concentrations, and criterion continuous concentrations (CCC), four (4) day average concentrations, of the dissolved metals (in µg/l) are not to exceed, more than once every three (3) years, the values calculated using the following equations:

Cadmium.

a. $CMC = 0.973 \times e^{[(1.0166 * \ln(H)) - 3.924]}$

b. $CCC = [1.101672 - (\ln(H)*0.041838] * e^{[(0.7852*\ln(H)) - 3.490]}$

Lead.

a. $CMC = e^{[(0.9402*\ln(H)) + 1.1834]}$ b. $CCC = e^{[(0.9402*\ln(H)) - 0.9875]}$

Zinc.

a. $CMC = e^{[(0.6624*\ln(H)) + 2.2235]}$ b. $CCC = e^{[(0.6624*\ln(H)) + 2.2235]}$

The effluent limitations for cadmium, lead and zinc have changed from the previous permit because new data collected during the permit cycle has a different coefficient of variation than the previous data set. The previous permit used the effluent hardness to calculate water quality criteria. To be consistent with the Idaho Water Quality Standards (IDAPA 58.01.02.210.03.c.ii) the receiving water hardness is used to calculate water quality criteria (see Hardness discussion in Appendix C).

Mercury

Methylmercury fish tissue criterion

DEQ has determined that facility monitoring is not necessary at this time because fish tissue sampling for methylmercury has already been completed. In 2016 fish in the South Fork Coeur d'Alene River were collected by DEQ at various locations including below the Lucky Friday Unit outfalls to determine concentrations of methylmercury in their tissue. The purpose of this monitoring was to determine if there are human health risks from the consumption of fish in the SFCdA River. Data indicated that methylmercury in the SFCdA River fish tissue does not result in elevated human health risks from consumption (Draft Letter Health Consultation Coeur d'Alene Basin Fish Tissue Analysis and Consumption Advisory, Coeur d'Alene Idaho, November, 2018). Results of this monitoring effort will be reported by the Idaho Department of Health and Welfare in 2019. DEQ has determined that this monitoring data meets sufficient rigor, quality and relevance to determine if an impairment of a beneficial use exists, to update the Integrated Report, and inform future permits (IDAPA 58.01.02.054.05). No additional monitoring is required to accomplish these tasks. In addition, fish populations in the SFCdA River are depressed and additional lethal sampling of these populations is unwarranted. As such, the EPA is not proposing monitoring in the draft permit.

Mercury water column aquatic life criteria

While the EPA approved Idaho's adoption of the fish tissue criterion in September 2005, it had withheld judgment on Idaho's removal of aquatic life criteria. On December 12, 2008, the EPA disapproved Idaho's removal of the old aquatic life criteria. The water column criteria for total recoverable mercury published in 2004 Idaho Administrative Code continue to apply and are effective for CWA purposes.

The effluent limitations for mercury have changed from the previous permit because new data collected during the permit cycle have a different coefficient of variation than the previous data set and different flows were used for the flow tiered effluent limitations. Also, water treatment plants have been installed that make the need for tiered limitations unnecessary.

WET

The draft permit includes WET monitoring and establishes trigger levels for each outfall, that, if exceeded would trigger additional WET testing and, potentially, investigations to reduce toxicity. The trigger levels were calculated based on the WET criteria, receiving water flow, effluent flow, and available dilution. The trigger levels were calculated using the following mass- balance equation (this is basically the same as Equation 5):

$$\text{WET toxicity trigger} = \frac{\text{criterion} \times [Qe + (Qu \times MZ)] - (Cu \times Qu \times MZ)}{Qe}$$

where,

criterion = 1 TUc for compliance with the chronic criterion
Qe = effluent flow
Qu = upstream flow
Cu = upstream concentration = 0 (assumes no upstream toxicity)
MZ = mixing zone = 0.25 for compliance with chronic policy

Table 15: Chronic Toxicity Triggers and Receiving Water Concentrations			
Outfall	**Flow**	**Chronic Toxicity Trigger, TU_C**	**Receiving Water Concentration (RWC), % effluent**
001/002 Effluent Flow of 0.87 cfs	at the 7Q10 of 11.46	4.3	23%
003 Effluent Flow of 1.66 cfs	at the 7Q10 of 5.3	1.8	56%

TSS

The TMDL for sediments contains a concentration limit and an annual loading limit for sediment in the discharges from two outfalls at LFU. The concentration WLA is the same as the TBEL discussed above but the loading WLA does not correspond to the typical equation using concentration and flow to determine the loading, rather the annual load is set in the TMDL. Therefore, a daily load is determined as follows:

Outfall 001: 45.1 tons/yr * 2000 lbs/ton / 365 days/yr = 247 lbs/day

Outfall 002: 45.1 tons/yr * 2000 lbs/ton / 365 days/yr = 247 lbs/day

Outfall 003: 34.4 tons/yr * 2000 lbs/ton / 365 days/yr = 188.5 lbs/day

These limitations will be expressed as an annual average for each outfall. The annual average TSS load must be calculated as the sum of all daily loads calculated for TSS during a calendar year, divided by the number of days sampled for TSS during that year. The daily loads must be calculated using the concentration and the flow measured on the day the sample was collected.

Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, except under certain conditions. The mass based limits are expressed in pounds per day and are calculated as follows:

Mass based limit (lb/day) = concentration limit (mg/L) × flow (mgd) × 8.34[1]

The EPA utilized the 99th percentile effluent flow for use in determining the mass based limits proposed in the draft permit.

[1] 8.34 is a conversion factor with units (lb ×L)/(mg × gallon×10^6)

D. Antibacksliding

CWA § 402(o) and federal regulations at 40 CFR §122.44(l) generally prohibit the renewal, reissuance or modification of an existing NPDES permit that contains effluent limits, permit conditions or standards that are less stringent than those established in the previous permit (i.e., anti-backsliding) but provides limited exceptions.

An anti-backsliding analysis was done for the hardness based copper effluent limitation and mercury effluent limations for discharges from Outfall 001 or 002. All effluent limitations for Outfall 003 are as stringent or more stringent than the previous permit effluent limitations so backsliding is not an issue.The copper effluent limitations based on the BLM are more stringent that the copper effluent limitations in the previous permit for all outfalls so backsliding will not be an issue if those effluent limitations are contained in the final permit.

CWA § 303(d)(4)(B) provides an exception against the prohibition on backsliding from a water quality-based effluent limitation. Specifically, when water quality meets or exceeds applicable water quality standards for a specific parameter, a permit can contain less stringent effluent limits than the previous permit if the revision is consistent with the State's approved antidegradation policy. Backsliding is allowed for copper and mercury for Outfall 001/002 because the receiving water quality meets water quality standards, and because DEQ found the changes to the effluent limitations in the draft permit to be insignificant thus meeting the state of Idaho's antidegradation policy (See Appendix D).

VI. Monitoring Requirements

A. Basis for Effluent and Surface Water Monitoring

CWA § 308 and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality.

The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for renewal, as appropriate, to the EPA and/or DEQ.

B. Effluent Monitoring

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples must be used for averaging if they are conducted using the EPA-approved test methods (generally found in 40 CFR 136) or as specified in the permit.

C. Surface Water Monitoring

In general, surface water monitoring may be required for pollutants of concern to assess the assimilative capacity of the receiving water for the pollutant. In addition, surface water monitoring may be required for pollutants for which the water quality criteria are hardness dependent and to collect data for TMDL development if the facility discharges to an impaired water body. Table 2 presents the proposed surface water monitoring requirements upstream of Outfalls 001 and 002. The draft permit also requires monitoring downstream of each outfall to collect data for site specific copper BLM criteria for the next

permit cycle. Table 3 presents these requirements. Surface water monitoring results must be submitted with the DMR.

1. Monitoring stations must be established at the following locations:
   a. in the SFCdA River directly upstream of Outfalls 001/002 and 003, and
   b. below Outfalls 001/002 and 003, at a point where the effluent and the SFCdA River are completely mixed.

   Sampling locations must be approved by DEQ.
2. All locations must be monitored according to the sampling frequency in Table 16 (Table 5 of the draft permit). The results of quarterly sampling must be submitted with the DMRs for March, June, September and December.
3. To the extent practicable, surface water sample collection must occur on the same day as effluent sample collection.
4. All ambient samples must be grab samples.
4. Samples must be analyzed for the parameters and achieve MDLs that are equivalent to or less than those listed in Table 16. The permittee may request different MDLs. Such a request must be in writing and must be approved by EPA.

Table 16: Surface Water Monitoring Requirements

Parameter	Units	Upstream Sampling Frequency	Downstream Sampling Frequency	Method Detection Limit (MDL)
Flow	cfs	Daily	Monthly	NA
Cadmium, dissolved	ug/L	Quarterly	Quarterly	0.1
Copper, dissolved	ug/L	Quarterly	Monthly	1
Lead, dissolved	ug/L	Quarterly	Quarterly	5.0
Mercury, total	ug/L	Quarterly	Quarterly	0.001
Zinc, dissolved	ug/L	Quarterly	Quarterly	10
pH	standard units	Quarterly	Monthly [1, 2]	NA
Temperature	^{o}C	--- [4]	Monthly [2, 3]	± 2
Temperature	^{o}C	Continuous [3]	--- [4]	± 2
Hardness (as $CaCO_3$)	mg/l	Quarterly	Monthly [2]	0.2
Dissolved Organic Carbon	mg/L	--- [4]	Monthly [2]	1
Calcium	ug/L	--- [4]	Monthly [2]	10
Magnesium	ug/L	--- [4]	Monthly [2]	50
Sodium	ug/L	--- [4]	Monthly [2]	30

Table 16: Surface Water Monitoring Requirements				
Parameter	Units	Upstream Sampling Frequency	Downstream Sampling Frequency	Method Detection Limit (MDL)
Potassium	mg/L	--- [4]	Monthly [2]	0.3
Sulfate (as SO_4)	mg/L	--- [4]	Monthly [2]	0.2
Chloride	mg/L	--- [4]	Monthly [2]	1
Alkalinity (as $CaCO_3$)	mg/L Ca	--- [4]	Monthly [2]	5

1 - pH can vary widely diurnally, it is important to consider the diurnal variation when sampling

2 – Water chemistry data collected for use in the biotic ligand model shall follow the *Implementation Guidance for the Idaho Copper Criteria for Aquatic Life*. August 2017.

After 24 consecutive monthly samples for the copper BLM have been collected, instream monitoring may be decreased to quarterly after DEQ review and approval of data quality.

Upon DEQ approval of the 24 consecutive monthly instream samples for the copper BLM criteria, the permittee may request reopening of the permit to recalculate the copper BLM effluent limits using the updated copper BLM criteria.

3 - See b., below.

4 - Sampling not required.

a. Certain constituents must be monitored downstream of each outfall to determine a outfall specific BLM criteria for copper. DEQ submitted these criteria to the EPA for action in January 2019. If the EPA approves the criteria prior to final issuance then, as discussed above, the default values from the DEQ Guidance will be used to develop effluent limitations. If the criteria have not been approved, then the current hardness based criteria will be used. The collection of the data specified in Table 16 (Table 5 of the draft permit) will serve to develop outfall specific criteria

b. Temperature shall be sampled for at least two consecutive years during the June through November timeframe. Temperature monitoring shall begin after the effective date of the permit on June 1 and ending November 30. After two consecutive years of data, no surface water temperature monitoring is required upstream of the outfalls. Permittee shall contact DEQ Coeur d'Alene Regional Office prior to start of temperature monitoring to obtain frequency of data collection and location of the monitoring (see Appendix D, Draft CWA § Certification).

5. River Flow Monitoring: The draft permit requires that daily streamflow be monitored for the SFCdA River directly upstream of each Outfall. This information will determine the stream flows used in the next permit reissuance. The permittee must report the average monthly flow on the DMR.

6. Bioassessment Monitoring. Annual instream bioassessment monitoring was conducted during the last permit cycle. DEQ has determined that enough data has been collected to analyze the impact of the discharges to the beneficial use. As such, bioassessment monitoring is not included in the draft permit.

7. Electronic Submission of Discharge Monitoring Reports

   The draft permit requires that the permittee submit DMR data electronically using NetDMR. NetDMR is a national web-based tool that allows DMR data to be submitted electronically via a secure Internet application.

   The EPA currently conducts free training on the use of NetDMR. Further information about NetDMR, including upcoming trainings and contacts, is provided on the following website: https://netdmr.epa.gov. The permittee may use NetDMR after requesting and receiving permission from EPA Region 10.

VII. Other Permit Conditions

A. Compliance Schedules

Compliance schedules are authorized by federal NPDES regulations at 40 CFR 122.47 and Idaho WQS at IDAPA 58.01.02.400.03. Compliance schedules allow a discharger to phase in, over time, compliance with water quality-based effluent limitations when limitations are in the permit for the first time.

Pursuant to IDAPA 58.01.02.400.03, DEQ may authorize compliance schedules for water quality-based effluent limits issued in a permit for the first time. Although the copper BLM-based criteria are not currently in effect, for reasons of efficiency, DEQ is proposing the compliance schedule found in Appendix D of this Fact Sheet or Permit Part II.A. in the event the BLM based copper criteria becomes effective (obtains EPA approval) prior to issuance of the final permit. The Lucky Friday Unit cannot immediately achieve compliance with the BLM-based effluent limits for copper; therefore, DEQ proposed to authorize a compliance schedule and interim requirements. This compliance schedule is only effective if BLM based effluent limits are retained in the final permit.

The Lucky Friday Unit WTP2 does not currently have the capability to treat water to the levels required to meet the new copper BLM limits. Due to limited space at that location and the need to add filters or other upgrades, time is necessary to design, install and test the equipment and process. DEQ authorizes a period of five (5) years from the effective date of the permit to meet final effluent limits as specified in the draft permit. The compliance schedule provides the permittee a reasonable amount of time to achieve the final effluent limits as specified in the permit. At the same time, the schedule ensures that compliance with the final effluent limits is accomplished as soon as possible. See 40 CFR § 122.47.

B. Quality Assurance Plan

The Permittee is required to update the Quality Assurance Plan within **60 days** of the effective date of the final permit. The Quality Assurance Plan must include standard operating procedures the permittee will follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting. The plan must be retained on site and be made available to the EPA and the DEQ upon request.

