ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT FACT SHEET
Permit Number: AK0050571
Coeur Alaska, Inc.: Kensington Gold Mine

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Permit Issuance Date: July 29, 2011
Permit Effective Date: September 1, 2011
Permit Expiration Date: August 31, 2016

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Issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

COEUR ALASKA, INC.

For wastewater discharges from the

Kensington Gold Mine
3031 Clinton Drive, Suite 200
Juneau, AK 99801

The Alaska Department of Environmental Conservation (the Department or ADEC) reissued an APDES individual permit (permit) to Coeur Alaska, Inc. The permit authorizes and sets conditions on the discharge of pollutants from this 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 and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Kensington Gold Mine in the Tongass National Forest 45 miles north of Juneau, Alaska. The discharges are a previously permitted discharge from the tailings treatment facility to East Fork Slate Creek and a previously permitted mine drainage treatment facility to Sherman Creek. The permit sets conditions on the discharge or release of pollutants from these mine related operations into waters of the United States. The fact sheet also outlines the development of the permit including:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions
- technical material supporting the conditions in the permit
- proposed monitoring requirements in the permit

Public Comment

Public comment on the draft permit was available from April 25 to June 9, 2011 and a formal public hearing was held on May 26, 2011 from 5 pm to 7 pm at the Centennial Hall in Juneau. Following the close of the public comment period, the Department reviewed the comments received on the draft permit and prepared a Response to Comments document that is available to the public. A final permit will become effective at least 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the final permit, fact sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of Water at the following address:

Director of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review.

See http://www.dec.state.ak.us/commish/InformalReviews.htm for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation at
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information regarding appeals of Department decisions.

Documents are Available

The draft permit, fact sheet, application, and related documents can be obtained by contacting Kenwyn George at the Juneau address above, by emailing kenwyn.george@alaska.gov or by calling 907-465-5313 to arrange for copies to be made available at the addresses below. The draft permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm.

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	**Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 410 Willoughby Avenue, Suite 310 Juneau, AK 99801 (907) 465-5180**

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Coeur Alaska, Inc. Kensington Gold Mine

APDES Permit No.: AK0050571

Mailing Address: Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Facility Location: 45 Miles North of Juneau, AK (See APPENDIX A)

Facility Contact: Kevin Eppers, Environmental Superintendent

2.0 FACILITY ACTIVITY

2.1 Background

In 1990, the Kensington Venture, a business entity that included Coeur Alaska, Inc., (Coeur) initially proposed to develop the Kensington Gold Mine. The joint venture never obtained all necessary approvals to begin the project. In 1995, Coeur became the sole stakeholder. Coeur proposed a revised Plan of Operations (POO) to the US Forest Service (USFS). This plan was amended again in 1996 and eventually approved by the USFS in 1998.

The Environmental Protection Agency (EPA) issued National Pollutant Discharge Elimination System (NPDES) Permit, AK0050571, (NPDES permit) to the Kensington Gold Mine on May 14, 1998 to address discharges from the historic Kensington 850 portal, through Outfall 001, as well as discharges from the dry tailings facility (DTF) approved with the POO in 1998. After not implementing the 1998 plan, Coeur submitted an amended POO in late 2001.

In the 2001 POO, Coeur proposed the use of the existing 20-acre Lower Slate Lake for the disposal of tailings and the construction of an 88-foot high Geosynthetic Face Rock fill Dam (GFRD) at the head of the lake to increase the overall size to 58 acres. The USFS conducted a National Environmental Policy Act (NEPA) review of the 2001 POO and selected Alternative D under the Supplemental Environmental Impact Statement (SEIS). The components of Alternative D included a mill in the Johnson Creek drainage, a 3.5-mile long tailings pipeline to the proposed Tailings Treatment Facility (TTF), also called the Tailings Storage Facility in the application, the construction of an 88-foot high by 500-foot wide dam for a 4.5 million-ton tailings impoundment, treatment of the tailings impoundment water before discharge to East Fork Slate Creek, and required a cap to be placed on the tailings at closure if Coeur were unable to show that the tailings were being colonized by plant and shallow-water macro invertebrates at least comparable to pre-mining conditions.

EPA issued a NPDES permit effective September 1, 2005 for the discharge of treated water from the mine drainage treatment plant (outfall 001), tailings treatment facility (outfall 002) and the mine camp at Comet Beach (domestic waste water outfall 003). During the life of the 2005 permit the camp at Comet Beach was dismantled and removed and discharges from outfall 003 ceased. For this reason the 2011 permit does not include outfall 003.

The Kensington Gold Mine is located approximately 45 miles north of Juneau, Alaska, in the Tongass National Forest. The mine is on the western and southern flanks of Lions Head Mountain between Berners Bay and Lynn Canal and in the Johnson, Sherman, and Slate Creek drainages, as shown by the Figure 1 in APPENDIX A to this fact sheet. The ore body extends from the surface to a depth of approximately 3,000 feet and is irregular in both shape and distribution of gold. After a two-year construction period, mining commenced in July, 2010 and will be accomplished over a projected period of 10.5 years using a long hole, open stoping method. Tailings discharge commenced to the TTF in August 2010. Ore is hauled by truck to the mill site located near the Jualin mining area. After crushing, the ore is transferred to a grinding circuit. Following grinding, oversized material is returned to the head of the grinding operation, while undersized material is separated into coarse and fine materials using centrifugal cyclones. From the cyclones, heavy material goes to a gravity concentrator and light material goes to a conditioning tank that feeds a flotation circuit. Concentrate from the gravity concentrator and the flotation circuit is dewatered, and approximately 700 tons per week of concentrate is transported from the site. From 1,250 tons of ore per day, mining and processing produces approximately 500 tons of waste rock per day and will produce approximately 7.5 million tons of tailings over the 10.5-year lifetime of the proposed project. Initially, all tailings go to the TTF. After the underground paste plant is constructed, 40% of the tailings will go underground.

Water from mine dewatering operations is treated at the Mine Water Treatment Plant (MWTP) and comprises gravity drainage and pumped water from a sump on the Jualin side of the project. The sump water is pumped to the grade break within the mine and continues by gravity to the MWTP for discharge from Outfall 001 to Sherman Creek. Treatment at the MWTP is flocculation, settling, multi-media filtration and micro filtration. Recent practices have demonstrated the ability to maintain ammonia and nitrate concentrations below effluent limits, so it may not be necessary to add an ammonia and nitrate treatment system to outfall 001 as was proposed in the application.

Tailings slurry with a 55% solids content flows from the mill through a 3.5-mile pipeline to the tailings treatment facility (TTF), which is the natural lake basin of Lower Slate Lake with a constructed retention dam at the outlet of the basin. The TTF is sized to accommodate 4.5 million tons of tailings at a rate of 456,000 tons per year (TPY) for the first seven months and 228,000 TPY thereafter. Approximately 3.0 million tons of tailings will be used as backfill in the mine. A concrete diversion structure and 26” diameter pipe conduct water around the TTF from the outlet of Upper Slate Lake. The TTF receives water from slurry transport of tailings, as well as undiverted natural inflows from drainage areas immediately adjacent to the TTF, and overflows from the Upper Slate Lake diversion structure. Water is recycled from the TTF to the mill at a rate of 150-300 gallons per minute (gpm). Tailings water in the TTF is treated in the TTF Water Treatment Plant (TTF WTP). The discharge of treated water commenced on December 4, 2010. The TTF WTP comprises clarification, multi-media filtration and carbon filtration. The TTF WTP effluent is discharged at Outfall 002 where it combines with water in the Upper Slate Lake diversion pipe. This pipe conducts the combined water to below the TTF embankment where it becomes the head of East Fork Slate Creek.

At mine closure the diversion structure and pipeline will be removed and natural flows will resume from Upper Slate Lake to Lower Slate Lake and then to East Fork Slate Creek via a spillway over the TTF embankment.

Receiving waters for Outfalls 001 and 002 are perennial creeks located at the base of Lions Head Mountain in the Kakuhan Range of the Coast Mountains. The Sherman Creek watershed, which flows west from Lions Head Mountain, includes a drainage area of approximately 2,681 acres. Slate Creek flows south/southeast from Lions Head Mountain to the west side of Berners Bay and provides drainage to an area of approximately 2,600 acres.

3.0 Compliance History

Exceedences of permit limits have occurred for Outfall 001 during the period January 2005 to July 2010 as shown in Table 3.