C. Best Management Practices (BMP) Plan

The permit requires a BMP Plan be developed (or modified) and implementedto prevent or minimize the generation and the potential for the release of pollutants from the facility

to the waters of the United States through normal and ancillary activities. The permittee is required to develop or modifiy an existing BMP Plan for their facility and implement the Plan within 60 days of the effective date of the final permit. The plan must be retained on site and made available to the EPA and the DEQ upon request.

D. Environmental Justice

As part of the permit development process, EPA Region 10 conducted a screening analysis to determine whether this permit action could affect overburdened communities. “Overburdened” communities can include minority, low-income, tribal, and indigenous populations or communities that potentially experience disproportionate environmental harms and risks. The EPA used a nationally consistent geospatial tool that contains demographic and environmental data for the United States at the Census block group level. This tool is used to identify permits for which enhanced outreach may be warranted.

The facility is not located within or near a Census block group that is potentially overburdened. The draft permit does not include any additional conditions to address environmental justice.

Regardless of whether a facility is located near a potentially overburdened community, the EPA encourages permittees to review (and to consider adopting, where appropriate) Promising Practices for Permit Applicants Seeking EPA-Issued Permits: Ways To Engage Neighboring Communities (see https://www.federalregister.gov/d/2013-10945). Examples of promising practices include: thinking ahead about community’s characteristics and the effects of the permit on the community, engaging the right community leaders, providing progress or status reports, inviting members of the community for tours of the facility, providing informational materials translated into different languages, setting up a hotline for community members to voice concerns or request information, follow up, etc.

For more information, please visit https://www.epa.gov/environmentaljustice and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.

E. Standard Permit Provisions

Permit Parts III, IV and V contain standard regulatory language that must be included in all NPDES permits. The standard regulatory language covers requirements such as monitoring, recording, and reporting requirements, compliance responsibilities, and other general requirements.

VIII. Other Legal Requirements

A. Endangered Species Act

The Endangered Species Act requires federal agencies to consult with National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. A review of the threatened and endangered species located in Idaho finds that there are no endangered aquatic species in the vicinity of the

discharges and no designated critical habitat. Therefore, the EPA is determining that there will be no effect on threatened or endangered species.

B. Essential Fish Habitat

Essential fish habitat (EFH) is the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires the EPA to consult with NOAA Fisheries when a proposed discharge has the potential to adversely affect EFH (i.e., reduce quality and/or quantity of EFH). A review of the Essential Fish Habitat documents shows that there are no managed fisheries in the area of the discharge.

The EPA has determined that issuance of this permit will have no effect on EFH.

C. State Certification

CWA § 401 requires the EPA to seek State certification before issuing a final permit. As a result of the certification, the State may require more stringent permit conditions or additional monitoring requirements to ensure that the permit complies with water quality standards, or treatment standards established pursuant to any State law or regulation. The draft CWA § 401 Certification provided in Appendix D addresses several issues including mixing zones, compliance schedules, hardness, antidegration and methylmercury monitoring.

D. Antidegradation

The DEQ has completed an antidegradation review which is included in the draft CWA § 401 Certification for this permit. (Appendix D) The EPA has reviewed this antidegradation analysis and finds that it is consistent with the State's water quality standards and the State's antidegradation implementation procedures. Comments on the CWA § 401 Certification including the antidegradation review can be submitted to the DEQ as set forth above (see FS 1).

E. Permit Expiration

The permit will expire five years from the effective date.

IX. References

NPDES Permit No. ID0000175 Updated Renewal Application. March 2018.

Seepage Study and Hydrological Analysis Prepared By: Water & Natural Resource Group, Inc. (Spokane, WA) for Hecla Limited Lucky Friday Unit. Final Edited Version March 14, 2008.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control.* US Environmental Protection Agency, Office of Water, EPA/505/2-90-001. https://www3.epa.gov/npdes/pubs/owm0264.pdf

EPA. 2010. *NPDES Permit Writers' Manual.* Environmental Protection Agency, Office of Wastewater Management, EPA-833-K-10-001. September 2010. https://www3.epa.gov/npdes/pubs/pwm_2010.pdf

EPA. 2014. Water Quality Standards Handbook Chapter 5: General Policies. Environmental Protection Agency. Office of Water. EPA 820-B-14-004. September 2014. https://www.epa.gov/sites/production/files/2014-09/documents/handbook-chapter5.pdf

40 CFR 122 – EPA administered permit programs: the National Pollutants Discharge Elimination System.

40 CFR 124 – Procedures for Decisionmaking

40 CFR 440 Subpart J - Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory.

USFWS, 2019. IPaC (Information for Planning and Consultation) updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project. Consultation Code: 01EIFW00-2018-SLI-0088 Event Code: 01EIFW00-2019-E-00285 Project Name: US Silver and Hecla Mines.

DEQ, 2018. Rules of the Department of Environmental Quality, IDAPA 58.01.02, “Water Quality Standards.” https://adminrules.idaho.gov/rules/current/58/580102.pdf

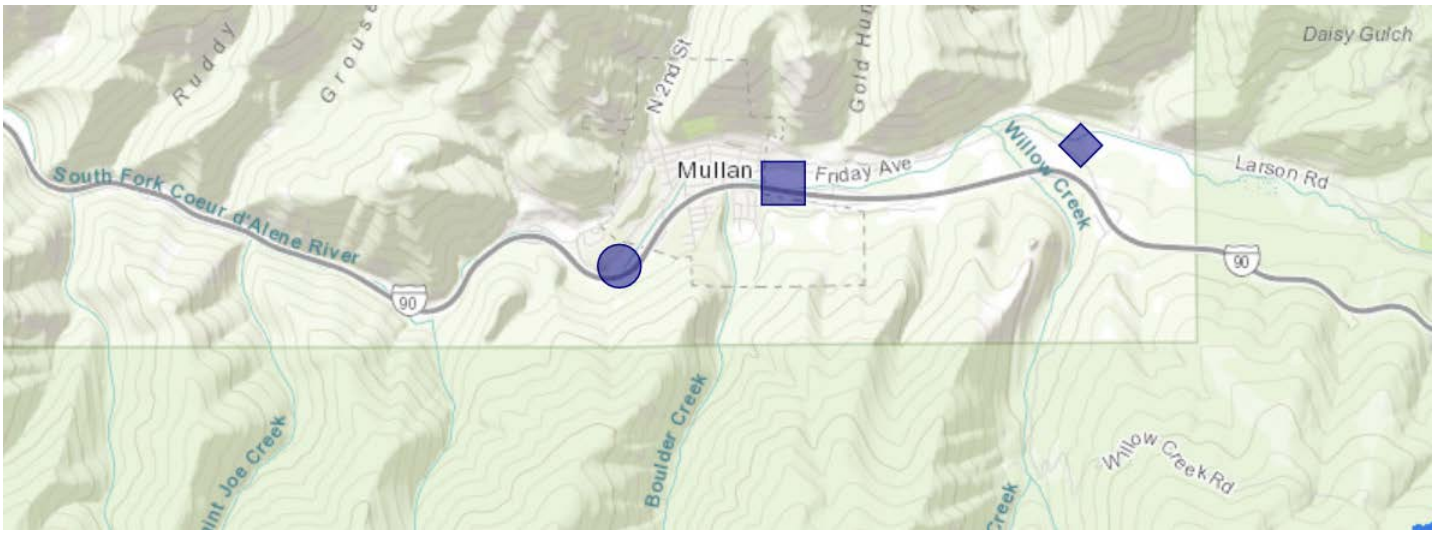
DEQ, 2004. Rules of the Department of Environmental Quality, IDAPA 58.01.02, “Water Quality Standards.” https://adminrules.idaho.gov/rules/2004/58/0102.pdf

DEQ, 2002. South Fork Coeur d’Alene River Sediment SubbasinAssessment and Total Maximum Daily Load, Idaho Department of Environmental Quality, Coeur d’Alene Regional Office. May 17, 2002. https://www.deq.idaho.gov/media/454003-_water_data_reports_surface_water_tmdls_cda_river_sf_cda_river_sf_sed_entire.pdf

DEQ 2017a. Implementation Guidance for the Idaho Copper Criteria for Aquatic Life: Using the Biotic Ligand Model. Idaho Department of Environmental Quality, Water Quality Division, Boise, Idaho. November 2017. http://air.idaho.gov/media/60180840/58-0102-1502-implementation-guidance-idaho-copper-criteria-aquatic-life-1117.pdf

DEQ 2017b. Draft Idaho Antidegradation Implementation Procedures. August 2017.

Appendix A.Facility Information



Outfall 001 ● Outfall 002 ■ Outfall 003 ♦

Appendix B.Water Quality Data

A. Effluent Data – Outfall 002

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
1/8/13	0.000075	1/2/13	0.05	1.67	2.5	0.05	17.5	19.9	8.2	0.7	1/2/13	145
1/22/13	0.000075	1/9/13	0.05	1.71	2.5	0.05	17.2	20.1	8.4	0.7	2/6/13	113
2/5/13	0.00034	1/16/13	0.05	2.2	2.5	0.05	22.8	19.3	8.3	1	2/18/13	300
2/19/13	0.00077	1/23/13	0.05	1.9	2.5	0.05	18.7	18.8	8.3	2.7	2/20/13	175
3/5/13	0.00017	1/30/13	0.11	1.64	2.5	0.05	27.5	13.5	7.9	0.6	2/22/13	199
3/20/13	0.00016	2/6/13	0.12	1.59	6.52	0.05	26.2	18.3	8.2	1.7	3/6/13	143
4/2/13	0.00039	2/13/13	0.05	1.9	7.2	0.05	16.8	18.9	8.1	1.8	4/3/13	104
4/23/13	0.00308	2/18/13	0.05	1.87	19	0.05	17.5	19	7.5	0.8	5/1/13	150
5/7/13	0.00051	2/20/13	0.1	1.3	7.58	0.05	20.5	16.3	7.7	1.2	5/20/13	277
5/21/13	0.000075	2/22/13	0.05	1.2	2.5	0.05	24.4	17.9	7.7	1.1	5/22/13	121
6/4/13	0.00143	2/27/13	0.05	1.01	2.5	0.05	12.2	18	7.7	1	5/24/13	128
6/11/13	0.000075	3/6/13	0.05	2.96	2.5	0.05	15.3	21.1	7.7	1.4	6/5/13	196
6/18/13	0.000075	3/13/13	0.05	7.32	2.5	0.05	17.2	20.7	7.7	0.8	7/3/13	136
7/9/13	0.001	3/20/13	0.05	4.22	2.5	0.05	5	20.3	7.8	1.3	8/7/13	311
7/23/13	0.00034	3/27/13	0.1	1.85	7.67	0.05	20.5	20.5	7.6	0.6	8/19/13	261
8/6/13	0.000075	4/3/13	0.29	3.21	8.1	0.05	19.9	24.9	7.9	1.7	8/21/13	114
8/20/13	0.00062	4/10/13	0.05	0.5	2.5	0.05	5	17.9	7.9	0.1	8/23/13	262
9/3/13	0.00058	4/20/13	0.05	2.24	2.5	0.05	10.4	10.2	7.9	1.8	9/4/13	190
9/17/13	0.00033	4/24/13	0.05	0.5	2.5	0.05	5	21.7	8	0.2	9/18/13	153
10/8/13	0.00024	5/1/13	0.13	0.5	2.5	0.05	10.7	20	7.1	0.9	10/2/13	170
10/22/13	0.0014	5/8/13	0.16	1.85	5.74	0.05	18	17.3	7.7	2.1	11/6/13	179
11/5/13	0.00022	5/15/13	1.3	2.87	16.5	0.05	62.5	22.1	7.7	0.4	11/11/13	165
11/19/13	0.00239	5/20/13	0.05	1.42	26.6	0.05	21.3	23	7.1	0.8	11/13/13	164
12/3/13	0.000075	5/22/13	0.05	0.5	2.5	0.05	11	25.2	7.3	0.4	11/15/13	144
12/17/13	0.00027	5/24/13	0.42	1.18	11.8	0.05	39.4	24.1	7.5	5	12/4/13	164

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
1/7/14	0.00215	5/29/13	0.05	0.5	2.5	0.05	5	23.4	7.8	0.3	1/8/14	254
1/23/14	0.00031	6/5/13	0.23	1.41	16.6	0.05	36.1	23	7.6	0.8	2/5/14	152
2/4/14	0.0013	6/12/13	0.05	0.5	2.5	0.05	19.4	27.3	7.4	0.6	2/10/14	178
2/18/14	0.00025	6/19/13	0.2	4.33	5.66	0.05	69.2	27.1	7.5	0.8	2/12/14	151
3/4/14	0.00023	6/26/13	0.05	6.07	2.5	0.05	25.6	28.5	7.5	0.5	2/14/14	134
3/18/14	0.000075	7/3/13	0.05	2.31	5.85	0.05	21.1	29.5	7.4	0.6	3/5/14	171
3/26/14	0.00034	7/10/13	0.12	3.86	23.6	0.05	50.9	26.7	6.8	1.7	4/9/14	209
4/1/14	0.000075	7/17/13	0.05	1.33	2.5	0.05	20.4	29.2	7	1.1	5/5/14	224
4/15/14	0.000075	7/24/13	0.82	1.31	14.1	0.05	51.8	29.5	7	2.5	5/7/14	216
5/6/14	0.000075	7/31/13	0.05	2.4	2.5	0.05	10.9	28.2	7.6	0.05	5/9/14	84.7
5/20/14	0.00043	8/7/13	0.21	1.37	16.9	0.05	49.4	26.5	7	1	6/4/14	201
6/3/14	0.000075	8/14/13	0.14	4.53	34.1	0.05	19.6	30.8	7.7	2	7/2/14	154
6/17/14	0.000075	8/19/13	0.05	13.1	46.2	0.05	16.9	28.5	7.4	1.9	8/6/14	128
7/8/14	0.00012	8/21/13	0.23	2.37	12.8	0.05	12.2	28.6	7.6	0.4	8/18/14	212
7/22/14	0.00005	8/23/13	0.05	3.16	7.79	0.05	17.1	27.9	7.2	0.5	8/20/14	202
8/5/14	0.00055	8/28/13	0.05	2.84	2.5	0.05	15.6	27.4	7.2	2.7	8/22/14	179
8/19/14	0.00013	9/4/13	0.05	5.11	2.5	0.05	15.3	27.5	7.4	0.6	9/3/14	208
9/9/14	0.000255	9/11/13	0.05	2.85	2.5	0.05	25.8	29.3	7.8	0.05	9/8/14	239
9/23/14	0.00015	9/18/13	0.05	7.54	2.5	0.05	10.6	30.2	7.3	1.2	9/10/14	197
10/6/14	0.00026	9/25/13	0.05	1.6	2.5	0.05	10.9	28.3	7.4	1.2	9/12/14	173
10/21/14	0.00005	10/2/13	0.05	1.08	2.5	0.05	5	28.3	7.4	0.5	9/15/14	209
11/4/14	0.00005	10/9/13	0.05	0.5	2.5	0.05	5	27.4	7.5	0.2	9/17/14	125
11/18/14	0.00024	10/16/13	0.05	1.49	7.23	0.05	11.6	25.2	7.2	1.8	10/1/14	223
12/9/14	0.00005	10/23/13	0.05	1.54	8.44	0.05	11.2	25.1	7.3	2	11/5/14	187
12/23/14	0.00013	10/30/13	0.05	0.5	2.5	0.05	5	27.6	7.4	1.2	11/17/14	169
1/6/15	0.00005	11/6/13	0.05	0.5	2.5	0.05	5	26.6	7.3	1	11/19/14	150
1/20/15	0.00005	11/11/13	0.05	0.5	2.5	0.05	5	25.6	7.4	0.2	11/21/14	266
2/3/15	0.0003	11/13/13	0.05	0.5	2.5	0.05	5	25.5	7.2	0.3	12/3/14	106

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
2/17/15	0.00088	11/15/13	0.05	0.5	2.5	0.1	5	27.2	7.3	0.5	1/7/15	150
3/3/15	0.0002	11/20/13	0.05	0.5	2.5	0.05	5	24.8	7.3	0.3	2/4/15	248
3/17/15	0.00018	11/27/13	0.05	0.5	2.5	0.05	5	22.8	7.3	0.7	2/16/15	195
4/7/15	0.00021	12/4/13	0.05	1.3	2.5	0.05	5	21.5	7.4	1	2/18/15	244
4/21/15	0.00016	12/11/13	0.05	1.65	7.82	0.05	20.7	21.8	7.6	1.4	2/20/15	281
5/5/15	0.00041	12/18/13	0.05	0.5	2.5	0.05	5	26.6	7.3	0.8	2/23/15	238
5/19/15	0.00053	12/24/13	0.05	0.5	2.5	0.05	5	19.9	7.7	0.2	2/25/15	277
6/9/15	0.00005	12/31/13	0.05	0.5	2.5	0.05	10.5	23.8	7.4	0.7	2/27/15	222
6/23/15	0.00021	1/8/14	0.05	0.5	2.5	0.05	22.5	17.2	7.3	0.8	3/4/15	312
7/7/15	0.00015	1/15/14	0.05	0.5	2.5	0.05	14.3	18.9	7	1	4/2/15	310
7/21/15	0.00069	1/23/14	0.05	0.5	2.5	0.05	12.1	23.4	7	1.4	4/22/15	235
8/11/15	0.00005	1/29/14	0.05	0.5	2.5	0.05	5	24	7.2	0.8	5/4/15	398
8/25/15	0.0012	2/5/14	0.05	0.5	2.5	0.05	5	20.6	6.8	1.3	5/6/15	462
9/8/15	0.00026	2/10/14	0.05	0.5	5.03	0.05	18	21.1	7	2.8	5/8/15	214
9/22/15	0.00014	2/12/14	0.05	0.5	2.5	0.05	5	20.9	6.9	2.3	6/3/15	376
10/6/15	0.00012	2/14/14	0.05	0.5	2.5	0.05	5	23.5	6.8	2.2	7/1/15	321
10/20/15	0.00014	2/19/14	0.05	0.5	2.5	0.05	11.7	23.8	7.3	0.7	8/5/15	297
11/3/15	0.00019	2/26/14	0.05	0.5	2.5	0.05	19.4	22.2	6.8	0.7	8/10/15	408
11/17/15	0.00015	3/5/14	0.05	0.5	2.5	0.05	5	21.6	6.7	1.2	8/12/15	361
12/9/15	0.0002	3/12/14	0.05	0.5	2.5	0.05	5	23.1	6.8	0.9	8/14/15	356
12/22/15	0.00066	3/19/14	0.05	0.5	2.5	0.05	5	21.3	7.1	0.7	9/2/15	367
1/5/16	0.00005	3/26/14	0.05	0.5	2.5	0.05	5	21.2	7.4	0.6	10/7/15	197
1/26/16	0.0004	4/2/14	0.05	0.5	2.5	0.05	5	15.5	7.1	1	11/4/15	185
2/9/16	0.00023	4/9/14	0.05	0.5	2.5	0.05	5	24.2	7.6	3.2	11/16/15	345
2/23/16	0.00025	4/16/14	0.05	0.5	2.5	0.05	5	23	7.3	1.3	11/18/15	367
3/8/16	0.00043	4/23/14	0.05	0.5	2.5	0.05	5	23.4	7.4	0.8	11/20/15	245
3/22/16	0.00051	4/30/14	0.05	0.5	2.5	0.05	5	24.1	7.2	0.7	12/2/15	404
4/5/16	0.00037	5/5/14	0.05	0.5	2.5	0.05	5	26.2	7.2	0.8	12/14/15	396

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
4/20/16	0.00155	5/7/14	0.05	0.5	2.5	0.05	5	22.1	7.2	1.2	12/16/15	355
5/3/16	0.00093	5/9/14	0.05	0.5	2.5	0.05	5	30.1	7.8	0.7	12/18/15	417
5/17/16	0.00039	5/14/14	0.05	0.5	2.5	0.05	17.5	23	7	1.2	1/6/16	268
6/7/16	0.0004	5/21/14	0.05	0.5	2.5	0.05	5	24.9	7.4	0.8	2/3/16	222
6/21/16	0.00028	5/28/14	0.05	0.5	2.5	0.05	17.9	27.3	7.8	0.5	2/8/16	289
7/6/16	0.0003	6/4/14	0.05	0.5	2.5	0.05	26.9	25.6	8.4	0.05	2/10/16	297
7/19/16	0.00035	6/11/14	0.05	0.5	2.5	0.05	13.1	25.6	7.3	0.8	2/12/16	134
8/2/16	0.00057	6/18/14	0.05	0.5	2.5	0.05	5	22.7	7.2	0.6	2/24/16	320
8/16/16	0.00014	6/25/14	0.05	0.5	2.5	0.05	5	28.6	7.5	1.2	3/2/16	322
9/6/16	0.00017	7/2/14	0.05	0.5	2.5	0.05	5	28.8	7	1	4/6/16	352
9/20/16	0.00005	7/9/14	0.05	0.5	2.5	0.05	5	30.8	7.2	1.7	5/2/16	360
10/4/16	0.00025	7/16/14	0.05	0.5	2.5	0.05	5	30.5	6.8	1.3	5/4/16	414
10/25/16	0.00005	7/23/14	0.17	0.5	2.5	0.05	5	31.8	7	1	5/6/16	489
11/8/16	0.00005	7/30/14	0.05	1.2	2.5	0.05	16.1	29.9	6.9	1.1	6/2/16	303
11/22/16	0.00005	8/6/14	0.05	0.5	2.5	0.05	20	27.8	7.5	0.7	6/8/16	155
12/6/16	0.00005	8/13/14	0.05	0.5	15.2	0.05	5	28.4	8.3	4.4	7/6/16	261
12/20/16	0.00016	8/18/14	0.05	0.5	2.5	0.05	5	29.7	6.9	0.5	8/3/16	237
1/3/17	0.00037	8/20/14	0.05	1.52	2.5	0.05	5	27.7	7.1	0.3	8/15/16	410
1/17/17	0.00028	8/22/14	0.05	0.5	2.5	0.05	5	28	7.2	0.6	8/17/16	200
2/7/17	0.00028	8/27/14	0.05	0.5	2.5	0.05	5	27.1	6.9	0.7	8/19/16	180
2/21/17	0.00051	9/3/14	0.05	0.5	2.5	0.05	5	25.7	7.1	0.9	9/7/16	354
3/7/17	0.00012	9/8/14	0.05	0.5	2.5	0.05	5	25.9	8.3	1.1	10/5/16	282
3/21/17	0.00013	9/10/14	0.05	0.5	2.5	0.05	5	26.1	7.4	0.8	11/2/16	141
4/11/17	0.00061	9/12/14	0.05	0.5	2.5	0.05	5	25	7.2	0.7	11/7/16	133
4/25/17	0.00037	9/15/14	0.05	0.5	2.5	0.05	5	25.4	6.9	0.9	11/9/16	122
5/9/17	0.00005	9/17/14	0.05	0.5	2.5	0.05	5	27.4	7.3	0.8	11/11/16	195
5/23/17	0.00016	9/24/14	0.05	0.5	2.5	0.05	5	28.8	7.8	0.5	12/7/16	353
6/6/17	0.000085	10/1/14	0.05	0.5	2.5	0.05	13.6	22	7.3	1.4	1/4/17	323