Table 3: Permit Limit Exceedences

Parameter	Date	Monitoring		
		Basis	Permit limit µg/L	Reported value µg/L
Aluminum	10/31/2005	MO AVG	71.00	133.00
	1/31/2006	MO AVG	71.00	179.00
	9/30/2005	MO AVG	71.00	212.35
	11/30/2005	MO AVG	71.00	261.00
	10/31/2005	DAILY MX	143.00	294.00
	11/30/2005	DAILY MX	143.00	343.00
	1/31/2008	DAILY MAX	143.00	348.00
	9/30/2005	DAILY MAX	143.00	369.00

Table 3: Permit Limit Exceedences

Parameter	Date	Monitoring		
		Basis	Permit limit µg/L	Reported value µg/L
	1/31/2006	DAILY MAX	143.00	1810.00
	10/31/2005	MO AVG	71.00	133.00
Cadmium	4/30/2007	MO AVG	0.10	0.33
Copper	7/31/2008	MO AVG	3.60	8.19
	7/31/2008	DAILY MAX	7.30	12.00
Iron	12/31/2007	MO AVG	800.00	942.00
	1/31/2008	DAILY MAX	1700.00	1790.00
Lead	6/30/2005	MO AVG	1.10	1.60
	6/30/2005	DAILY MAX	2.20	6.39
TSS	7/31/2007	DAILY MAX	30.00	35.00
WET	2/28/2009	DAILY MAX	1.60	2.00
Turbidity	3/31/2006	DAILY MAX	5.00	5.50
	6/30/2008	DAILY MAX	5.00	5.60
	12/31/2007	DAILY MAX	5.00	6.23
	6/30/2007	DAILY MAX	5.00	6.50
	8/31/2008	DAILY MAX	5.00	6.50
Note: These are the exceedances out of 1941 samples. Data from Discharge Monitoring Reports (DMRs) received from 1/31/05 through 7/31/10.				

4.0 Permit Requirements

4.1 Basis for Effluent Limits

The Clean Water Act requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based effluent limits. A technology-based effluent limit is set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards of a water body are met. Water quality-based effluent limits may be more stringent than technology-based effluent limits. APPENDIX B contains additional information on deriving water quality-based effluent limits for the Kensington Gold Mine.

4.2 Effluent Limits

4.2.1 Outfall 001 – Sherman Creek

Proposed effluent limits for discharges to Sherman Creek through Outfall 001 are summarized in Table 4-1.

Water quality criteria for some metals and effluent limits derived from those criteria are hardness dependent (i.e., the toxicity of some metals increases with decreasing hardness). During dry weather conditions, flow in Sherman Creek below the outfall is expected to be dominated by the discharge, which is expected to have high hardness levels (> 200 mg/L). During wet weather conditions, natural flows may dominate Sherman Creek with hardness levels of 50 – 100 mg/L. Consistent with the 2005 permit, tiered permit limits are established for hardness dependent pollutants. Whenever the effluent is sampled, the permittee must collect a downstream sample for a hardness analysis to determine which limits apply to that specific sample.

Table 4-1: Outfall 001 Effluent Limits

Parameter [a]	Hardness as mg/L $CaCO_3$	Units	Effluent Limits	
			Maximum Daily	Average Monthly
Aluminum [c]	—	µg/L	153	50
Ammonia, Total	—	mg/L as N	4.0	2.0
Arsenic	-	ug/L	Monitor only	
Cadmium [c]	50 ≤ H < 100	µg/L	0.3	0.1
	100 ≤ H < 200	µg/L	0.5	0.2
	H ≥ 200	µg/L	0.8	0.3
Copper [c]	50 ≤ H < 100	µg/L	7.3	2.5
	100 ≤ H < 200	µg/L	14	4.8
	H ≥ 200	µg/L	26.9	9.2
Chromium, Total	—	µg/L	Monitor only	
Iron	—	µg/L	1850	690
Lead [c]	50 ≤ H < 100	µg/L	2.3	0.8
	100 ≤ H < 200	µg/L	5.6	1.8
	H ≥ 200	µg/L	13.4	4.4
Manganese	—	µg/L	98	50
Mercury [c]	—	µg/L	0.02	0.01

Table 4-1: Outfall 001 Effluent Limits

Parameter [a]	Hardness as mg/L $CaCO_3$	Units	Effluent Limits	
			Maximum Daily	Average Monthly
Nickel [c]	50 ≤ H < 100	µg/L	52.9	21.2
	100 ≤ H < 200	µg/L	95.0	38.1
	H ≥ 200	µg/L	170.3	68.5
Nitrate	—	mg/L as N	20	10
Selenium	-	ug/L	Monitor only	
Silver	-	ug/L	Monitor only	
Zinc [c]	50 ≤ H < 100	µg/L	66.6	29.1
	100 ≤ H < 200	µg/L	119.8	52.4
	H ≥ 200	µg/L	215.6	94.3
TDS	—	mg/L	1,000	1,000
TDS anions/cations [d]	—	mg/L	Monitor only	
Sulfate associated with Na & Mg	—	mg/L	200	200
Turbidity, effluent	—	NTU	See Permit Part 1.2.6	
Turbidity, natural condition	—	NTU	Monitor only	
Hardness	—	mg/L $CaCO_3$	Monitor only	
pH	—	s.u.	See Permit Part 1.2.5	
TSS	—	mg/L	30	20
Flow	—	gpm	Monitor only	
Temperature	—	°C	Monitor only	
Dissolved Oxygen	—	mg/L	Monitor only	
Chronic Whole Effluent Toxicity [e] (WET)	—	TU_c	1.6	1.1

Note:

a. Parameters must be analyzed and reported as total recoverable unless otherwise noted.

b. Weekly sampling shall occur on the same day of each week, unless the Permittee can document that sampling could not be performed due to extreme conditions. In such cases, a detailed explanation of the reason sampling could not be performed shall be prepared and kept with the analytical results for that day.

c. Reporting of a maximum daily limit violation is required according to Appendix A, Item 3.4.3.3.

d. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including but not limited to boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), fluoride (F), chloride (Cl), sulfate (SO_4), total alkalinity, hardness, pH, and electrical conductivity.

e. See Permit Part 1.4. for whole effluent toxicity testing requirements.

4.2.2 Outfall 002 – East Fork Slate Creek

Effluent limits for discharges to East Fork Slate Creek through Outfall 002 are summarized in Table 4-2. Because the downstream conditions in East Fork Slate Creek below the TTF will be dominated by natural drainage flow, which has low hardness, the limits for hardness dependant metals are based on a receiving water hardness of 25 mg/L for hardness less than 30 mg/L, and 30 mg/l for hardness at or greater than 30 mg/L. Hardness in the creek will be monitored at Site #5 just downstream of the outlet to the Upper Slate Lake diversion pipe.

Table 4-2: Outfall 002 Effluent Limits

Parameter [a]	**Units**	**Hardness (mg/L)**	**Effluent Limits**	
			Maximum Daily	**Average Monthly**
Aluminum	µg/L		143	71
Ammonia, Total	mg/L as N		3.5	1.7
Arsenic	µg/L		Monitor only	
Cadmium [c]	µg/L	H < 30	0.2	0.1
	µg/L	H ≥ 30	0.2	0.1
Copper [c]	µg/L	H < 30	3.8	1.9
	µg/L	H ≥ 30	4.5	2.2
Chromium, Total [d]	µg/L		Monitor only	
Chromium VI [c, d]	µg/L		16	8
Iron	µg/L		1,700	800
Lead [c]	µg/L	H < 30	0.9	0.5
	µg/L	H ≥ 30	1.1	0.6
Manganese	µg/L		98	50
Mercury [c]	µg/L		0.02	0.01
Nickel [c]	µg/L	H < 30	26	13
	µg/L	H ≥ 30	31	15
Selenium [c]	µg/L		8.2	4.1
Silver [c]	µg/L	H < 30	0.4	0.2
	µg/L	H ≥ 30	0.5	0.25
Zinc [c]	µg/L	H < 30	37	18
	µg/L	H ≥ 30	43	22
TDS	mg/L		500	500
TDS anions/cations [e]	mg/L		Monitor only	
Nitrates	mg/L		Monitor only	
Sulfates	mg/L		250	250
Turbidity, effluent	NTU		See Permit Part 1.3.5	
Turbidity, natural condition	NTU		Monitor only	
pH	s.u.		See Permit Part 1.3.4	
TSS	mg/L		30	20
Outfall Flow	gpm		1,500	—
Temperature	°C		Monitor only	

Table 4-2: Outfall 002 Effluent Limits

Parameter [a]	Units	Hardness (mg/L)	Effluent Limits	
			Maximum Daily	Average Monthly
Hardness, as $CaCO_3$	mg/L		Monitor only	
Chronic Whole Effluent Toxicity [f] (WET)	TU_c		1.6	1.1

Note:

a. Parameters must be analyzed and reported as total recoverable unless otherwise indicated.

b. Weekly sampling shall occur on the same day of each week, unless the Permittee can document that sampling could not be performed due to extreme conditions. In such cases, a detailed explanation of the reason sampling could not be performed shall be prepared and kept with the analytical results for that day.

c. Reporting of a maximum daily limit violation is required according to Appendix A.

d. Chromium VI (Cr VI) must be analyzed during the next sampling event when results are received showing a total chromium measure exceeding 11 µg/L; the sample holding time for Cr VI is 24 hours. Cr VI must be analyzed and reported as dissolved.

e. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including but not limited to boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), fluoride (F), chloride (Cl), sulfate (SO_4), total alkalinity, hardness, pH, and electrical conductivity.

f. See Permit Part 1.4 for whole effluent toxicity testing requirements.