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
6/20/17	0.00005	10/8/14	0.05	0.5	2.5	0.05	13.9	27.3	7.6	0.4	2/1/17	277
7/11/17	0.00005	10/15/14	0.05	4.03	2.5	0.05	22.4	25.7	7.1	1.7	2/13/17	380
7/25/17	0.00005	10/22/14	0.05	2.41	2.5	0.05	11	25.1	7	2.6	2/15/17	428
8/9/17	0.00135	10/29/14	0.05	1.08	2.5	0.05	5	22.5	6.8	0.4	2/17/17	306
8/29/17	0.00011	11/5/14	0.05	0.5	2.5	0.05	30.5	24.5	8	3.9	3/1/17	445
9/12/17	0.00043	11/12/14	0.05	0.5	2.5	0.05	11.6	21.3	7.5	1.5	3/15/17	193
9/26/17	0.00005	11/17/14	0.05	3.97	2.5	0.05	5	21.4	7.4	1.2	4/5/17	172
10/10/17	0.00096	11/19/14	0.05	0.5	2.5	0.05	5	22.6	7.4	0.8	5/3/17	226
10/24/17	0.00025	11/21/14	0.05	0.5	9.73	0.05	5	23.3	7.8	3.7	5/8/17	202
		11/26/14	0.05	0.5	2.5	0.05	5	24	7.7	0.3	5/10/17	189
		12/3/14	0.05	1.65	2.5	0.05	13.1	23.2	7.6	0.7	5/12/17	204
		12/10/14	0.05	1.48	2.5	0.05	5	24.2	10	2.8	6/7/17	193
		12/17/14	0.05	3.48	6.48	0.05	10.9	24.1	7.6	0.7	7/5/17	210
		12/24/14	0.05	0.5	2.5	0.05	5	22.3	7.5	1.1	8/2/17	163
		12/31/14	0.05	0.5	2.5	0.05	5	20.8	8.4	2.6	8/7/17	171
		1/7/15	0.05	0.5	2.5	0.05	5	20.9	8.2	1.6	8/11/17	181
		1/14/15	0.05	0.5	2.5	0.05	5	23.4	8.3	4.5	8/30/17	119
		1/21/15	0.05	1.28	2.5	0.05	5	22.7	7.2	1.2	9/6/17	163
		1/28/15	0.05	0.5	2.5	0.05	5	23.3	7.2	1	10/4/17	166
		2/4/15	0.05	1.7	2.5	0.05	5	13.5	7.3	0.4		
		2/11/15	0.05	0.5	2.5	0.05	5	14.1	7.1	0.5		
		2/16/15	0.05	0.5	2.5	0.05	5	12	7	0.4		
		2/18/15	0.05	0.5	2.5	0.05	5	12.6	7.4	0.8		
		2/20/15	0.05	1.12	2.5	0.05	5	16.3	7.2	0.3		
		2/23/15	0.05	1.34	2.5	0.05	5	14.2	7.3	0.8		
		2/25/15	0.05	0.5	2.5	0.05	5	16.2	6.9	0.4		
		2/27/15	0.05	0.5	2.5	0.05	5	10.1	7	0.5		
		3/4/15	0.05	0.5	2.5	0.05	5	13.9	7.2	0.3		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		3/11/15	0.05	1.86	2.5	0.05	5	24.3	7.1	0.7		
		3/18/15	0.05	6.79	2.5	0.05	5	17.1	6.9	0.8		
		3/25/15	0.05	1.55	2.5	0.05	5	15.6	6.6	0.4		
		4/2/15	0.05	0.5	2.5	0.05	5	20.9	6.9	0.7		
		4/8/15	0.05	2.73	2.5	0.05	5	23.7	7.2	0.7		
		4/15/15	0.05	0.5	2.5	0.05	5	23.6	7.3	0.5		
		4/22/15	0.05	0.5	2.5	0.05	5	24.5	7.2	0.2		
		4/29/15	0.05	0.5	2.5	0.05	5	19.6	7.2	0.6		
		5/4/15	0.05	0.5	2.5	0.05	5	22.4	7	0.5		
		5/6/15	0.05	0.5	2.5	0.05	5	22.7	8.6	1.2		
		5/8/15	0.05	0.5	2.5	0.05	5	21.8	7.9	1.5		
		5/13/15	0.05	0.5	6.07	0.05	19.4	20.7	7.7	0.9		
		5/20/15	0.05	0.5	9.89	0.05	5	21.2	8.1	3.1		
		5/27/15	0.05	0.5	2.5	0.05	5	20.5	7.8	0.3		
		6/3/15	0.11	0.5	2.5	0.05	5	24.3	7.5	1.4		
		6/10/15	0.05	0.5	2.5	0.05	5	21.9	7.2	0.6		
		6/17/15	0.05	0.5	2.5	0.05	5	23.3	7	0.8		
		6/24/15	0.05	0.5	2.5	0.05	5	25.3	7.6	0.9		
		7/1/15	0.05	0.5	2.5	0.05	5	29	7.7	1.5		
		7/8/15	0.05	0.5	2.5	0.05	5	28.7	8	0.5		
		7/15/15	0.16	0.5	9.07	0.05	5	26.8	7.7	2.4		
		7/22/15	0.05	0.5	2.5	0.05	5	22	7	0.9		
		7/29/15	0.05	0.5	13.1	0.05	19.9	19.9	7.7	1		
		8/5/15	0.05	0.5	7.34	0.05	13.4	22.9	7.7	1.1		
		8/10/15	0.05	3.51	2.5	0.05	5	26.9	7.6	1.4		
		8/12/15	0.05	0.5	2.5	0.05	5	27	7.3	1		
		8/14/15	0.05	0.5	2.5	0.05	5	26.9	7.2	1.3		
		8/19/15	0.05	0.5	2.5	0.05	5	26	7.5	2.4		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		8/26/15	0.05	0.5	7.08	0.05	5	26.5	7.6	1.6		
		9/2/15	0.05	0.5	2.5	0.05	5	24.3	7.3	1.4		
		9/9/15	0.05	0.5	2.5	0.05	5	21.6	7.2	0.6		
		9/16/15	0.05	0.5	2.5	0.05	5	20.4	7.1	0.7		
		9/23/15	0.05	0.5	2.5	0.05	5	23.3	7	1		
		9/30/15	0.05	0.5	2.5	0.05	5	26	7.2	1.2		
		10/7/15	0.05	0.5	2.5	0.05	5	26	7.4	0.7		
		10/14/15	0.05	4.11	2.5	0.05	5	26.4	7.2	0.8		
		10/21/15	0.05	0.5	2.5	0.05	5	26	7.4	0.3		
		10/28/15	0.05	0.5	2.5	0.05	5	24	7.1	0.6		
		11/4/15	0.05	0.5	2.5	0.05	5	25.1	7.4	1		
		11/11/15	0.05	0.5	2.5	0.05	5	17.9	7.2	1.1		
		11/16/15	0.05	0.5	2.5	0.05	5	20.2	7.6	0.6		
		11/18/15	0.05	0.5	2.5	0.05	5	17.7	7	0.2		
		11/20/15	0.05	0.5	2.5	0.05	5	11.1	7.6	2.9		
		11/23/15	0.05	0.5	2.5	0.05	5	18.4	7.4	1.8		
		12/2/15	0.05	0.5	2.5	0.05	5	18.6	6.9	1.1		
		12/9/15	0.05	0.5	2.5	0.05	5	18.5	7.4	1.5		
		12/14/15	0.05	0.5	2.5	0.05	5	12.8	7.4	1.8		
		12/16/15	0.05	0.5	2.5	0.05	5	15.6	7.3	1.2		
		12/18/15	0.05	0.5	2.5	0.05	5	13.5	7	0.5		
		12/23/15	0.1	0.5	2.5	0.08	5	17.8	7.5	1.6		
		12/30/15	0.05	0.5	2.5	0.05	5	15.5	7.4	0.9		
		1/6/16	0.05	0.5	2.5	0.05	5	16.7	7.2	0.6		
		1/13/16	0.05	4.92	7.76	0.05	5	12.5	7.5	0.8		
		1/20/16	0.05	0.5	2.5	0.05	5	20.8	7.5	1		
		1/27/16	0.05	0.5	2.5	0.05	5	19.8	7.2	1.4		
		2/3/16	0.05	0.5	2.5	0.05	5	19.3	7.1	1.3		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		2/8/16	0.05	0.5	2.5	0.05	5	20.1	7.3	1.3		
		2/10/16	0.05	0.5	2.5	0.11	5	19.9	7.2	0.9		
		2/12/16	0.05	0.5	2.5	0.05	5	22.7	7.7	2.4		
		2/17/16	0.05	0.5	2.5	0.05	5	14.7	7.4	0.9		
		2/24/16	0.05	0.5	2.5	0.05	5	14.2	7.2	1.2		
		3/2/16	0.05	0.5	2.5	0.05	5	13.7	7.3	1		
		3/9/16	0.05	0.5	2.5	0.05	5	12.6	7.5	1.1		
		3/16/16	0.05	0.5	2.5	0.05	5	11.5	7.7	1.1		
		3/23/16	0.05	0.5	2.5	0.05	5	16.7	7.4	0.3		
		3/30/16	0.05	0.5	2.5	0.05	5	15.2	7.4	0.9		
		4/6/16	0.05	2.66	2.5	0.05	5	18	7.3	0.7		
		4/12/16	0.05	0.5	2.5	0.05	5	19.7	7.8	1.1		
		4/20/16	0.05	1.37	2.5	0.05	5	20.4	7.8	1.5		
		4/27/16	0.05	0.5	2.5	0.05	5	19.8	7	1.8		
		5/2/16	0.05	0.5	2.5	0.05	5	20.5	7.7	1.9		
		5/4/16	0.05	0.5	2.5	0.05	5	20.1	7.8	2.1		
		5/6/16	0.05	0.5	2.5	0.05	5	20.5	7.1	1.7		
		5/11/16	0.05	0.5	2.5	0.05	5	22.2	7.8	1.7		
		5/18/16	0.05	0.5	2.5	0.05	5	24.9	7.3	1.9		
		5/25/16	0.05	0.5	2.5	0.05	5	20	7.5	1.5		
		6/2/16	0.05	0.5	2.5	0.05	5	24.7	7.3	2.2		
		6/8/16	0.05	1.7	2.5	0.05	5	27.2	7.9	1.4		
		6/15/16	0.19	0.5	2.5	0.05	14.9	22.7	7.8	2.3		
		6/22/16	0.05	0.5	2.5	0.05	5	25.9	7.6	2.2		
		6/29/16	0.05	0.5	2.5	0.05	5	26.2	7.6	1.6		
		7/6/16	0.05	0.5	2.5	0.05	5	25.1	7.1	1.1		
		7/13/16	0.05	0.5	2.5	0.05	5	24.6	7.6	1.4		
		7/20/16	0.05	0.5	2.5	0.05	5	25	7.2	1.6		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		7/27/16	0.05	0.5	2.5	0.05	5	27.5	7.3	1.3		
		8/3/16	0.05	0.5	2.5	0.05	5	27	7.7	1.8		
		8/10/16	0.05	0.5	2.5	0.05	5	25.9	7.4	0.8		
		8/15/16	0.05	0.5	2.5	0.05	5	26	7.8	2		
		8/17/16	0.05	0.5	2.5	0.05	5	27.1	7.7	1.3		
		8/19/16	0.05	0.5	2.5	0.05	5	26.1	7.1	1.3		
		8/24/16	0.05	0.5	2.5	0.05	5	27.1	7.8	1		
		8/31/16	0.05	0.5	2.5	0.05	5	25	7.5	0.7		
		9/7/16	0.05	0.5	2.5	0.05	5	23.4	7.8	3.1		
		9/14/16	0.05	0.5	2.5	0.05	5	22.9	7.5	1.3		
		9/21/16	0.05	0.5	2.5	0.05	5	26.5	7.6	1.2		
		9/28/16	0.05	0.5	2.5	0.05	5	25.6	7.6	2		
		10/5/16	0.05	0.5	2.5	0.05	5	23.2	7.7	1.2		
		10/12/16	0.05	0.5	2.5	0.05	5	21.8	7.9	1.2		
		10/19/16	0.05	0.5	2.5	0.05	5	24	7.8	0.9		
		10/26/16	0.05	0.5	2.5	0.05	5	24.5	7.5	2.6		
		11/2/16	0.05	0.5	2.5	0.05	5	25.7	7.8	1.1		
		11/7/16	0.05	0.5	2.5	0.05	5	25.1	7.3	1		
		11/9/16	0.05	0.5	2.5	0.05	5	24.8	7.3	1		
		11/11/16	0.05	0.5	2.5	0.05	5	22.3	8.9	4.4		
		11/16/16	0.05	0.5	2.5	0.05	5	21.9	7.4	1.4		
		11/22/16	0.05	0.5	2.5	0.05	5	18.9	7.9	1.1		
		11/30/16	0.05	0.5	2.5	0.05	5	19.1	7.6	0.5		
		12/7/16	0.05	0.5	2.5	0.05	5	15.7	7.3	1.4		
		12/14/16	0.05	0.5	2.5	0.05	5	15.3	7.1	0.8		
		12/21/16	0.05	0.5	2.5	0.05	5	18.2	7.3	1.1		
		12/28/16	0.05	0.5	2.5	0.05	5	17.9	7.5	1.2		
		1/4/17	0.05	0.5	2.5	0.05	5	16	7.2	1.2		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		1/11/17	0.05	0.5	2.5	0.05	5	17.3	7.4	1		
		1/18/17	0.05	0.5	2.5	0.05	5	18	7.4	1		
		1/25/17	0.05	0.5	2.5	0.05	5	17	7.3	1.3		
		2/1/17	0.05	0.5	2.5	0.05	5	15.1	7.3	0.8		
		2/8/17	0.05	0.5	2.5	0.05	5	11.8	8.3	3.3		
		2/13/17	0.05	0.5	2.5	0.05	5	12.2	7.3	0.6		
		2/15/17	0.05	0.5	2.5	0.05	5	11.7	7.3	0.8		
		2/17/17	0.05	0.5	2.5	0.05	5	10.6	7.4	0.05		
		2/21/17	0.05	0.5	2.5	0.05	5	11.3	7.4	0.9		
		3/1/17	0.05	0.5	2.5	0.05	5	11	7.2	0.6		
		3/8/17	0.05	0.5	2.5	0.05	5	10.3	7.6	0.6		
		3/15/17	0.05	0.5	2.5	0.05	5	9.1	7.5	0.8		
		3/22/17	0.05	0.5	2.5	0.05	5	8.1	7.3	0.5		
		3/29/17	0.05	0.5	2.5	0.05	5	8.6	7.4	0.5		
		4/5/17	0.05	0.5	2.5	0.05	5	8.4	7.6	0.7		
		4/12/17	0.05	0.5	2.5	0.05	5	10.3	7.3	0.9		
		4/19/17	0.05	0.5	2.5	0.05	5	11	7.2	0.7		
		4/26/17	0.05	0.5	2.5	0.05	5	14	8	1.4		
		5/3/17	0.05	0.5	2.5	0.05	5	12.8	7.9	0.9		
		5/8/17	0.05	0.5	2.5	0.05	5	14.1	7.7	0.6		
		5/10/17	0.05	0.5	2.5	0.05	5	15.4	7.4	0.6		
		5/12/17	0.05	0.5	2.5	0.05	5	16.6	7.5	1.2		
		5/17/17	0.05	0.5	2.5	0.05	5	15	7.8	1.1		
		5/24/17	0.05	0.5	2.5	0.05	5	17.9	8	0.7		
		5/31/17	0.05	0.5	2.5	0.05	5	19.9	8.1	1.5		
		6/7/17	0.05	0.5	2.5	0.05	5	20	8.4	0.7		
		6/14/17	0.05	0.5	2.5	0.05	5	17.7	8	0.7		
		6/21/17	0.05	0.5	2.5	0.05	5	19.6	8.2	0.3		

Effluent Data Outfall 002												
Date	Mercury ug/L	Date	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Date	Hardness mg/L $CaCO_3$
		6/28/17	0.05	0.5	2.5	0.05	5	21.1	8.1	0.8		
		7/5/17	0.05	0.5	2.5	0.05	5	22.1	8.3	0.5		
		7/12/17	0.05	0.5	2.5	0.05	5	22.2	8	1		
		7/19/17	0.05	0.5	2.5	0.05	5	21.6	8.1	0.5		
		7/26/17	0.05	0.5	2.5	0.05	5	22.2	8.5	0.3		
		8/2/17	0.05	0.5	2.5	0.05	5	24.1	8.1	0.5		
		8/7/17	0.12	0.5	15.2	0.05	16.2	22.1	8.1	1		
		8/9/17	0.05	0.5	2.5	0.05	5	21.1	8	1		
		8/11/17	0.05	0.5	2.5	0.05	5	23.3	8.1	0.9		
		8/16/17	0.05	0.5	2.5	0.05	5	20.2	8.1	0.2		
		8/23/17	0.05	0.5	2.5	0.05	5	24.6	7.2	0.5		
		8/30/17	0.05	0.5	2.5	0.05	5	23.9	8	0.8		
		9/6/17	0.05	0.5	2.5	0.05	5	21	8.4	0.4		
		9/13/17	0.05	0.5	2.5	0.05	16.6	24.3	6.8	1.1		
		9/20/17	0.05	0.5	2.5	0.05	5	15	8.1	1		
		9/27/17	0.05	0.5	2.5	0.05	5	14.8	7.8	0.6		
		10/4/17	0.05	0.5	2.5	0.05	5	14.2	8.1	0.05		
		10/11/17	0.05	0.5	2.5	0.05	5	18.9	8.2	1.9		
		10/18/17	0.05	0.5	2.5	0.05	5	12.5	7.6	1.2		
		10/25/17	0.05	0.5	2.5	0.05	5	12.2	8.4	0.8	5th percentile	121.35
*Half the detection level was used for this data set where there were non-detects.												