4.2.3 Reasonable Potential Analysis

Effluent limits must be included for all pollutants addressed by effluent guidelines. In determining which other pollutants will require water quality-based effluent limits (WQBELs), ADEC determines the reasonable potential of the discharge to exceed or cause an exceedance of applicable water quality criteria.

For Outfall 001, ADEC determined that it is important to retain WQBELs for all pollutants included in the 2005 permit that had a reasonable potential to exceed water quality standards. In addition, manganese, which was not in the 2005 permit, was added. WQBELs are included for aluminum, iron, and sulfate since these pollutants are expected at concentrations in the discharge approaching the water quality criteria. Limits are set at three different hardness ranges for Outfall 001.

For Outfall 002, ADEC anticipates that pollutant levels will be below applicable water quality criteria. The predicted water quality, however, is based on limited analysis of tailings slurry and background water quality. ADEC, therefore, determined that it is appropriate to establish limits for all of the same pollutants addressed at Outfall 001 and add a limit for manganese. The limits for hardness dependant metals are based on a receiving water hardness of 25 mg/L CaCO3 for hardness less than 30 mg/L, and 30 mg/l CaCO3 for hardness at or greater than 30 mg/L.

5.0 Receiving Water Body

5.1 Outfall Locations

The permittee proposes to discharge through two outfalls, which are currently regulated by APDES Permit No. AK0050571. Outfall 001 discharges mine water to Sherman Creek and is located at latitude 58° 52' 04" North and longitude 135° 06' 55" West. Outfall 002 discharges treated water from the TTF to East Fork Slate Creek at latitude 58° 49' 58" North and longitude 134° 57' 58" West.

5.2 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the Alaska Water Quality Standards (WQS). The WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each water body.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230, as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b).

The State's designated uses for Sherman Creek and East Fork Slate Creek include water supply (drinking, culinary, and food processing; agricultural irrigation and stock watering; aquaculture; and industrial), contact and secondary recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife. At 18 AAC 70.020, the State also establishes water quality criteria for each designated beneficial use. 18 AAC 70.236(b)(3) establishes site-specific criteria for total dissolved solids (TDS) for Sherman Creek.

6.0 Description of Discharges

6.1 Outfall 001 – Sherman Creek

Outfall 001 represents the discharge from the mine water treatment plant (MWTP) into Sherman Creek. This plant treats mine drainage water. There are two sediment ponds. Pond 1 is designed to hold the average annual sediment yield for a five-year period. Removal of settled solids will occur periodically when sediment levels reach 2.5 feet below the notched spillway, which separates Ponds 1 and 2.

A spillway notched in the center berm allows flow from Pond 1 to Pond 2. The rate of flow from Pond 1 to Pond 2 will vary, depending on the amount of inflow from runoff and the storage available in Pond 1. Pond 2, which is designed to treat water from mine dewatering operations and high flows from Pond 1, has been conservatively designed to hold settled solids for the life of the mine. Water from Pond 2 will be pumped to and treated at the MWTP and discharged to Sherman Creek through Outfall 001. If necessary, settled solids will be removed from Pond 2 when levels reach 2.5 feet below the bottom perforations of the decant pipe.

The permittee estimates the rate of mine drainage to generally range from 3.65 to 4.8 cfs (1600 – 2100 gpm) with a maximum of 6.7 cfs (3000 gpm). All of the mine drainage will be collected in sumps within the mine where initial settling will occur. Mine drainage will be pumped to the MWTP for metals coagulation, flocculation, clarification, and filtration. The effluent is discharged via Outfall 001. Settled solids will be added to tailings that are backfilled into the mine or other approved locations.

Table 6-1 presents Outfall 001 water quality reported under the NPDES permit from September 2005 through October 2009.

Table 6-1: Outfall 001 – Effluent Water Quality 2005-2009

Parameter	Units	Minimum	Maximum	Mean	CV[a]
Aluminum (total)	µg/L	0.5	369	28	1.95
Ammonia	mg/L	0.005	3.4	0.4	1.47
Arsenic	µg/L	0.075	2.5	1.24	0.12
Cadmium (total)	µg/L	0.025	1.0	0.08	1.2
Chromium (total)	µg/L	<2.5	<2.5	<2.5	0.04
Copper (total)	µg/L	0.05	16	0.77	1.55
Iron (total)	µg/L	25	1790	230	1.20
Lead (total)	µg/L	0.025	3.76	0.12	1.98
Manganese	µg/L	6.09	187	50	0.57
Mercury (total)	µg/L	0.0	0.006	0.001	0.82
Nickel (total)	µg/L	0.075	23	3.8	0.97
Nitrate	mg/L	<0.05	7.2	0.9	1.5
Selenium (total)	µg/L	0.5	2.5	0.97	0.58

Table 6-1: Outfall 001 – Effluent Water Quality 2005-2009

Parameter	Units	Minimum	Maximum	Mean	CV[a]
Silver (total)	µg/L	0.01	0.6	0.06	0.99
Sulfate associated with Na & Mg	mg/L	14	105	43	0.51
TDS	mg/L	20	700	290	0.4
Zinc (total)	µg/L	0.7	29.6	5.7	0.80
pH	s.u.	7.4	8.4	--	--
TSS	mg/L	< 4.0	19	--	--
Hardness	mg/L	22	543	96	--

Note:

a. CV = coefficient of variation

Discharge flows from Outfall 001 vary seasonally. During the 2005-2009 period, the highest reported flow of 1,434 gpm occurred in October 2008. The lowest reported flow of 119 gpm occurred in February 2005. The MWTP was upgraded in 2010 to increase treatment capacity to 3,000 gpm. Outfall 001 discharge flows will also vary depending on the volume of inflows from storm events, which affect mine drainage and dewatering. During dry weather, treated mine drainage water will be the principal component of discharges from Outfall 001. During large rainfall events, discharges from Outfall 001 will be a mixture of treated mine drainage water and storm water from waste rock discharged to Pond 2.

6.2 Outfall 002

Outfall 002 discharges treated wastewater from the tailings treatment facility in the TTF WTP which discharges into a diversion pipe carrying water from Upper Slate Lake. At the point this diversion pipeline discharges below the TTF embankment it forms East Fork Slate Creek. The TTF is formed from the natural lake basin of Lower Slate Lake and an enlargement of this natural bowl by the constructed TTF embankment at the outlet of the lake. The TTF is sized to accommodate 4.5 million tons of tailings, which represents 60 percent of the tailings to be generated by the mining operation. The remaining 40 percent (3 million tons) will be backfilled into the mine. TTF inflows include tailings slurry from mill operations, precipitation that falls into the lake, and storm water runoff from upland areas adjacent to the TTF. The upstream flow from Upper Slate Lake is diverted into a 26 inch pipeline around the TTF for discharge into East Fork Slate Creek below the TTF embankment.

Tailings slurry will be initially pumped from the mill to a high point, then flow by gravity to the TTF in a 3.5-mile pipeline. The pipeline is double walled high-density polyethylene (HDPE). Flow sensors with automatic shutdown mechanisms will be used to detect blockages or breaks in the system. Leak detectors are also located in eight manholes along the pipeline to detect moisture between the two walls of the pipeline.

The average tailings slurry throughput to the TTF is projected to be 354 gpm with an average solids content of 55 percent by weight (i.e., the water component of the slurry will be approximately 247 gpm). A portion of the slurry water will be entrained in the tailings and will be unavailable for recycle. The permittee proposes to recycle an average of 100 gpm from the TTF back to the mill.

Table 6-2 presents anticipated untreated, water quality in the TTF, based on water quality modeling using @Risk, a Monte Carlo simulation program. From user-defined probability distributions of input variables, the program randomly selects input values for calculation. After repeating input selection and calculation over hundreds of model iterations, a probabilistic distribution of possible outcomes is generated; i.e., the likelihood of particular outcomes is determined. EPA completed one thousand iterations of the model in order to project untreated TTF water quality. A detailed discussion of the TTF modeling is presented in Basis for Effluent Limits – Outfalls 001 and 002, Sections 4.2.1 and 4.2.2, respectively, of this Fact Sheet.

Table 6-2: Projected Untreated TTF Water Quality

Parameter	Units	Projected TTF Discharge		
		Minimum	Mean	Maximum
Aluminum [a]	µg/L	--	--	--
Ammonia	mg/L	0.128	0.57	0.7
Arsenic	µg/L	0.59	0.82	0.9
Cadmium	µg/L	0.0056	0.025	0.031
Chromium	µg/L	0.94	2.0	2.3
Copper	µg/L	0.68	1.7	1.9
Iron	µg/L	400	760	900
Lead	µg/L	0.12	0.55	0.67
Mercury	µg/L	0.002	0.01	0.01
Nickel	µg/L	0.97	1.8	2.1
Nitrate	mg/L	< 10 [a]	< 10 [b]	< 10 [b]
pH	s.u.	6.5 – 8.5		
Selenium	µg/L	0.13	0.59	0.71
Silver	µg/L	0.02	0.02	0.02
Sulfate	mg/L	24	98	118
TSS [a]	mg/L	--	--	--
TDS	mg/L	114	218	246
Zinc	µg/L	2.8	11	13

Note:

a. Parameters not included in model analysis.

b. Values assume continued implementation of the explosives BMP Plan

An important factor in the model is the volume of water available to mix with process water in the TTF. The volume of water available for mixing corresponds to precipitation. In each model run, precipitation is a variable; i.e., the model randomly selects a monthly precipitation value from the projected precipitation distribution at the site. In one thousand runs, it is expected that the “typical” and extreme wet and dry conditions will be represented. Other hydrologic inputs (evaporation, snow melt, etc.) were incorporated into the values as deterministic values.