B. Effluent Data - Outfall 003

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
1/2/13		0.05	0.5	2.5	0.05	5				131
1/8/13	0.00046									
1/9/13		0.05	0.5	2.5	0.05	13	7.8	8.3	1	
1/16/13		0.05	0.5	2.5	0.05	19.1	4.7	8.3	1.7	
1/22/13	0.00057									
1/23/13		0.13	1.21	5.91	0.05	50.1	8.8	8.2	1.7	
1/30/13		0.05	0.5	2.5	0.05	5	6.4	8	0.4	
2/5/13	0.000075									
2/6/13		0.05	0.5	2.5	0.05	5	8.1	8.3	0.05	165
2/13/13		0.05	1	2.5	0.05	5	7.7	8.2	0.2	
2/18/13		0.05	0.5	2.5	0.05	5	7.1	8	0.05	184
2/19/13	0.00016									
2/20/13		0.05	0.5	2.5	0.05	5	8.1	7.8	0.05	228
2/22/13		0.05	0.5	2.5	0.05	5	8.5	7.8	0.05	224
2/27/13		0.05	0.5	2.5	0.05	5	8	7.7	0.05	
3/5/13	0.00078									
3/6/13		0.05	0.5	2.5	0.05	5	15.9	7.7	0.8	197
3/13/13		0.05	0.5	2.5	0.05	5	15	7.8	0.2	
3/20/13	0.00034	0.05	0.5	2.5	0.05	18.1	17.7	7.8	1.2	
3/27/13		0.05	0.5	2.5	0.05	18.4	17.5	7.9	0.9	
4/2/13	0.000075									
4/3/13		0.05	1.49	2.5	0.05	15.7	19.6	8	0.05	142
4/10/13		0.05	0.5	2.5	0.05	10.1	17.3	8.1	0.05	
4/16/13	0.000075									
4/17/13		0.05	0.5	2.5	0.05	5	7.3	8	0.7	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
4/24/13		0.05	0.5	2.5	0.05	5	18.2	8.1	0.1	
5/1/13		0.1	0.5	9.13	0.05	5	17	8.1	0.05	168
5/7/13	0.000075									
5/8/13		0.05	0.5	2.5	0.05	5	13.4	7.7	0.05	
5/15/13		0.05	0.5	2.5	0.05	15.8	17.7	7.9	0.05	
5/20/13		0.05	2.79	2.5	0.05	11.1	19.3	7.4	0.2	175
5/21/13	0.000075									
5/22/13		0.05	0.5	2.5	0.05	5	20.8	7.6	0.05	135
5/24/13		0.05	0.5	2.5	0.123	5	20.6	7.8	0.2	141
5/29/13		0.05	0.5	2.5	0.05	5	20.9	7.7	0.2	
6/4/13	0.000075									
6/5/13		0.05	0.5	2.5	0.05	24.4	18.5	7.6	0.9	220
6/10/13		0.05	0.5	2.5	0.05	31.7	21.8	7.3	0.2	198
6/11/13	0.000075									
6/12/13		0.05	0.5	2.5	0.05	26.2	24.4	7.8	0.1	200
6/14/13		0.05	0.5	2.5	0.05	227	23.2	8	0.5	119
6/18/13	0.000075									
6/19/13		0.05	0.5	2.5	0.05	38.9	23.8	7.5	0	138
6/26/13		0.13	0.5	6.44	0.05	27.4	23.6	7.4	0.1	
7/3/13		0.05	0.5	2.5	0.05	14	27.7	7.5	0.1	156
7/9/13	0.000075									
7/10/13		0.05	0.5	2.5	0.05	28.7	26.9	7.4	0.5	
7/17/13		0.05	0.5	2.5	0.05	5	29.1	8	0.05	88.5
7/23/13	0.000075									
7/24/13		0.05	0.5	2.5	0.05	24.5	28.3	7.7	0.3	
7/31/13		0.05	0.5	2.5	0.05	5	25	7.9	0.5	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
8/6/13	0.00059									
8/7/13		0.05	0.5	2.5	0.05	47	25.9	7.5	0.2	208
8/14/13		0.05	0.5	2.5	0.05	36.1	27.3	8	0.1	
8/19/13		0.05	0.5	2.5	0.05	21.3	26.1	7.9	0.05	205
8/20/13	0.00055									
8/21/13		0.05	0.5	2.5	0.05	10.1	25.8	8	0.05	166
8/23/13		0.05	1.5	2.5	0.05	14.2	26.6	7.8	0.05	169
8/28/13		0.05	0.5	2.5	0.05	23.1	25.5	7.8	0.05	
9/3/13	0.00019									
9/4/13		0.05	1.62	2.5	0.05	10.1	25.1	8	0.05	192
9/11/13		0.05	0.5	2.5	0.05	10.7	27.4	8	0.05	
9/17/13	0.00016									
9/18/13		0.05	0.5	2.5	0.05	25.3	26.9	7.6	0.4	
9/25/13		0.05	0.5	2.5	0.05	62.1	23	7.6	0.4	
10/2/13		0.05	0.5	2.5	0.05	25.6	22.2	7.5	0.3	199
10/8/13	0.000075									
10/9/13		0.05	0.5	2.5	0.05	22.4	21.2	7.7	0.05	
10/16/13		0.05	0.5	2.5	0.05	24.8	19	7.2	0.1	
10/22/13	0.000075									
10/23/13		0.05	0.5	2.5	0.05	25.7	23	7.6	0.4	
10/30/13		0.05	0.5	2.5	0.05	5	23.5	7.9	0.3	
11/5/13	0.000075									
11/6/13		0.05	0.5	2.5	0.05	5	23.2	7.5	0.3	191
11/11/13		0.05	0.5	2.5	0.05	12.2	23	7.5	0.1	192
11/13/13		0.05	0.5	2.5	0.05	11.5	24	7.5	0.05	168
11/15/13		0.05	0.5	2.5	0.1	13.3	21.2	7.3	0.3	177

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
11/19/13	0.000075									
11/20/13		0.05	1.03	2.5	0.05	116	21.1	7.1	0.2	
11/27/13		0.05	0.5	2.5	0.05	47.9	20.4	7.4	0.3	
12/3/13	0.000075									
12/4/13		0.05	0.5	2.5	0.05	17.9	16.7	7.5	0.6	196
12/11/13		0.05	0.5	2.5	0.05	5	20.8	7.9	0.5	
12/17/13	0.00262									
12/18/13		0.05	1.27	2.5	0.05	49.9	20.2	7.3	1.3	
12/24/13		0.05	0.5	2.5	0.05	22.7	16.9	7.9	0.8	
12/31/13		0.05	0.5	2.5	0.05	52.8	16.8	7.6	0.5	
1/7/14	0.00028									
1/8/14		0.05	0.5	2.5	0.05	60.5	19.5	7.7	0.4	139
1/15/14		0.05	0.5	2.5	0.05	37.8	14	7.7	0.2	
1/22/14		0.05	1.69	2.5	0.05	31.1	5.6	7.2	0.4	
1/23/14	0.00074									
1/29/14		0.05	0.5	2.5	0.05	16.7	5.9	7.3	0.7	
2/4/14	0.000075									
2/5/14		0.05	0.5	2.5	0.05	13.9	2.6	7.5	0.1	196
2/12/14		0.05	0.5	2.5	0.05	5	6.1	7.6	0.1	180
2/14/14		0.05	0.5	2.5	0.05	5	8.6	7.5	0.05	145
2/17/14		0.05	0.5	2.5	0.05	5	8	7.5	0.05	170
2/18/14	0.000075									
2/19/14		0.05	0.5	2.5	0.05	41.8	7.1	7.2	0.3	
2/26/14		0.05	0.5	2.5	0.05	24.5	7.3	7.4	0.05	
3/4/14	0.000075									
3/5/14		0.05	0.5	2.5	0.05	69.5	7.3	7.1	0.1	150

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
3/14/14		0.05	0.5	2.5	0.05	155	9.3	7.4	0.2	
3/18/14	0.000075									
3/19/14		0.05	0.5	2.5	0.05	84.2	8.6	7.1	0.05	
3/26/14	0.000075	0.05	0.5	2.5	0.05	299	10.6	7.2	0.6	162
3/29/14		0.05	0.5	2.5	0.05	14.2	4.2	7.4	0.2	
4/1/14	0.000075									
4/2/14		0.05	0.5	2.5	0.05	5	18.8	7.8	0.3	103
4/9/14		0.05	0.5	2.5	#VALUE!	62.8	14.1	7.3	0.3	
4/15/14	0.000075									
4/16/14		0.05	0.5	2.5	0.05	26.2	13.3	7.2	0.1	
4/23/14		0.05	0.5	2.5	0.05	5	10.7	7.6	0.4	
4/30/14		0.05	0.5	2.5	0.05	5	15	7.3	0.05	
5/5/14		0.05	0.5	2.5	0.05	28.2	16.5	7.3	0.5	193
5/6/14	0.000075									
5/7/14		0.05	0.5	2.5	0.05	27.9	17.4	7.1	0.5	199
5/9/14		0.05	0.5	2.5	0.05	18.4	18.1	7.6	0.6	170
5/14/14		0.05	0.5	2.5	0.05	14.5	16.3	7.3	0.7	
5/20/14	0.000075									
5/21/14		0.05	0.5	2.5	0.05	5	19	7.8	1.8	
5/28/14		0.05	0.5	2.5	0.05	5	18.4	7.6	1.1	
6/3/14	0.000075									
6/4/14		0.05	0.5	2.5	0.05	5	18.4	7.5	1.4	219
6/11/14		0.05	0.5	2.5	0.05	5	19.1	7.6	1.3	
6/17/14	0.00019									
6/18/14		0.05	1.04	2.5	0.05	5	15.9	7.4	1.2	
6/25/14		0.05	0.5	2.5	0.05	5	19.7	7.8	0.05	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
7/2/14		0.05	0.5	2.5	0.05	5	21	7.3	0.3	194
7/8/14	0.00005									
7/9/14		0.05	0.5	2.5	0.05	5	24.1	7.1	1.4	
7/16/14		0.05	0.5	2.5	0.05	5	25.9	7.3	2.1	
7/22/14	0.00005									
7/23/14		0.29	0.5	2.5	0.05	5	22	7.6	1.4	
7/30/14		0.05	0.5	2.5	0.05	5	27	7.5	0.8	
8/5/14	0.00005									
8/6/14		0.05	0.5	2.5	0.05	5	26.9	7.9	0.6	132
8/13/14		0.05	0.5	2.5	0.05	5	26.8	7.8	0.8	
8/18/14		0.05	0.5	2.5	0.05	5	26	7.6	0.05	168
8/19/14	0.00021									
8/20/14		0.05	0.5	2.5	0.05	5	27.3	7.7	0.05	125
8/22/14		0.05	0.5	2.5	0.05	5	23.7	7.8	0.05	180
8/27/14		0.05	0.5	2.5	0.05	5	25.7	7.6	0.2	
9/3/14		0.05	0.5	2.5	0.05	5	19	7.7	0.3	218
9/8/14		0.05	0.5	2.5	0.05	5	17.1	7.8	0.2	262
9/9/14	0.000255									
9/10/14		0.05	0.5	2.5	0.05	5	16.6	7.7	0.05	255
9/12/14		0.05	0.5	2.5	0.05	5	14.2	7.6	0.2	248
9/15/14		0.05	0.5	2.5	0.05	5	15.7	7.5	0.05	247
9/17/14		0.05	0.5	2.5	0.05	5	17.1	7.6	0.2	239
9/23/14	0.00011									
9/24/14		0.05	0.5	2.5	0.05	5	18.5	7.6	0.2	
10/1/14		0.05	0.5	2.5	0.05	5	25.4	7.8	0.4	82.4
10/6/14	0.00005									

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
10/8/14		0.05	0.5	2.5	0.05	12.7	15.9	7.5	0.1	
10/15/14		0.05	0.5	2.5	0.05	12.6	14.2	7.7	0.05	
10/21/14	0.00005									
10/22/14		0.05	0.5	2.5	0.05	5	12.5	7.6	0.9	
10/29/14		0.05	0.5	2.5	0.05	5	24.5	8.4	0.05	
11/4/14	0.00005									
11/5/14		0.05	0.5	2.5	0.05	5	15.5	7.8	0.1	150
11/14/14		0.05	0.5	2.5	0.05	5	4.1	7.9	0.5	
11/17/14		0.05	0.5	2.5	0.05	5	5.7	8.1	0.05	196
11/18/14	0.00011									
11/19/14		0.05	0.5	2.5	0.05	5	6.5	7.9	0.05	194
11/21/14		0.05	0.5	2.5	0.05	5	7.1	8	0.05	194
11/26/14		0.05	0.5	2.5	0.05	5	6.8	7.7	0.05	
12/3/14		0.05	0.5	2.5	0.05	5	5	7.5	0.05	182
12/8/14		0.05	0.5	2.5	0.05	5	6	7.2	0.05	165
12/9/14	0.00005									
12/10/14		0.05	0.5	2.5	0.05	5	7.1	7.5	0.2	167
12/12/14		0.05	0.5	2.5	0.175	15.9	7.9	7.3	0.05	173
12/17/14		0.05	0.5	2.5	0.05	11.4	6.4	7.3	0.1	
12/23/14	0.00005									
12/24/14		0.05	0.5	2.5	0.05	17.6	7.7	7.1	0.2	
12/31/14		0.05	0.5	2.5	0.05	12.8	5.2	7.3	0.05	
1/6/15	0.00005									
1/7/15		0.05	0.5	2.5	0.05	12.8	6.1	7.1	0.05	144
1/14/15		0.05	0.5	2.5	0.05	11.1	6.7	6.9	0.2	
1/20/15	0.00005									

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
1/21/15		0.05	0.5	2.5	0.05	5	3.5	7.2	0.05	
1/28/15		0.05	0.5	2.5	0.05	5	7.7	7.1	0.1	
2/3/15	0.00005									
2/4/15		0.05	0.5	2.5	0.05	5	22.3	8.1	0.2	86.1
2/11/15		0.05	0.5	2.5	0.05	19.3	23.3	7.8	0.05	
2/16/15		0.05	0.5	2.5	0.05	5	21.6	7.9	0.2	102
2/17/15	0.00005									
2/18/15		0.05	0.5	2.5	0.05	5	21.7	7.8	0.05	118
2/20/15		0.05	0.5	2.5	0.05	5	22.5	8	0.1	120
2/23/15		0.05	0.5	2.5	0.05	5	20.7	7.8	0.05	95.3
2/25/15		0.05	0.5	2.5	0.05	5	22.6	7.7	0.05	103
2/27/15		0.05	0.5	2.5	0.05	5	22.2	7.8	0.05	103
3/3/15	0.00005									
3/4/15		0.05	0.5	2.5	0.05	5	21.9	7.8	0.05	84.5
3/11/15		0.05	0.5	2.5	0.05	12	9.7	7.4	0.05	
3/17/15	0.00005									
3/18/15		0.05	0.5	2.5	0.05	5	22.4	8.1	0.05	
3/25/15		0.05	0.5	2.5	0.05	5	21.4	7.8	0.05	
4/1/15		0.05	0.5	2.5	0.05	5	22.9	8.15	0.1	102
4/7/15	0.00015									
4/8/15		0.05	1.43	2.5	0.05	5	22.3	8.1	0.6	
4/15/15		0.05	0.5	2.5	0.05	5	22.8	7.6	0.2	
4/21/15	0.00005									
4/22/15		0.05	0.5	2.5	0.05	5	25.1	8.1	0.1	99.1
4/29/15		0.05	0.5	2.5	0.05	5	25.4	8.1	0.05	
5/4/15		0.05	0.5	2.5	0.05	5	25.3	8.2	0.1	84.5