Discharge chemistry is also a function of process (tailings) water character and the background chemistry of Lower Slate Lake. The tailings chemistry input is based on sampling and analysis of decant water associated with rougher tailings generated during pilot milling tests performed in 1996 and 1998. The data represent total constituent results for each sample and the tests are considered representative of the full-scale milling operations. Lower Slate Lake background data represent the highest detected concentrations for each parameter from sampling and analysis performed in East Fork Slate Creek during 2000-2001.

Aluminum was not included in the modeling analysis. When the tailings water is mixed in the TTF, the pH is expected to be reduced to natural levels of 7 – 8 standard units, and excess aluminum will precipitate and settle. As a result, aluminum levels in the TTF prior to treatment are expected to be consistent with background water quality levels in the lake.

TSS was also not included in the modeling analysis because the TSS levels in the TTF are not only a function of mixing with natural inflows but also of settling. As discussed above, the modeling results presented in Tetra Tech 2004 (see References section) show that TSS levels of 660 mg/L or higher may be observed in the TTF without flocculant addition. Flocculation is generally a proven method to enhance settling; however, its specific performance at the TTF cannot be determined until additional tailings are analyzed for site-specific testing of flocculants.

The TTF WTP uses conventional flocculation, settling, and filtration to achieve permit limits.

Operationally, tailings water will be decanted and pumped from the TTF to the TTF WTP. The design capacity of the system is 1,500 gpm, which is adequate to treat the maximum projected inflows into the TTF without exceeding TTF capacity. The permittee has indicated that it will continue to pursue additional studies and approaches to address aluminum, TSS, and, as appropriate, other pollutants.

The permittee may request site-specific criteria (SSC) for aluminum consistent with 18 AAC 70.235 and based on the actual effects of aluminum on species found in the Slate Creek drainage. As appropriate, ADEC would reopen the permit to revise the permit limits to reflect any site-specific criteria that was adopted by the department and approved by EPA.

Along with establishing the geochemical character of the tailings, the analyses (Montgomery Watson 1996), (CMRI 1998), (See references), showed that due to 90 to 98 percent removal of sulfide through flotation, tailings will have a total sulfur concentration of approximately 0.3 percent, and therefore, acid generation is not expected to occur in the TTF.

The permittee will manage the TTF to maintain a minimum water volume of at least 600 acre feet and a minimum of 9 feet of water over the tailings. The TTF, including the pipeline diversion, will be actively managed to maintain ADF&G Division of Sport Fish minimum stream flow requirements and mirror historic fluctuations in the East Fork Slate Creek hydrograph downstream of the TTF.

7.0 Reissued Permit (anti-backsliding)

18 AAC 83.480 requires that effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the 2005 permit. 18 AAC 83.480(c) also states that a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued" unless the department can justifying relaxing limits in accordance with 18 AAC 83.480 (b). With the exception of permit limit adjustments allowed by 18 AAC 83.480(b)(2), the 2011 permit effluent limitations, standards, and conditions are equal to or more stringent than those in the 2005 permit (see Table 8 and Appendix B, Section X for parameter-by-parameter analysis and see section 9.3 for the changes to some receiving water monitoring.

No mixing zones are authorized for either Outfall 001 or 002, and the Waste Load Allocations (WLA) have not changed from the 2005 permit. The 2005 through 2009 data on effluent quality from Outfall 001 during active mining was not available at the time the 2005 permit was issued. The Department used this more current data to calculate effluent limits, which resulted in several minor increases in Maximum Daily limits. However, the Monthly Average limits for those same parameters decreased, resulting in more stringent limits. In accordance with 18 AAC 83.480(b)(2), establishing less stringent limits in the permit reissuance does not constitute backsliding, because the limits are based on new information that was not available at the time the permit was issued in 2005. In addition, consistent with 33 U.S.C 1313(d)(4)(B), this does not constitute backsliding if the antidegradation criteria are satisfied (as discussed in Section 8.0). See Table 8 where the bold numbers represent the 2011 limits that are less stringent than the 2005 limits.

8.0 ANTIDEGRADATION

8.1 Receiving waters

As described in Section 6.0 , Outfall 001 discharges treated mine drainage water to Sherman Creek, which flows west from Lions Head Mountain into Lynn Canal. Outfall 002 discharges treated TTF water to East Fork Slate Creek, which flows south into Slate Creek Cove and Berners Bay.

8.2 Tier Determination

The department's approach to implementing the antidegradation policy found in 18 AAC 70.015 is based on the requirements in 18 AAC 70 and *Interim Antidegradation Implementation Methods* dated July 14, 2010. Using these requirements and policies, the department determines whether a water body or portion of a water body is classified as Tier 1, Tier 2, or Tier 3, where a larger number indicates a greater level of water quality protection. To qualify as a Tier 3, or "outstanding national resource" water, one of two criteria must be met. The water must either be 1) in a national or state park or wildlife refuge or 2) a water with exceptional recreational or ecological significance. The Kensington Gold Mine is not in a national or state park or wildlife refuge, and the waters in Sherman and East Fork Slate Creeks are not identified as having exceptional recreational or ecological significance. Therefore, the department determined that the creeks are not Tier 3 waters. The affected reaches of the streams near the mine are inaccessible to anadromous fish due to steep terrain and are not included in the ADF&G's anadromous catalog. The water quality of these creeks is better than the criteria applicable to the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water, see CWA 101(a)(2); therefore, the creeks near the mine are considered to be Tier 2 waters for this antidegradation analysis.

8.3 Analysis

The Antidegradation Policy of the Alaska WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing and designated uses must be maintained and protected. The Department may allow reduction of water quality only after finding that five specific criteria are met. These criteria and the Department's findings are as follows:

The proposed adjustments to effluent limits and other updates to this Permit meet the Antidegradation Policy. As described in Appendix B to the fact sheet, the updated limits are calculated and designed to meet the applicable WQS in receiving waters and to maintain and protect existing and designated uses. The minor increases due to updated calculations for some Daily Maximum limits for Outfall 001 are all accompanied by decreases in the Monthly Average limits—and no increases in Waste Load Allocations, which will ensure that the water quality of Sherman Creek will not be reduced (GOLDER 1). Similarly, the addition of hardness-based limits for Outfall 002 will not reduce water quality in East Fork Slate Creek (GOLDER 2).

Further, although the Department has determined that these adjustments to permit limits do not result in a reduction in water quality, and so no antidegradation analysis is triggered, the adjustments meet the five criteria applicable to allowing such a reduction in Tier 2 waters (and, therefore, support the antibacksliding conclusions in Section 7.0, as well as the conclusions regarding Antidegradation in this Section). These criteria and the Department's findings are as follows:

8.3.1 **18 AAC 70.015 (a)(2)(A).** Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

Rationale: The Kensington Gold Mine had a capital cost of $450 million and is expected to produce 125,000 ounces of gold per year over an initial mine life of 10 + years. Coeur Alaska has a commitment to local and Native hire. Approximately 300 workers were employed during construction of which: 40% were Native/Native-affiliated, 60% were Juneau residents, 12% were other Southeast residents, 72% were Southeast residents, and 84% were Alaska residents. During operations there are 200 full-time, year-round employees with $16 million in direct annual payroll and another 170 indirect jobs with $7 million in indirect payroll, totaling 370 total jobs and $23 million in annual payroll. The Kensington Gold Mine is the second largest private employer in terms of payroll in the Juneau area, and several million dollars are generated in annual state and local sales tax.

As described in Sections 8.3.2 through 8.3.5, the limits in the Permit will meet water quality standards, provide for water quality adequate to protect existing uses, and treat and control discharges by the most effective and reasonable means and to the highest statutory and regulatory requirements. Allowing the adjustments is necessary to update the Permit for a Project that is important economically and socially for Southeast Alaska. Imposing more stringent limits would not be consistent with current data and analysis regarding what is needed to adequately protect and maintain water quality.

The department finds that the criterion is satisfied.

8.3.2 **18 AAC 70.015 (a)(2)(B).** Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

Table 8 compares the 2005 permit limits to the 2011 permit limits for Outfall 001. The bold numbers represent the 2011 limits that are less stringent than the 2005 limits.

Table 8: Outfall 001 - Comparison of 2005 and 2011 permit limits

Parameter	Hardness mg/l CaCO3	2005 Maximum Daily Limit	2011 Maximum Daily Limit	2005 Average Monthly Limit	2011 Average Monthly Limit
		All units µg/L			
Aluminum		143	**153**	71	50
Cadmium	50 ≤ H < 100	0.3	0.3	0.1	0.1
	100 ≤ H < 200	0.4	0.5	0.2	0.2
	H ≥ 200	0.7	0.84	0.4	0.3
Copper	50 ≤ H < 100	7.3	7.3	3.6	2.5
	100 ≤ H < 200	14.0	14.0	7.0	4.8
	H ≥ 200	26.9	26.9	13.4	9.2
Chromium		16	**Monitor only**	8	**Monitor only**
Iron		1700	**1850**	800	690
Lead	50 ≤ H < 100	2.2	**2.3**	1.1	0.8
	100 ≤ H < 200	5.2	**5.6**	2.6	1.8
	H ≥ 200	12.6	**13.4**	6.3	4.4
Manganese		Monitor only	98	Monitor only	50
Mercury		0.02	0.02	0.01	0.01
Nickel	50 ≤ H < 100	47.7	**52.9**	23.8	21.2
	100 ≤ H < 200	85.7	**95**	42.7	38.1
	H ≥ 200	154.0	**170.3**	76.8	68.5
Selenium		8.2	**Monitor only**	4.1	**Monitor only**
Silver	100 ≤ H < 200	1.2	**Monitor only**	0.6	**Monitor only**
	H ≥ 200	4.1		2.0	
	100 ≤ H < 200	13.4		6.6	
Zinc	50 ≤ H < 100	66.6	66.6	33.2	29.1
	100 ≤ H < 200	119.8	119.8	59.7	52.4
	H ≥ 200	215.6	215.6	107.5	94.3
	Units	***Values below have different/individual units***			
Ammonia	mg/L as N	4.0	4.0	2.0	2.0
Nitrate	mg/L as N	20	20	10	10
TDS	mg/L	1000	1000	1000	1000
TDS anions/ cations	mg/L	Monitor only	Monitor only	Monitor only	Monitor only

Table 8: Outfall 001 - Comparison of 2005 and 2011 permit limits					
Parameter	Hardness mg/l CaCO3	2005 Maximum Daily Limit	2011 Maximum Daily Limit	2005 Average Monthly Limit	2011 Average Monthly Limit
Sulfate associated with Na & Mg	mg/L	200	200	200	200
Turbidity, effluent	NTU	Turbidity to be not more than 5 NTU above background			
Turbidity, natural condition	NTU	Monitor only	Monitor only	Monitor only	Monitor only
Hardness	mg/L $CaCO_3$	Monitor only	Monitor only	Monitor only	Monitor only
pH	s.u.	pH to be between 6.5 and 8.5			
TSS	mg/L	30	30	20	20
Flow	Gpm	Monitor only	Monitor only	Monitor only	Monitor only
Temperature	°C	Monitor only	Monitor only	Monitor only	Monitor only
Dissolved Oxygen	mg/L	Monitor only	Monitor only	Monitor only	Monitor only
Chronic Whole Effluent Toxicity (WET)	TU_c	1.6	1.6	1.1	1.1

- *Rationale: Discharge allowed by the permit at Outfall 001 conforms to the requirements of 18 AAC 70.020, 18 AAC 70.235, and 18 AAC 70.030. No mixing zones are authorized at Outfall 001, and WQS are met at the end of pipe before the discharge enters Sherman Creek. More specifically, the effluent limits in this permit for Outfall 001 are based on the applicable water quality standards (18 AAC 70.020), converted to maximum daily and average monthly values using established calculations and the recalculated coefficient of variation (CV) from the past effluent data. When based on the recalculated CV, some of the Maximum Daily effluent limits increased while some of the Average Monthly limits decreased. These changes are the result of recalculating the CV using 2005 through 2009 actual effluent data following established procedures consistent with EPA requirements. Parameter by parameter details of those changes can be found in Table 8 and in Appendix B of this Fact Sheet.*

- *Rationale: The effluent limits for the parameters at Outfall 002 discharging to East Fork Slate Creek described in Table 4 of the APDES permit are based on* *the water quality standards. These limits are calculated using two hardness values, one based on the existing permit 5th percentile hardness of 25 mg/L and one based on new data collected during construction activities for a 5th percentile value of 30 mg/L. They are also based on the default CV of 0.6, since there has been no discharge at Outfall 002. No mixing zone is authorized for this discharge.*

- *The department finds that this criterion is satisfied.*

8.3.3 **18 AAC 70.015(a)(2)(C).** The resulting water quality will be adequate to fully protect existing uses of the water.

- *Rationale for Outfall 001: No mixing zone is authorized. The WQS, upon which the effluent limits are based, serve the specific purpose of protecting the existing and designated uses and are met at the end of pipe before the discharge enters Sherman Creek. The effluent limits in this permit are the same as the 2005 NPDES permit, with the exception of those limits that were recalculated based on actual data of past performance of the MWTP, as described in section 4.2.1.*

  When compared to Table 5-2 in the 2005 NPDES permit, and as highlighted in Table 8, some Maximum Daily Limits increased while some Average Monthly Limits decreased. That is because those limits were calculated using the 2005 through 2009 water quality data that was not available when the permit was issued in 2005. Despite the fact that some Maximum Daily Limits are less stringent, the limits are protective, based on new data, meet WQS, resulted from strict adherence to prescribed limits calculation procedures, and comply with 18 AAC 83.480 (Reissued Permit).

- *Rationale for Outfall 002: The effluent limits for the parameters at Outfall 002 to East Fork Slate Creek described in Table 4 of the APDES permit are based on the WQS. These limits are calculated using two hardness values, one based on the existing permit 5th percentile hardness of 25 mg/L and one based on new data collected during construction activities for a 5th percentile value of 30 mg/L. They are also based on the default CV of 0.6 (default CV per TSD), since there has been no discharge at Outfall 002. No mixing zone was applied for or authorized. The WQS, upon which the effluent limits are based, were established for the specific purpose of protecting the existing and designated uses. They were deemed protective in the 2005 permit and are still protective for the 2011 permit. Aquatic biomonitoring in Slate Creek will ensure that these limits remain protective.*

- *The department finds that the resulting water quality will be adequate to fully protect existing and designated uses and that the criterion is met.*

8.3.4 **18 AAC 70.015(a)(2)(D).** The methods of pollution prevention, control, and treatment found by the department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.

- *Rationale: The department finds the most effective methods of prevention, control, and treatment are the practices and requirements set out in this permit and currently in use for both Outfalls 001 and 002. Mine operators are required to implement a best management practices (BMP) plan as required by the permit. The Permittee was required in the 2005 permit, and is required in the 2011 permit, to review the BMP Plan annually. The BMP Plan includes pollution prevention measures and controls appropriate for each facility and discharge. The design, construction, and performance of the treatment plants have also been reviewed and approved by the department.*

- *The department finds that this criterion to address pollution prevention, control, and treatment is met.*

8.3.5 **18 AAC 70.015(a)(2)(E).** All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.

- *Rationale: For both Outfalls 001 and 002, applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30), as amended June 26, 2003. Accordingly, there are three parts to the definition. First, it includes all federal technology-based effluent limitation guidelines as found in 40 Code of Federal Regulations, Part 440, Subpart J. The permit implements the technology-based Effluent Limits Guidelines (ELGs) for the subcategory of gold mines. The second part considers discharge of sewage to sewers and is not applicable to this permit. The third part includes any more stringent treatment required by state law, including 18 AAC 70 and 18 AAC 72. The correct operation of equipment, visual monitoring, and following the BMPs, as wells as other permit requirements, will control the discharge and satisfy all applicable federal and state requirements. This achieves the highest statutory and regulatory requirements.*

- *The department finds that the treatment required in this permit achieves the highest statutory and regulatory requirements and that the criterion is satisfied.*

9.0 Monitoring Requirements

Under 18 AAC 83.455, ADEC must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limits, assist in the development of effluent limits, and assess the quality of receiving waters. The 2011 permit contains both effluent and receiving water (ambient) monitoring requirements.

9.1 Quality Assurance Project Plan (QAPP)

The 2005 permit required a QAPP be developed and submitted to EPA and ADEC within 60 days of the effective date of the permit. Coeur Alaska, Inc. submitted the QAPP May 6, 2005. The QAPP was subsequently updated January 1, 2009. ADEC has guidance for QAPP contents to aid development of a QAPP at http://dec.alaska.gov/water/wqapp/Generic_Tier_2_WQ_QAPP_Rev_1.pdf.