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
5/5/15	0.00005									
5/6/15		0.05	0.5	2.5	0.05	5	25.3	8.2	0.1	83.7
5/8/15		0.05	0.5	2.5	0.05	5	26.2	8.2	0.05	82.2
5/13/15		0.05	0.5	2.5	0.05	5	25.7	8.3	0.05	
5/19/15	0.00005									
5/20/15		0.05	0.5	2.5	0.05	5	25.6	8.1	0.05	
5/27/15		0.05	0.5	2.5	0.05	5	26	8.1	0.1	
6/3/15		0.18	0.5	2.5	0.05	5	22.9	8	0.05	108
6/9/15	0.00005									
6/10/15		0.05	0.5	2.5	0.05	5	28.2	7.8	0.2	
6/17/15		0.05	0.5	2.5	0.05	5	26.8	8.1	0.2	
6/23/15	0.00005									
6/24/15		0.05	0.5	2.5	0.05	5	28	8.2	0.3	
7/1/15		0.05	0.5	2.5	0.05	5	30.4	8.1	0.8	96
7/7/15	0.00005									
7/8/15		0.05	0.5	2.5	0.05	5	30.1	8.2	0.4	
7/15/15		0.25	0.5	2.5	0.05	5	28.2	8.2	0.3	
7/21/15	0.00011									
7/22/15		0.05	0.5	2.5	0.05	5	23	8	0.1	
7/29/15		0.05	0.5	2.5	0.05	5	21.9	8	0.1	
8/5/15		0.05	0.5	2.5	0.05	5	28.9	8.2	0.6	161
8/10/15		0.05	0.5	2.5	0.05	5	28	8.3	0.1	101
8/11/15	0.00015									
8/12/15		0.05	0.5	2.5	0.05	5	28.5	8.1	0.1	112
8/14/15		0.05	0.5	2.5	0.05	5	28.5	8.1	0.05	105
8/19/15		0.05	0.5	2.5	0.05	5	27.8	8.2	0.05	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
8/25/15	0.00016									
8/26/15		0.05	0.5	2.5	0.05	5	26.9	8.2	0.05	
9/2/15		0.05	0.5	2.5	0.05	5	26.2	8.2	0.1	111
9/8/15	0.00019									
9/9/15		0.05	0.5	2.5	0.05	5	25.6	8.3	0.05	
9/16/15		0.05	0.5	2.5	0.05	5	24.4	8.2	0.05	
9/22/15	0.00017									
9/23/15		0.05	0.5	2.5	0.05	5	27	8.3	0.1	
9/30/15		0.05	0.5	2.5	0.05	5	28.9	8.2	0.05	
10/6/15	0.00005									
10/7/15		0.05	0.5	2.5	0.05	5	23.9	8.1	0.2	104
10/14/15		0.05	0.5	2.5	0.05	5	22.6	8.2	0.2	
10/20/15	0.00005									
10/21/15		0.05	0.5	2.5	0.05	5	22.4	8.2	0.1	
10/28/15		0.05	0.5	2.5	0.05	5	21.6	8.2	0.05	
11/3/15	0.00011									
11/4/15		0.05	0.5	2.5	0.05	5	17.9	8.6	0.1	101
11/11/15		0.05	0.5	2.5	0.05	5	22.3	8.4	0.05	
11/16/15		0.05	0.5	2.5	0.05	5	23.6	8.2	0.05	83.5
11/17/15	0.00005									
11/18/15		0.05	0.5	2.5	0.05	5	20.7	8.2	0.05	96.3
11/20/15		0.05	0.5	2.5	0.05	5	10.3	7.6	0.1	251
11/23/15		0.05	0.5	2.5	0.05	5	21.3	8.3	0.05	
12/2/15		0.05	0.5	2.5	0.05	5	20.5	8.1	0.05	95.1
12/9/15	0.00016	0.05	0.5	2.5	0.05	5	20.8	8.2	0.05	
12/14/15		0.05	0.5	2.5	0.05	5	22.5	8.2	0.05	119

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
12/16/15		0.05	0.5	2.5	0.05	5	22.3	8.2	0.05	110
12/18/15		0.05	0.5	2.5	0.05	5	21.9	8	0.05	130
12/22/15	0.00015									
12/23/15		0.1	0.5	2.5	0.08	5	21.6	8.1	0.05	
12/30/15		0.05	0.5	2.5	0.05	5	20.7	8.1	0.05	
1/5/16	0.00005									
1/6/16		0.05	0.5	2.5	0.05	5	22.3	8.2	0.05	104
1/13/16		0.05	0.5	2.5	0.05	5	21.5	8.2	0.05	
1/20/16		0.05	0.5	2.5	0.05	5	18.6	8.1	0.3	
1/26/16	0.00005									
1/27/16		0.05	0.5	2.5	0.05	5	19.7	7.8	0.05	
2/3/16		0.05	0.5	2.5	0.05	5	17.8	7.8	0.05	115
2/8/16		0.05	0.5	2.5	0.05	5	19.8	8.4	0.05	112
2/9/16	0.00005									
2/10/16		0.05	0.5	2.5	0.05	5	20.4	8.1	0.05	101
2/12/16		0.05	0.5	2.5	0.05	5	20.7	8	0.05	107
2/17/16		0.05	0.5	2.5	0.05	5	22.8	8	0.05	
2/23/16	0.00005									
2/24/16		0.05	0.5	2.5	0.05	5	22.1	8	0.6	105
3/2/16		0.05	0.5	2.5	0.05	5	22.6	7.8	0.05	91.9
3/8/16	0.00014									
3/9/16		0.05	0.5	2.5	0.05	5	22.2	7.9	0.05	
3/16/16		0.05	0.5	2.5	0.05	5	22.1	7.9	0.1	
3/22/16	0.00005									
3/23/16		0.05	0.5	5.94	0.181	5	22.6	8.1	0.05	
3/30/16		0.05	0.5	2.5	0.139	5	22.8	7.8	0.05	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
4/5/16	0.00005									
4/6/16		0.05	0.5	2.5	0.05	5	23.2	8	0.05	80.1
4/12/16		0.05	0.5	2.5	0.05	5	23.7	8	0.2	
4/20/16	0.00005	0.05	0.5	2.5	0.05	5	24.9	7.8	0.1	
4/27/16		0.05	0.5	2.5	0.05	5	24.8	7.9	0.05	
5/2/16		0.05	0.5	2.5	0.05	5	24.7	8	0.05	69.2
5/3/16	0.00005									
5/4/16		0.05	0.5	2.5	0.05	5	24.7	8	0.05	71.6
5/6/16		0.05	0.5	2.5	0.05	5	24.9	8.1	0.4	71.6
5/11/16		0.05	0.5	2.5	0.05	5	22.5	7.9	0.05	
5/17/16	0.00005									
5/18/16		0.05	0.5	2.5	0.05	5	25.9	7.7	0.05	
5/25/16		0.05	0.5	2.5	0.05	5	25.4	7.8	0.1	
6/1/16		0.05	0.5	2.5	0.05	5	24.4	8.1	0.05	72.2
6/7/16	0.00005									
6/8/16		0.05	0.5	2.5	0.05	5	27.2	7.9	0.05	99.2
6/15/16		0.3	0.5	2.5	0.05	5	27	8	0.05	
6/21/16	0.00005									
6/22/16		0.05	0.5	2.5	0.05	5	25.7	8.1	0.05	
6/29/16		0.05	0.5	2.5	0.05	5	26.6	8.2	0.05	
7/6/16	0.00012	0.05	0.5	2.5	0.162	5	25.8	8.2	0.05	67.3
7/13/16		0.05	0.5	2.5	0.116	5	26	8.1	0.3	
7/19/16	0.00013									
7/20/16		0.05	0.5	2.5	0.05	5	25.9	8.1	0.05	
7/27/16		0.05	0.5	2.5	0.05	5	27.9	8.1	0.05	
8/2/16	0.00023									

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
8/3/16		0.05	0.5	2.5	0.05	10.6	25	8.1	0.1	86.4
8/10/16		0.05	0.5	2.5	0.05	5	26.4	8	0.05	
8/15/16		0.05	0.5	2.5	0.05	5	28.7	8.5	0.1	74.5
8/16/16	0.00005									
8/17/16		0.05	0.5	2.5	0.05	5	29.1	8.1	0.1	73.5
8/19/16		0.05	0.5	2.5	0.05	5	28.4	8.1	0.1	68.8
8/24/16		0.05	0.5	2.5	0.05	5	28.5	8.3	0.05	
8/31/16		0.05	0.5	2.5	0.05	5	29.1	8.2	0.05	
9/6/16	0.00015									
9/7/16		0.05	0.5	2.5	0.05	5	27.4	8.1	0.2	78.5
9/14/16		0.05	0.5	2.5	0.05	5	26	8	0.2	
9/20/16	0.00005	0.05	0.5	2.5	0.05	5	24.1	8.5	0.05	
9/28/16		0.05	0.5	2.5	0.05	5	25.1	8.1	0.05	
10/4/16	0.00019									
10/5/16		0.05	0.5	2.5	0.05	5	25.3	8.1	0.05	74.9
10/12/16		0.05	0.5	2.5	0.05	5	24.1	8.2	0.05	
10/25/16	0.00005									
10/26/16		0.05	0.5	2.5	0.05	5	20.3	7.6	0.05	
11/2/16		0.05	0.5	2.5	0.05	5	18.3	7.8	0.05	130
11/7/16		0.05	0.5	2.5	0.05	5	19.3	7.8	0.05	117
11/8/16	0.00005									
11/9/16		0.05	0.5	2.5	0.05	5	22.3	7.8	0.05	105
11/11/16		0.05	0.5	2.5	0.05	5	22.3	8	0.05	83.8
11/16/16		0.05	0.5	2.5	0.05	5	23.5	7.9	0.2	
11/22/16	0.00005	0.05	0.5	2.5	0.05	5	23.8	8.3	0.05	
11/30/16		0.05	0.5	2.5	0.05	5	21.4	7.8	0.1	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
12/6/16	0.00028									
12/7/16		0.05	0.5	2.5	0.05	5	21.1	7.9	0.05	109
12/14/16		0.05	0.5	2.5	0.05	5	21.3	7.9	0.05	
12/20/16	0.00005									
12/21/16		0.05	0.5	2.5	0.05	5	22.3	7.7	0.05	
12/28/16		0.05	0.5	2.5	0.05	5	22.3	8.3	0.05	
1/3/17	0.00005									
1/4/17		0.05	0.5	2.5	0.05	5	20.2	8.1	0.05	83.3
1/11/17		0.05	0.5	2.5	0.05	5	21.1	8	0.05	
1/17/17	0.00005									
1/18/17		0.05	0.5	2.5	0.05	5	21.6	8.1	0.05	
1/25/17		0.05	0.5	2.5	0.05	5	22.4	8.3	0.05	
2/1/17		0.05	0.5	2.5	0.05	5	21.4	8.2	0.05	81.2
2/7/17	0.00005									
2/8/17		0.05	0.5	2.5	0.05	5	23.3	7.8	0.05	
2/13/17		0.05	0.5	2.5	0.05	5	22	7.9	0.2	108
2/15/17		0.05	0.5	2.5	0.05	5	22	8.1	0.05	107
2/17/17		0.05	0.5	2.5	0.05	5	22.1	7.9	0.05	105
2/21/17	0.00066	0.05	0.5	2.5	0.05	5	24.2	8	0.05	
3/1/17		0.05	0.5	2.5	0.05	5	23	8.2	0.05	99
3/7/17	0.00021									
3/8/17		0.05	0.5	2.5	0.05	5	24.3	8.3	0.05	
3/15/17		0.05	0.5	2.5	0.05	5	15.4	8.1	0.05	128
3/21/17	0.00019									
3/22/17		0.05	0.5	2.5	0.05	5	17.6	8	0.05	
3/29/17		0.05	0.5	2.5	0.05	5	18.8	8	0.05	

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
4/5/17		0.05	0.5	2.5	0.05	5	18.9	8	0.2	172
4/11/17	0.00005									
4/12/17		0.05	0.5	2.5	0.05	5	19.6	7.8	0.05	
4/19/17		0.05	0.5	2.5	0.05	5	20.1	7.8	0.05	
4/25/17	0.00005									
4/26/17		0.05	0.5	2.5	0.05	5	20.1	8.1	0.2	
5/3/17		0.05	0.5	2.5	0.05	5	20.1	8.1	0.05	212
5/8/17		0.05	0.5	2.5	0.05	5	20.6	8.5	0.05	193
5/9/17	0.00005									
5/10/17		0.05	0.5	2.5	0.05	5	21.4	8	0.05	187
5/12/17		0.05	0.5	2.5	0.05	5	21.5	7.8	0.05	193
5/17/17		0.05	0.5	2.5	0.05	5	20	8.2	0.05	
5/23/17	0.00005									
5/24/17		0.05	0.5	2.5	0.05	5	22.1	8	0.05	
5/31/17		0.05	0.5	2.5	0.05	5	24.4	8.1	0.05	
6/6/17	0.000085									
6/7/17		0.05	0.5	2.5	0.05	5	23.8	8.1	0.05	155
6/14/17		0.05	0.5	2.5	0.05	5	22.1	8.1	0.05	
6/20/17	0.00005									
6/21/17		0.05	0.5	2.5	0.05	5	24.2	8	0.05	
6/28/17		0.05	0.5	2.5	0.05	5	24.5	7.9	0.1	
7/5/17		0.05	0.5	2.5	0.05	5	24.6	8.1	0.05	172
7/11/17	0.00005									
7/12/17		0.05	0.5	2.5	0.05	5	25	8	0.4	
7/19/17		0.05	0.5	2.5	0.05	5	25.3	7.9	0.05	
7/26/17	0.00012									

Effluent Data Outfall 003										
Date	Mercury ug/L	Cadmium ug/L	Copper ug/L	Lead ug/L	Silver ug/L	Zinc ug/L	Temperature °C	pH su	TSS mg/L	Hardness mg/L $CaCO_3$
7/27/17		0.05	0.5	2.5	0.05	5	25.5	7.5	0.05	
8/2/17		0.05	0.5	2.5	0.05	5	26.1	8.1	0.05	147
8/7/17		0.05	0.5	2.5	0.05	5	26	8.7	0.3	134
8/9/17	0.00005	0.05	0.5	2.5	0.05	5	26	8.1	0.3	
8/11/17		0.05	0.5	2.5	0.05	5	25.6	8.2	0.05	154
8/16/17		0.05	0.5	2.5	0.05	5	25.7	8.2	1.1	
8/29/17	0.0013									
8/30/17		0.05	0.5	2.5	0.05	5	24.8	8	0.05	
9/6/17		0.05	0.5	2.5	0.05	5	23.4	7.8	0.05	103
9/19/17	0.00005									
9/20/17		0.05	0.5	2.5	0.05	5	18.8	7.7	0.05	
9/26/17	0.00005									
9/27/17		0.05	0.5	2.5	0.05	5	22.1	7.9	0.05	
10/4/17		0.05	0.5	2.5	0.05	5	18.7	8	0.6	93.5
10/10/17	0.00005									
10/11/17		0.05	0.5	2.5	0.05	5	17.7	7.7	0.05	
10/18/17		0.05	0.5	2.5	0.05	5	18.3	7.8	0.1	
10/24/17	0.00005									
10/25/17		0.05	0.5	2.5	0.05	5	21	8.1	0.05	
*Half the detection level was used for this data set where there were non-detects.										