9.2 Outfall Monitoring

Table 9-1: Outfall 001 Monitoring Requirements

Parameter [a]	Units	Monitoring Requirements		
		Sample Frequency [b]	Sample Location	Sample Type
Aluminum [c]	µg/L	Weekly	Effluent (E)	24 hr. comp
Ammonia, Total	mg/L as N	Weekly	E	24 hr. comp
Arsenic	µg/L	Monthly	E	24 hr. comp
Cadmium [c]	µg/L	Weekly	E	24 hr. comp
Copper [c]	µg/L	Weekly	E	24 hr. comp
Chromium, Total	µg/L	Monthly	E	24 hr. comp
Iron	µg/L	Weekly	E	24 hr. comp
Lead [c]	µg/L	Weekly	E	24 hr. comp
Manganese	µg/L	Weekly	E	24 hr. comp
Mercury [c]	µg/L	Monthly	E	24 hr. comp
Nickel [c]	µg/L	Weekly	E	24 hr. comp
Nitrate	mg/L as N	Weekly	E	24 hr. comp
Selenium [c]	µg/L	Monthly	E	24 hr. comp
Silver	µg/L	Monthly	E	24 hr. comp
Zinc [c]	µg/L	Monthly	E	24 hr. comp
TDS	mg/L	Weekly	E	24 hr. comp
TDS anions/cations [d]	mg/L	Quarterly	E	24 hr. comp
Sulfate associated with Na & Mg	mg/L	Weekly	E	24 hr. comp
Turbidity, effluent	NTU	Weekly	E	Grab
Turbidity, natural condition	NTU	Weekly	Background	Grab
Hardness	mg/L $CaCO_3$	Weekly	Downstream	Grab
pH	s.u.	Continuous	E	Recorder

Table 9-1: Outfall 001 Monitoring Requirements

Parameter [a]	Units	Monitoring Requirements		
		Sample Frequency [b]	Sample Location	Sample Type
TSS	mg/L	Daily	E	24 hr. comp
Flow	gpm	Continuous	E	Recorder
Temperature	°C	Weekly	E	Grab
Dissolved Oxygen	mg/L	Weekly	E	Grab
Chronic Whole Effluent Toxicity [e] (WET)	TU_c	Monthly	E	24 hr. comp

Note:

a. Parameters must be analyzed and reported as total recoverable unless otherwise noted.

b. Weekly sampling shall occur on the same day of each week, unless the Permittee can document that sampling could not be performed due to extreme conditions. In such cases, a detailed explanation of the reason sampling could not be performed shall be prepared and kept with the analytical results for that day.

c. Reporting of a maximum daily limit violation is required according to Appendix A.

d. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including but not limited to boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), fluoride (F), chloride (Cl), sulfate (SO_4), total alkalinity, hardness, pH, and electrical conductivity.

e. See Permit Part 1.4 for whole effluent toxicity testing requirements.

Table 9-2: Outfall 002 Monitoring Requirements

Parameter [a]	Units	Monitoring Requirements	
		Sample Frequency [b]	Sample Type
Aluminum	µg/L	Weekly	24 hr. comp
Ammonia, Total	mg/L as N	Weekly	Grab
Arsenic	µg/L	Monthly	24 hr. comp
Cadmium [c]	µg/L	Weekly	24 hr. comp
Copper [c]	µg/L	Weekly	24 hr. comp
Chromium, Total	µg/L	Weekly	24 hr. comp
Chromium VI [c, d]	µg/L	See note (d)	Grab
Iron	µg/L	Weekly	24 hr. comp
Lead [c]	µg/L	Weekly	24 hr. comp
Manganese	µg/L	Weekly	24 hr. comp
Mercury [c]	µg/L	Weekly	24 hr. comp

Table 9-2: Outfall 002 Monitoring Requirements

Parameter [a]	Units	Monitoring Requirements	
		Sample Frequency [b]	Sample Type
Nickel [c]	µg/L	Weekly	24 hr. comp
Selenium [c]	µg/L	Weekly	24 hr. comp
Silver [c]	µg/L	Weekly	24 hr. comp
Zinc [c]	µg/L	Weekly	24 hr. comp
TDS	mg/L	Weekly	24 hr. comp
TDS anions/cations[e]	mg/L	Quarterly	24 hr. comp
Nitrates	mg/L	Weekly	24 hr. comp
Sulfates	mg/L	Weekly	24 hr. comp
Turbidity, effluent	NTU	Weekly	Grab
Turbidity, natural condition	NTU	Weekly	Grab
pH	s.u.	Continuous	Recorder
TSS	mg/L	Daily	24 hr. comp
Outfall Flow	gpm	Continuous	Recorder
Temperature	°C	Weekly	Grab
Hardness, as $CaCO_3$	mg/L	Weekly	Grab
Chronic Whole Effluent Toxicity [f] (WET)	TU_c	Monthly	24 hr. comp

Note:

a. Parameters must be analyzed and reported as total recoverable unless otherwise indicated.

b. Weekly sampling shall occur on the same day of each week, unless the Permittee can document that sampling could not be performed due to extreme conditions. In such cases, a detailed explanation of the reason sampling could not be performed shall be prepared and kept with the analytical results for that day.

c. Reporting of a maximum daily limit violation is required according to Appendix A.

d. Chromium VI (Cr VI) must be analyzed during the next sampling event when results are received showing a total chromium measure exceeding 11 µg/L — the sample holding time for Cr VI is 24 hours. Cr VI must be analyzed and reported as dissolved.

e. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including but not limited to boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), fluoride (F), chloride (Cl), sulfate (SO_4), total alkalinity, hardness, pH, and electrical conductivity.

f. See Permit Part 1.4 for whole effluent toxicity testing requirements.

Table 9-3: Monitoring Requirements During Non-Mining Periods

Effluent Parameter [a]	Units	Monitoring Requirement	
		Sampling Frequency	Sample Type
Aluminum	µg/L	Quarterly	Grab
Ammonia, Total	mg/L	Quarterly	Grab
Arsenic	µg/L	Quarterly	Grab
Cadmium	µg/L	Quarterly	Grab
Copper	µg/L	Quarterly	Grab
Chromium, Total	µg/L	Quarterly	Grab
Iron	µg/L	Quarterly	Grab
Lead	µg/L	Quarterly	Grab
Manganese	µg/L	Quarterly	Grab
Mercury	µg/L	Quarterly	Grab
Nickel	µg/L	Quarterly	Grab
Nitrate	mg/L	Quarterly	Grab
Selenium	µg/L	Quarterly	Grab
Silver	µg/L	Quarterly	Grab
Zinc	µg/L	Quarterly	Grab
Total Dissolved Solids	mg/L	Quarterly	Grab
TDS anions/cations	mg/L	Annually	Grab
Sulfate	mg/L	Quarterly	Grab
Hardness [b]	mg/L	Monthly – Instream	Grab
pH [c]	s.u.	Quarterly	Grab
Total Suspended Solids	mg/L	Daily	Grab
Flow	MGD	Continuous	Recorder
Temperature	°C	Quarterly	Grab
WET, Chronic	TU_C [d]	Annually	Grab

Notes:

a. The Permittee shall conduct analysis for total recoverable.

b. The Permittee shall sample the receiving water hardness downstream of the discharge.

c. The Permittee shall monitor and report the number of pH excursions outside the range of 6.5 to 8.5 Standard Units.

d. Chronic toxic units (See Definitions).

The monitoring requirements in Tables 9-1 and 9-2 are consistent with the 2005 permit requirements with one additional parameter, manganese, which is newly limited in the 2011 permit. During periods of extended shutdown (after a six-month closure period), the monitoring requirements in Table 9-3 will apply to Outfalls 001 and 002.

9.3 Receiving Water (Ambient) Monitoring

This permit requires monitoring in Sherman Creek, Slate Creek, and Johnson Creek. Based on the data collected between 2005 and 2009, ADF&G recommended changes to ambient monitoring from the 2005 permit as shown in Table 9-4.

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
WATER COLUMN MONITORING		
Sherman Creek		
1. Upper Sherman Creek (SH109) 2. Middle Sherman Creek (SH113) 3. Lower Sherman Creek (SH105)	1. Upper Sherman Creek (SH109) 2. Middle Sherman Creek (SH113) 3. Lower Sherman Creek (SH105)	No change
Slate Creek		
1. Diversion pipeline (MLA) 2. East Fork Slate Creek (SLB) 3. Lower Slate Creek (SLC)	1. Diversion pipeline (MLA) 2. East Fork Slate Creek (SLB) 3. Lower Slate Creek (SLC)	No change
Johnson Creek		
1. Upper Johnson Creek (JS2) 2. Middle Johnson Creek (JS5)	1. Upper Johnson Creek (JS2) 2. Middle Johnson Creek (JS5)	No change

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
Ophir Creek		
NONE	1. Above the waste pile (SH111). 2. Below the waste pile (SH103).	Ophir Creek monitoring added to detect any water quality changes due to waste rock or sediments deposited in the pile.
MANGANESE MONITORING		
NONE	1. Sherman Creek (SH115). 2. Slate Creek (Site 5)	Unexpectedly high manganese has been observed in effluents. Treatment will be installed under a Compliance Order. Additional monitoring is required until two months after water quality standards are met in the receiving water. See Section 11.1.
SEDIMENT MONITORING		
Sherman Creek		
1. Middle Sherman Creek 2. Lower Sherman Creek	1. Middle Sherman Creek 2. Lower Sherman Creek.	Data collected 2005-2009 show sediment metal concentrations are generally consistent between years. Water quality in the creek is strictly monitored because of the discharge from outfall 001. This is more efficient, and provides a timelier indicator of toxicity.
Johnson Creek		
1. Lower Johnson Creek	1. Lower Johnson Creek	No change

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
Slate Creek		
1. East Fork Slate Creek 2. Lower Slate Creek	1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek 3. Lower Slate Creek	The inlet creek to Upper Slate Lake sample site will provide reference data on sediment toxicity for comparing data collected downstream of mine operations.
BENTHIC INVERTEBRATES		
Sherman Creek		
1. Lower Sherman Creek (2 sites)	1. Lower Sherman Creek (2 sites)	No change
Sweeny Creek		
1. Lower Sweeny Creek (2 sites)	NONE	Data collected 2006-2009 suggest benthic invertebrate populations in Sweeny Creek are stable and healthy. Sweeny Creek is not impacted by mine development and reference data can be obtained from other streams, therefore, further sampling in Sweeny Creek is unnecessary.
Johnson Creek		
1. Upper Johnson Creek	1. Upper Johnson Creek	Data collected 2004-2009 suggest the abundance and diversity of benthic invertebrates in Johnson Creek are healthy and stable. Little development and infrastructure occurs in the creek, and construction adjacent to the creek is complete.