C. SFCdA River Data – Above Outfall 002

Above 002	Cadmium	Copper	Lead	Mercury	Silver	Zinc	TSS	pH	Temperature	Hardness -up
February-12	0.05	1.57	2.5	0.00069	0.05	11.8	0.6	7.9	1.9	61.6
May-12	0.05	1.97	2.5	0.00101	0.05	5	2	7.6	5.5	23
August-12	0.05	1.77	2.5	0.00069	0.05	5	0.5	8	8.9	51.9
November-12	0.05	1.43	2.5	0.00051	0.05	10.3	0.05	8	4.9	51.6
February-13	0.05	1.55	2.5	0.0004	0.05	12.6	0.05	8.3	2.1	55.8
May-13	0.05	0.5	2.5	0.00065	0.05	5	1.7	7.8	5.2	21.3
August-13	0.05	0.5	2.5	0.00154	0.05	5	1	8	14.1	62.2
November-13	0.05	1.18	2.5	0.00031	0.05	5	0.2	8.1	8.4	58.1
February-14	0.11	0.5	2.5	0.00043	0.05	22	0.05	7.6	0.8	70.3
May-14	0.05	0.5	2.5	0.00142	0.05	5	5.4	8	6.3	23.9
August-14	0.05	1.47	2.5	0.00035	0.05	5	0.3	7.9	7.5	58.2
November-14	0.05	1.26	2.5	0.00042	0.05	14.1	0.4	7.8	0.4	60.1
February-15	0.05	1.01	2.5	0.00051	0.05	5	0.5	8	3.8	44.5
May-15	0.05	0.5	2.5	0.00046	0.05	5	0.7	7.9	6.6	29.1
August-15	0.05	2.14	2.5	0.00059	0.05	5	0.1	8.2	12.2	59.4
November-15	0.05	1.82	2.5	0.00051	0.05	5	0.2	7.9	6.4	61.6
February-16	0.05	1.46	2.5	0.00045	0.05	16.8	0.05	7.9	2.2	65.6
May-16	0.05	0.5	2.5	0.00061	0.05	5	0.7	7.9	6.6	25.1
August-16	0.05	1.86	2.5	0.00055	0.05	5	0.1	8.1	12.1	52.9
November-16	0.05	1.58	2.5	0.00104	0.05	5	1.1	7.9	6.9	40.6

***Half the detection level was used for this data set where there were non-detects.**

D. SFCdA River Data – Above Outfall 003

Above 003	Cadmium	Copper	Lead	Mercury	Silver	Zinc	TSS	pH	Temperature	Hardness -up
February-12	0.05	1.21	2.5	0.00057	0.05	12.7	0.3	7.9	1.5	54.8
May-12	0.05	2.48	2.5	0.00098	0.05	5	2.2	7.6	5.6	17.9
August-12	0.05	0.5	2.5	0.00044	0.05	5	0.4	8.1	9.6	54.4
November-12	0.05	0.5	2.5	0.00041	0.05	18.1	0.3	8	4.9	50.7
February-13	0.05	0.5	2.5	0.00033	0.05	12.9	0.1	8.2	1.9	53.1
May-13	0.005	0.5	2.5	0.00055	0.05	5	1.8	7.8	5.5	17.2
August-13	0.005	0.5	2.5	0.00046	0.05	5	0.3	8.1	13.9	52.1
November-13	0.005	0.5	2.5	0.000075	0.05	5	0.6	8.1	5.9	54
February-14	0.05	0.5	2.5	0.00033	0.05	23.1	0.1	7.6	0.5	66.3
May-14	0.05	0.5	2.5	0.00109	0.05	5	6.5	8.1	7.1	18.2
August-14	0.05	0.5	2.5	0.00013	0.05	5	0.5	7.9	8.1	49
November-14	0.05	0.5	2.5	0.00032	0.05	15.4	0.05	8	0.3	52.3
February-15	0.05	0.5	2.5	0.00034	0.05	5	0.1	8.1	3	41.3
May-15	0.05	0.5	2.5	0.00037	0.05	5	0.7	7.9	6.8	24.9
August-15	0.05	2.41	2.5	0.00103	0.05	11.6	0.6	8.2	12.3	54.9
November-15	0.05	0.5	2.5	0.00047	0.05	10.4	0.05	8.1	8.5	58.6
February-16	0.05	1	2.5	0.00051	0.05	15.7	0.1	7.8	1.5	63.4
May-16	0.05	0.5	2.5	0.00105	0.05	5	1.1	7.5	6.3	20.6
August-16	0.05	0.5	2.5	0.00046	0.05	5	0.2	8.1	12.5	54.9
November-16	0.05	0.5	2.5	0.00102	0.05	12.9	1.3	7.8	6.6	39.5

***Half the detection level was used for this data set where there were non-detects.**

Appendix C.Reasonable Potential and WQBEL Formulae

A. Reasonable Potential Analysis

The EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991) to determine reasonable potential. To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit.

Table C-1: Water Quality Standards

			002 Chronic	002 Acute	003 Chronic	003 Acute			
		Hardness =	76.5	76.20	49.7	49.8			
		Water Quality-based							
		Aquatic Life 002		Aquatic Life 003		Human Health		Technology-based	
Parameter	Units	Chronic	Acute	Chronic	Acute	Water & Org	Org Only	Average	Maximum
Cadmium	ug/L	0.9	1.6	0.9	1.6			50	100
Lead	ug/L	22.0	192.0	22.0	192.0			300	600
Zinc	ug/L	163.5	163.0	163.5	163.0	7400.0	26000.0	500	1000
Copper	ug/L	9.4	13.7	6.5	9.2			150	300
Mercury	ug/L	0.012	2.1	0.012	2.1			2	1
Silver	ug/L		2.56		2.56				
TSS	mg/L							20	30
pH	s.u.	within 6.5 to 9.0		within 6.5 to 9.0				within 6.0 to 10.0	
Temperature	°C	19.0	22.0	19.0	22.0				
Copper - BLM	ug/L	0.6	1.0						

The metals criteria presented in Table C-1 are in total recoverable. Idaho's water quality criteria for some metals are expressed as the dissolved fraction, but the Federal regulation at 40 CFR 122.45(c) requires that effluent limits be expressed as total recoverable metal. Therefore, the EPA calculated total recoverable metal criteria that are protective of the dissolved criterion. This is accomplished by dividing the criterion expressed as dissolved by the criterion translator. The criteria translators (CT) are equal to the conversion factors because site-specific translators are not available for this discharge.

The hardnesses utilized in Table C-1 are those of a design discharge conditions, the 1Q10 and 7Q10. The hardness used to determine effluent limitations when a mixing zone is authorized is discussed below.

Hardness

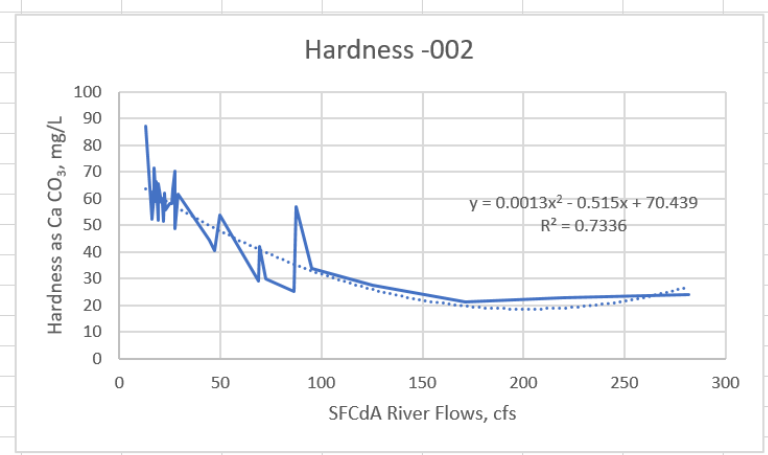
The WQS at IDAPA 58.01.02.210.03(c)(ii) state:

> The hardness values used for calculating aquatic life criteria for metals at design discharge conditions shall be representative of the ambient hardnesses for a receiving water that occur at the design discharge conditions given in Subsection 210.03.b.

This requirement has been interpreted as applying the hardness at the design discharge conditions to a criterion (1Q10 for an acute criterion and the 7Q10 for the chronic) to calculate an end-of-pipe criterion and applying a mixed hardness to calculate a criterion for a parameter with an authorized mixing zone. In a mixed hardess scenario, the equations expressed in the following figures were used to determine the upstream hardness at the various tier levels and incorporated into the mass balance equation to calculate the mixed hardness:

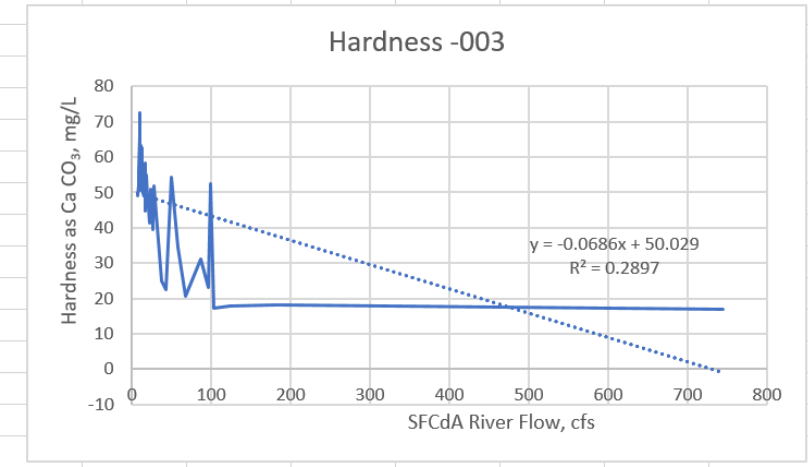
$$H_d = (QuHu + QeHe)/Qd$$

Where: H_d = mixed hardness downstream
Qu = upstream flow (design or flow tier)
Hu = upstream hardness (calculated with the equation)
Qe = 99th percentile of the effluent flow
He = 5th percentile of the effluent hardness
Qd = downstream flow = Qu+Qe



	cfs	Hardness
1Q10	10.9	76.2
7Q10	11.46	76.5

Figure C-1: Instream Hardness above Outfall 002



	cfs	Hardness
1Q10	3.74	49.8
7Q10	5.27	49.7

Figure C-2: Instream Hardness above Outfall 003

Mass Balance

For discharges to flowing water bodies, the maximum projected receiving water concentration is determined using the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \quad \textit{Equation 1}$$

where,

C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)
C_e = Maximum projected effluent concentration
C_u = 95th percentile measured receiving water upstream concentration
Q_d = Receiving water flow rate downstream of the effluent discharge = Q_e+Q_u
Q_e = Effluent flow rate (set equal to the design flow of the WWTP)
Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10 or 30Q5

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times Q_u}{Q_e + Q_u} \quad \textit{Equation 2}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with 100% of the receiving stream.

If the mixing zone is based on less than complete mixing with the receiving water, the equation becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times (Q_u \times \%MZ)}{Q_e + (Q_u \times \%MZ)} \quad \textit{Equation 3}$$

Where:

% MZ = the percentage of the receiving water flow available for mixing.

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water concentration and,

$$C_d = C_e \quad \textit{Equation 4}$$

A dilution factor (D) can be introduced to describe the allowable mixing. Where the dilution factor is expressed as:

$$D = \frac{Q_e + Q_u \times \%MZ}{Q_e} \quad \textit{Equation 5}$$

After the dilution factor simplification, the mass balance equation becomes:

$$C_d = \frac{C_e - C_u}{D} + C_u \quad \textit{Equation 6}$$

If the criterion is expressed as dissolved metal, the effluent concentrations are measured in total recoverable metal and must be converted to dissolved metal as follows:

$$C_d = \frac{CF \times C_e - C_u}{D} + C_u \quad \textit{Equation 7}$$

Where C_e is expressed as total recoverable metal, C_u and C_d are expressed as dissolved metal, and CF is a conversion factor used to convert between dissolved and total recoverable metal.

The above equations for C_d are the forms of the mass balance equation which were used to determine reasonable potential and calculate wasteload allocations.

Maximum Projected Effluent Concentration

When determining the projected receiving water concentration downstream of the effluent discharge, the EPA's Technical Support Document for Water Quality-based Toxics Controls (TSD, 1991) recommends using the maximum projected effluent concentration (C_e) in the mass balance calculation (see Equation 3). To determine C_e the EPA has developed a statistical approach to better characterize the effects of effluent variability. The approach combines knowledge of effluent variability as estimated by a coefficient of variation (CV) with the uncertainty due to a limited number of data to project an estimated maximum concentration for the effluent. Once the CV for each pollutant parameter has been calculated, the reasonable potential multiplier (RPM) used to derive the C_e can be calculated using the following equations:

First, the percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - \text{confidence level})^{1/n} \qquad \textit{Equation 8}$$

where,

p_n = the percentile represented by the highest reported concentration
n = the number of samples

confidence level = 99% = 0.99

and

$$RPM = \frac{C_{99}}{C_{P_n}} = \frac{e^{Z_{99} \times \sigma - 0.5 \times \sigma^2}}{e^{Z_{P_n} \times \sigma - 0.5 \times \sigma^2}} \qquad \textit{Equation 9}$$

where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile)
Z_{Pn} = z-score for the P_n percentile (inverse of the normal cumulative distribution function at a given percentile)
CV = coefficient of variation (standard deviation ÷ mean)

C_e is determined by simply multiplying the maximum reported effluent concentration by the RPM:

$$C_e = (RPM)(MRC) \qquad \textit{Equation 10}$$

where MRC = Maximum Reported Concentration

Maximum Projected Effluent Concentration at the Edge of the Mixing Zone

Once the C_e is calculated, the maximum projected effluent concentration at the edge of the acute and chronic mixing zones is calculated using the mass balance equations presented previously.

Reasonable Potential

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant.

Table C-2: Reasonable Potential Outfall 002								Edge of MZ				RP?	
Parameter	Units	N	CV	Pn	RPM	Max Eff	MEC	Chronic	Acute	HH - nc	HH - c		
Cadmium - EOP	ug/L	298	1.415	0.985	1.188	1.3	1.55					Yes	End of Pipe
Cadmium - TBEL							50.00					Yes	End of Pipe
Lead - EOP	ug/L	298	1.194	0.985	1.168	46.2	53.94					Yes	End of Pipe
Lead - TBEL							300.00					Yes	End of Pipe
Zinc - EOP	ug/L	298	1.006	0.985	1.148	69.2	79.42					No	End of Pipe
Zinc - TBEL							750.00					Yes	End of Pipe
Copper - EOP	ug/L	298	1.327	0.985	1.181	13.1	15.46					Yes	End of Pipe
Copper - TBEL							150.00					Yes	End of Pipe
Copper-1							15.46	5.47	5.60			No	25% of 7Q10 and 1Q10
Copper - BLM	ug/L						15.46					Yes	No mixing, ambient exceeds criteria
Mercury - EOP	ug/L	118	1.304	0.962	1.000	0.003	0.003					No	End of Pipe
Mercury - TBEL							1.0					Yes	End of Pipe
Mercury-1							0.003	0.0019	0.0019			No	25% of 7Q10 and 1Q10
Silver	ug/L	298	0.096	0.985	1.016	0.110	0.112	End of pipe MEC less than the criterion				No	No upstream data - used zero

Table C-3: Reasonable Potential Outfall 003								Edge of MZ				RP?	
Parameter	Units	N	CV	Pn	RPM	Max Eff	MEC	Chronic	Acute	HH - nc	HH - c		
Cadmium - EOP	ug/L	299	0.47	0.985	2.839	0.30	0.85					No	End of Pipe
Cadmium - TBEL							50.00					Yes	End of Pipe
Lead - EOP	ug/L	299	0.20	0.985	1.603	9.13	14.63					No	End of Pipe
Lead - TBEL							300.00					Yes	End of Pipe
Zinc - EOP	ug/L	299	2.14	0.985	21.052	299.00	6294.63					Yes	End of Pipe
Zinc - TBEL							750.00					Yes	End of Pipe
Copper - EOP	ug/L	299	0.38	0.985	2.348	2.79	6.55					Yes	End of Pipe
Copper - TBEL							150.00					Yes	End of Pipe
Copper-1							6.55	4.20	4.55			No	25% of 7Q10 and 1Q10
Copper - BLM	ug/L						15.46					Yes	No mixing, ambient exceeds criteria
Mercury - EOP	ug/L	299	0.47	0.985	2.839	0.30	0.852					Yes	End of Pipe
Mercury - TBEL							1.0					Yes	End of Pipe
Mercury-1							0.852	0.37	0.44			Yes	25% of 7Q10 and 1Q10
Silver	ug/L	299	0.28	0.985	1.904	0.18	0.34	End of pipe MEC less than the criterion				No	No upstream data - used zero

Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis. To calculate the wasteload allocations, C_d is set equal to the acute or chronic criterion and the equation is solved for C_e. The calculated C_e is the acute or chronic WLA. Equation 6 is rearranged to solve for the WLA, becoming:

$$C_e = WLA = D \times (C_d - C_u) + C_u$$ *Equation 11*

The next step is to compute the "long term average" concentrations which will be protective of the WLAs. This is done using the following equations from the EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a \times e^{(0.5\sigma^2 - z\,\sigma)}$$ *Equation 12*

$$LTA_c = WLA_c \times e^{(0.5\sigma_4^2 - z\sigma_4)}$$ *Equation 13*

where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile probability basis)
CV = coefficient of variation (standard deviation ÷ mean)
σ_4^2 = $\ln(CV^2/4 + 1)$

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits as shown below.

Derive the maximum daily and average monthly effluent limits

Using the TSD equations, the MDL and AML effluent limits are calculated as follows:

$$MDL = LTA \times e^{(z_m\sigma - 0.5\sigma^2)}$$ *Equation 14*

$$AML = LTA \times e^{(z_a\sigma_n - 0.5\sigma_n^2)}$$ *Equation 15*

where σ, and σ² are defined as they are for the LTA equations above, and,

σ_n^2 = $\ln(CV^2/n + 1)$
z_{95} = 1.645 (z-score for the 95th percentile probability basis)
z_{99} = 2.326 (z-score for the 99th percentile probability basis)
n = number of sampling events required per month.

Tables C-4 and C-5 show the values used to calculate the effluent limitations as well as the concentration and loading limitations proposed in the draft permit..

Table C-4: 002 Effluent Limitations													Concentration			Loading	
	Acute	Chronic	CV*	σ^2 =	σ =	σ^2_4 =	σ_4 =	WLAc	WLAa	LTAc	LTAa	LTAmin	AML_4*	MDL	Hardness	AML	MDL
Cadmium	1.62	0.92	1.42	1.10	1.05	0.41	0.64	1.62	0.92	0.26	0.24	0.24	0.57	1.62	76.2/76.5	0.003	0.008
Lead	192.03	21.99	1.19	0.89	0.94	0.30	0.55	192.03	21.99	7.09	33.50	7.09	15.10	40.65	76.2/76.5	0.071	0.191
Zinc	163.03	163.45	1.01	0.70	0.84	0.23	0.48	163.03	163.45	60.60	33.06	33.06	64.52	163.03	76.2/76.5	0.304	0.768
Copper	14.29	9.74	1.33	1.02	1.01	0.36	0.60	31.22	48.72	9.19	7.77	7.77	17.48	48.72	79.6/79.7	0.08	0.23
Copper (BLM)	1.00	0.60	1.33	1.02	1.01	0.36	0.60	0.60	1.00	0.18	0.16	0.16	0.36	1.00		0.002	0.005
Mercury	2.40	0.01	1.30	0.99	1.00	0.35	0.60	0.05	9.89	0.02	1.60	0.02	0.03	0.09		0.00016	0.00045

* The permit effluent limitations for copper will be based on the standard that is in effect at the time the permit is issued.

** The background concentration of copper is higher than the BLM criteria so no mixing zone can be authorized.

Table C-5: 003 Effluent Limitations													Concentration			Loading	
	Acute	Chronic	CV*	σ^2 =	σ =	σ^2_4 =	σ_4 =	WLAc	WLAa	LTAc	LTAa	LTAmin	AML	MDL	Hardness	AML	MDL
Cadmium	1.62	0.93	0.47	0.20	0.45	0.05	0.23	1.62	0.93	0.56	0.63	0.56	0.80	1.43	49.8/49.7	0.007	0.013
Lead	235.84	235.84	235.84	235.84	235.84	235.84	235.84	235.84	235.84	17.42	122.29	17.42	20.51	27.36	49.8/49.7	0.18	0.24
Zinc	188.43	188.43	188.43	188.43	188.43	188.43	188.43	188.43	188.43	31.43	18.26	18.26	52.43	163.03	49.8/49.7	0.47	1.46
Copper	10.07	6.87	0.38	0.13	0.37	0.04	0.19	5.59	11.97	3.67	5.46	3.67	4.91	8.06	57.3/55.6	0.04	0.07
Copper (BLM)	1.00	0.60	0.38	0.13	0.37	0.04	0.19	0.60	1.00	0.39	0.46	0.39	0.53	0.87		0.005	0.008
Mercury	2.40	0.01	1.90	1.53	1.24	0.64	0.80	0.02	3.75	0.0046	0.45	0.0046	0.01	0.04		0.00011	0.00034

* The permit effluent limitations for copper will be based on the standard that is in effect at the time the permit is issued.

** The background concentration of copper is higher than the BLM criteria so no mixing zone can be authorized.

Appendix D. CWA 401 State Certification

Idaho Department of Environmental Quality

Draft §401 Water Quality Certification

February 20, 2019

NPDES Permit Number(s): ID0000175 Lucky Friday Mine

Receiving Water Body: South Fork Coeur d'Alene River

Pursuant to the provisions of Section 401(a)(1) of the Federal Water Pollution Control Act (Clean Water Act), as amended; 33 U.S.C. Section 1341(a)(1); and Idaho Code §§ 39-101 et seq. and 39-3601 et seq., the Idaho Department of Environmental Quality (DEQ) has authority to review National Pollutant Discharge Elimination System (NPDES) permits and issue water quality certification decisions.

Based upon our review of the above-referenced permit and associated fact sheet, DEQ certifies that if the permittee complies with the terms and conditions imposed by the permit along with the conditions set forth in this water quality certification, then there is reasonable assurance the discharge will comply with the applicable requirements of Sections 301, 302, 303, 306, and 307 of the Clean Water Act, the Idaho Water Quality Standards (WQS) (IDAPA 58.01.02), and other appropriate water quality requirements of state law.

This certification does not constitute authorization of the permitted activities by any other state or federal agency or private person or entity. This certification does not excuse the permit holder from the obligation to obtain any other necessary approvals, authorizations, or permits.

X. Antidegradation Review

The WQS contain an antidegradation policy providing three levels of protection to water bodies in Idaho (IDAPA 58.01.02.051).

- Tier I Protection. The first level of protection applies to all water bodies subject to Clean Water Act jurisdiction and ensures that existing uses of a water body and the level of water quality necessary to protect those existing uses will be maintained and protected (IDAPA 58.01.02.051.01; 58.01.02.052.01). Additionally, a Tier I review is performed for all new or reissued permits or licenses (IDAPA 58.01.02.052.07).
- Tier II Protection. The second level of protection applies to those water bodies considered high quality and ensures that no lowering of water quality will be allowed unless deemed necessary to accommodate important economic or social development (IDAPA 58.01.02.051.02; 58.01.02.052.08).

- Tier III Protection. The third level of protection applies to water bodies that have been designated outstanding resource waters and requires that activities not cause a lowering of water quality (IDAPA 58.01.02.051.03; 58.01.02.052.09).

DEQ is employing a water body by water body approach to implementing Idaho's antidegradation policy. This approach means that any water body fully supporting its beneficial uses will be considered high quality (IDAPA 58.01.02.052.05.a). Any water body not fully supporting its beneficial uses will be provided Tier I protection for that use, unless specific circumstances warranting Tier II protection are met (IDAPA 58.01.02.052.05.c). The most recent federally approved Integrated Report and supporting data are used to determine support status and the tier of protection (IDAPA 58.01.02.052.05).

A. Pollutants of Concern

The Lucky Friday Mine discharges the following pollutants of concern: cadmium, lead, silver, zinc, copper, mercury, total suspended solids (TSS), pH, temperature, and whole effluent toxicity (WET). Effluent limits have been developed for cadmium, lead, zinc, copper, mercury, TSS, and pH. No effluent limits are proposed for temperature, silver, or WET.

Permit History

The most recent NDPES permit for the Lucky Friday Unit was first issued in 2003 but was modified twice, once in 2006 and again in 2008. This permit will be referenced in this certification as the 2003 permit to reflect the start date of the permit cycle but reviewers should be sure they look at the 2006 and 2008 modifications also.

Discharge Information

Lucky Friday Unit has a surface mill, two water treatment facilities, four tailings impoundments, and three outfalls. Currently, Tailings Impoundment Nos. 1 and 2 are closed, and a third, Tailings Impoundment No. 3, is in the process of closure. A fourth tailings impoundment, Tailings Impoundment No. 4, has been constructed and has operated since the fourth quarter of 2010. Tailings Impoundment No. 3 is only used for storm surge storage and storage of water treatment residuals from water treatment plant 3 (WTP3).

Although two of the impoundments are closed, outfalls associated with those impoundments are still active. Water treatment plant 2 (WTP2) primarily discharges through Outfall 002 but can also be diverted to Outfall 001. WTP2 collects and treats mine water, mill water, ground water and captured storm water. WTP3 discharges through Outfall 003 and also collects and treats mine water, mill water, ground water and captured storm water.

Since the last permit was issued, Hecla's construction of the two water treatment facilities has resulted in dramatic improvements to discharge water (effluent) quality. To achieve this high level of metals removal, pH must be elevated. DEQ modeled a proposed effluent discharge at pH10 and determined that a mixing zone of 25% of the critical low flow for Outfall 002 will provide for safe fish passage but that Outfall 003 must be limited to a maximum pH of 9.9 to provide for safe fish passage (see Mixing Zone section and Fact Sheet V.C). Acidification of the discharge is not required which has the added benefits of avoiding hazards associated with the transport, handling, mixing, and discharge of an acid.