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
Slate Creek		
1. East Fork Slate Creek	1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek 3. Lower Slate Creek 4. West Fork Slate Creek	The inlet creek to Upper Slate Lake site will provide reference data for invertebrates to compare sites downstream of mine operations; the Lower Slate Creek site will provide data on invertebrates in the anadromous reach; and the West Fork Slate Creek site will provide additional reference data where no development occurs.
RESIDENT FISH POPULATION STATUS		
Sherman Creek		
1. Upper Sherman Creek 2. Middle Sherman Creek 3. Lower Sherman Creek	NONE	Data collected 1998-2002 and 2005-2009 suggest Dolly Varden char (DV) abundance and condition in Sherman Creek are healthy and stable. Water quality in the creek and its tributaries are strictly monitored because of Outfall 001, therefore further resident fish monitoring is not warranted given the low level of mine operations and development in the Sherman Creek watershed.
Johnson Creek		
1. Upper Johnson Creek 2. Middle Johnson Creek 3. Lower Johnson Creek	NONE	Data collected 2005-2009 suggest resident DV abundance varies between years and reaches, and fish condition may be increasing. Other

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
		than two bridges and an infiltration gallery, no development or operations occur in Johnson Creek; therefore, further monitoring of resident fish abundance and condition is not warranted.
Slate Creek		
1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek 3. Lower Slate Creek	1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek	Data collected 2005-2009 suggest the DV population in the inlet creek to Upper Slate Lake is much larger than in Middle or Lower Slate Creeks, and abundance varies each year. However, DV in Lower Slate Creek may be resident, anadromous, or from another nearby stream, thus fish collected in Lower Slate Creek may not represent a true resident population. Further monitoring in the lower reach is therefore not warranted.
RESIDENT FISH MONITORING - WHOLE BODY METAL ANALYSIS		
Slate Creek		
NONE	1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek 3. Lower Slate Creek	Monitoring resident fish tissue metal concentrations will provide additional data on metals in Slate Creek and study metal bioaccumulation rates. Though sampling limitations in Middle and Lower Slate Creek (e.g. few fish, unknown residency time, and unknown origination) will restrict data analyses, the data may provide

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
		additional information on metal bioavailability in Slate Creek.
ANADROMOUS FISH MONITORING		
Sherman Creek		
1. Estimate Pink Escapement 2. Estimate Pink Fry Outmigration 3. Estimate Egg-to-Fry Survival Rate 4. Quality of Spawning Substrate	NONE	Data collected 2005-2009 do not illustrate weak or strong parent year runs, and the estimated egg-to-fry survival was greater than typical survival rates except for the year 2005-2006 where <1% survival likely resulted from a severe natural storm event. No further baseline data collection is necessary. Ongoing monitoring is not warranted because salmonid reproduction depends on many natural physical and chemical factors. Other biomonitoring parameters that study aquatic productivity, such as benthic invertebrate density and diversity, are better indicators of overall stream health. In addition, water quality is strictly monitored in the creek and its tributaries because of Outfall 001.
Johnson Creek		
1. Estimate Pink Escapement 2. Estimate Pink Fry Outmigration 3. Estimate Egg-to-Fry	NONE	Data collected 2005 – 2009 illustrate weak odd and strong even year parent runs, and the estimated egg-to-fry survival was average or greater than typical survival rates.

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
Survival Rate 4. Quality of Spawning Substrate		No further baseline data collection is necessary. Ongoing monitoring is not warranted since no significant development or outfall occurs in the creek, and because salmonid reproduction depends on many natural physical and chemical factors.
Slate Creek		
1. Estimate Pink Escapement 2. Estimate Pink Fry Outmigration 3. Estimate Egg-to-Fry Survival Rate 4. Quality of Spawning Substrate	1. Quality of Spawning Substrate	Data collected 2005 – 2009 illustrate weak odd and strong even year parent runs, and the estimated egg-to-fry survival was average or greater than typical survival rates. No further baseline data collection is necessary. Ongoing monitoring is not warranted since no significant development or outfall occurs in the creek, and because salmonid reproduction depends on many natural physical and chemical factors.
AQUATIC VEGETATION		
Sherman Creek		
1. Middle Sherman Creek 2. Lower Sherman Creek	NONE	Visual vegetation surveys do not provide quantitative data for analysis. Periphyton biomass and community composition studies (below) will provide quantitative data to assess stream health.

Table 9-4: Summary of Receiving Water (Ambient) Monitoring Changes

2005 NPDES Monitoring Requirements	2011 APDES Monitoring Requirements	Justification for change
Johnson Creek		
1. Middle Johnson Creek 2. Lower Johnson Creek	NONE	Visual vegetation surveys do not provide quantitative data for analysis. Periphyton biomass and community composition studies (below) will provide quantitative data to assess stream health.
Slate Creek		
1. East Fork Slate Creek 2. Lower Slate Creek	NONE	Visual vegetation surveys do not provide quantitative data for analysis. Periphyton biomass and community composition studies (below) will provide quantitative data to assess stream health.
PERIPHYTON BIOMASS AND COMMUNITY COMPOSITION		
Sherman Creek		
NONE	1. Lower Sherman Creek	Periphyton is sensitive to changes in water chemistry. Monitoring biomass and community composition will provide another dataset to monitor stream health.
Slate Creek		
NONE	1. Inlet creek to Upper Slate Lake 2. East Fork Slate Creek 3. Lower Slate Creek 4. West Fork Slate Creek	Periphyton is sensitive to changes in water chemistry. Monitoring biomass and community composition will provide another dataset to monitor stream health.

9.3.1 Water Column Monitoring

The 2011 permit proposes requirements for monthly water column monitoring at locations in Sherman Creek, Slate Creek, and Johnson Creek. Sherman Creek and Slate Creek monitoring will provide data to assess the characteristics of the receiving stream below the discharges. Monitoring results from Johnson Creek will be used to determine whether the process area or mine infrastructure are affecting conditions in the creek. Water column monitoring will consist of analyzing samples for each of the parameters identified in Table 9-5. The monitoring results shall be included in a report and submitted with the discharge monitoring report for the month in which samples are collected, and all results must be included in the Annual Water Quality Monitoring Summary. Water column monitoring shall be performed: (1) in Sherman Creek above Outfall 001 at SH109, below Outfall 001 after effluent and ambient waters have mixed, at SH113, and at the mouth of the creek at SH105; (2) in East Fork Slate Creek at the inlet to the TTF diversion (ML-A or within the diversion pipeline prior to mixing with Outfall 002), at Site 5 (manganese only), at SLB upstream of the confluence with West Fork Slate Creek, and in Slate Creek at SLC downstream of the confluence of East and West Forks of Slate Creek; and (3) in Johnson Creek at points above the process area at JS2 and below the mill at JS5.

Table 9-5: Water Column Monitoring

Effluent Parameters	Units	Monitoring Frequency
Aluminum	μg/L	Monthly[a]
Arsenic	μg/L	Monthly
Cadmium	μg/L	Monthly
Color	c.u.	Monthly
Chromium	μg/L	Monthly
Copper	μg/L	Monthly
Iron	μg/L	Monthly
Lead	μg/L	Monthly
Manganese[a]	μg/L	Monthly[b]
Mercury	μg/L	Monthly
Nickel	μg/L	Monthly
Selenium	μg/L	Monthly
Silver	μg/L	Monthly
Zinc	μg/L	Monthly
Nitrate	mg/L	Monthly
Ammonia, Total	mg/L	Monthly
Total Dissolved Solids, TDS	mg/L	Monthly
Total Suspended Solids, TSS	mg/L	Monthly

Table 9-5: Water Column Monitoring

Effluent Parameters	Units	Monitoring Frequency
Turbidity	NTU	Monthly
Sulfates	mg/L	Monthly
Chlorides	mg/L	Monthly
Dissolved Oxygen	mg/L	Monthly
Conductivity	µmhos/cm	Monthly
Temperature	°C	Monthly
pH	s.u.	Monthly
Hardness[c]	mg/L	Monthly

Notes:

a. Monthly monitoring for manganese at Site 5 shall occur mid-way between monitoring times at SLB until permit limits are complied with.

b. Monitoring for manganese shall occur every 2 weeks at site SH113 until permit limits are complied with.

c. As required to establish hardness-based water quality-based effluent limits, hardness must also be monitoring weekly at an instream location after complete mixing of stream water and effluent below the discharge from Outfall 001.

9.3.2 Sediment Monitoring

The deposition of contaminants in sediments can result in the sediments being toxic to aquatic life and wildlife. The 2011 permit continues the monitoring in Sherman,, Johnson and Slate Creeks (see Table 9-4). One additional monitoring site has been added at the inlet creek to Upper Slate Lake.

Sediment monitoring will continue in Johnson Creek. Although construction activities have now ceased and the data collected from 2005-2009 did not show any adverse impacts from mine activities, monitoring will continue to ensure that there is no potential long term impact from non-point sources.

The permittee shall collect enough sediment from each location to conduct all of the required chemical and biological testing. Sediment samples will consist of the upper two centimeters of sediment and the maximum depth of the sampler penetration shall be four centimeters.

The parameters specified in Table 9-6 shall be monitored at each location using the listed analytical protocol (or equivalent) for each sediment sample.

Table 9-6: Sediment Monitoring Parameters and Analytical Methods

Parameter	Units	Preparation Method	Analysis Method	Sediment MDL [a]
Aluminum	mg/Kg	PSEP [b]	—	—
Arsenic	mg/Kg	PSEP [b]	GFAA [c]	2.5
Cadmium	mg/Kg	PSEP [b]	GFAA [c]	0.3
Chromium	mg/Kg	PSEP [b]	—	—
Copper	mg/Kg	PSEP [b]	ICP [d]	15.0
Lead	mg/Kg	PSEP [b]	ICP [d]	0.5
Mercury	mg/Kg	7471 [e]	7471 [e]	0.02
Nickel	mg/Kg	PSEP [b]	ICP [d]	2.5
Selenium	mg/Kg	PSEP [b]	—	—
Silver	mg/Kg	PSEP [b]	GFAA [c]	0.2
Zinc	mg/Kg	PSEP [b]	ICP [d]	15.0
Acute Toxicity	TU_c	see below	see below	NA
Total Solids	%	—	PSEP [a], pg 17	0.1
Total Volatile Solids	%	—	PSEP [a], pg 20	0.1
Total Organic[g] Carbon	%	—	PSEP [a, f], pg 23	0.1
Total Sulfides	mg/Kg	—	PSEP [a], pg 32	1
Grain Size		—	Modified ASTM with Hydrometer	NA

Note:

a. Dry weight basis
b. Recommended Protocols for Measuring Selected Environmental Variables, in Puget Sound Estuary Program, EPA 910/9-86-157, as updated by Washington Department of Ecology; Subsection: Metals in Puget Sound Water, Sediment, and Tissue Samples
c. Graphite Furnace Atomic Absorption Spectrometry, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986
d. Inductively Coupled Plasma Emission Spectrometry, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986
e. Mercury Digestion and Cold Vapor Atomic Absorption Spectrometry, SW-84
f. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. The Permittee shall sample the receiving water hardness downstream of the discharge.
g. Recommended Methods for Measuring TOC in Sediments, Kathryn Brandon-Cook Clarification Paper, Puget Sound Dredged Disposal Authority Annual Review, May, 1993.

Sediment samples will undergo acute toxicity testing to assess the relative toxicity of the sediment to representative aquatic life. The 2011 permit requires the following bioassays:

- Test Method 100.1: *Hyalella azteca* 10-day survival test for sediments
- Test Method 100.2: *Chironomus dilutus* 10-day survival test for sediments

Test methods, QA/QC, data recording, data analysis and calculations, and reporting shall be in accordance with *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, EPA/600/R-94/024.

Both *Hyalella azteca* and *Chironomus dilutus* are representative species for their respective classes of aquatic life.

9.3.3 Biological Testing and Monitoring of Aquatic Resources

9.3.3.1 Benthic Invertebrates

Benthic invertebrates were monitored in the 2005 permit in Sherman, Sweeny, Slate and Johnson Creeks. In the 2011 permit benthic invertebrate monitoring is not required in Sweeny Creek. The original plan for tailings was a dry stack in the vicinity of Sweeny Creek. The plans subsequently changed to tailings disposal in the TTF in the Slate Creek drainage on the other side of the mountain from Sweeny Creek. Benthic invertebrate sampling is no longer required in Sweeny Creek, because there is no mine activity or discharge to this creek, and reference data can be obtained from upstream sites in Slate and Sherman Creeks.

Benthic invertebrates are to be monitored in Johnson, Sherman and Slate Creeks at established sites using established methods. Monitoring in the 2005 permit for Slate Creek included one site in East Fork Slate Creek. The 2011 permit adds three new benthic invertebrate monitoring sites: Upper, Lower, and West Fork Slate Creeks. The inlet creek to Upper Slate Lake will provide reference data for invertebrate data collected downstream of mine operations; the Lower Slate Creek site will provide data in the anadromous reach; and the West Fork site will provide additional reference data where no development occurs.

Samples shall be collected using a 0.093 m^2 Surber sampler with a 300-micronmesh collection net, or similar. Collected samples will be placed in labeled plastic containers and preserved with 70 percent ethyl alcohol. Samples will be enumerated and identified to the genus level. Data reported will include the number of each genus per sample, density per unit area, and Shannon Diversity and Evenness indices.

Sampling shall be conducted annually during the month of July, prior to salmon spawning.

9.3.3.2 Resident Fish

Monitoring abundance and condition of resident Dolly Varden char in Sherman, Slate, and Johnson Creeks was required in the 2005 permit. In the 2011 permit no resident fish monitoring will be required in either Sherman or Johnson Creeks (see Table 9-4) as populations and fish condition appear healthy, and because of the low level of mine operations and development in each creek. Water quality monitoring is required in Sherman Creek to assure protection of aquatic species from the discharge from Outfall 001.

The 2005 permit required monitoring in Slate Creek at three locations: Upper, East Fork, and Lower Slate Creeks. The 2011 permit continues the monitoring in Upper and East Fork Slate Creeks. The 2011 permit does not require fish monitoring in Lower Slate Creek because Dolly Varden in Lower Slate Creek may be anadromous or from another stream in the Berners Bay estuary. For these reasons the fish may not be representative of resident fish living in the waterbody. Water quality monitoring will still ensure the protection of water quality for resident fish.

Abundance and condition will be monitored in established reaches using established methods. Data to be derived from these surveys include: 1) population estimates by species, habitat type, and stratum, and (2) condition factor by stratum.

Data will be collected so that statistical comparisons can be made with all data previously collected to monitor resident fish populations. Estimates will be made of the variability of the data, including minimum detectable differences between samples, as well as the precision of the 95^{th} percentile confidence interval.

The 2011 permit requires tissue analysis of resident Dolly Varden in the inlet creek to Upper Slate Lake, East Fork Slate Creek, and Lower Slate Creek to study metal concentrations and bioaccumulation rates of nine different elements. Sampling in Lower Slate Creek is required, despite the fact that sampled fish may have migrated to Slate Creek from another stream system, to study Dolly Varden tissue and bioaccumulation rates in all reaches potentially impacted by mine development or operations (fish collected in the inlet creek to Upper Slate Lake will serve as reference data). Tissue analysis is required in Slate Creek because of the discharge of treated water from the TTF; however, it is not required in Sherman or Johnson Creeks because benthic and invertebrate monitoring in Sherman Creek is sensitive enough to detect any changes and there is no discharge from the mine to Johnson Creek. Tissue analysis was not required in any creek in the 2005 permit.

Tissue analysis will determine the concentration of aluminum, arsenic, cadmium, copper, lead, mercury, nickel, selenium, silver, and zinc in tissues of resident Dolly Varden char. Six fish shall be collected annually from each reach during mid-July using non-destructive methods to avoid injuring fish not retained for analysis. Fish retained for analysis must measure greater than 90mm and less than 130mm to ensure adequate body size for testing and to avoid sampling anadromous or mature resident Dolly Varden.

Each fish retained shall be measured for total length and weighed for wet weight prior to tissue preparation. The fish shall then be dried and re-weighed for a dry weight measurement. The fish sample shall be prepared following EPA Method 200.2, where 0.3 g of dry tissue and 5 ml of nitric acid are heated to 85°C for four hours, cooled, and diluted to a volume of 22 ml. Levels of the elements shall be determined by Inductively Coupled Plasma/Mass spectrometer (ICP-MS).

9.3.3.3 **Anadromous Fish**

Monitoring pink salmon escapement, estimates of pink fry outmigration, estimates of pink egg-to-fry survival rates, and quality of spawning gravel was required in the 2005 permit in Sherman, Slate, and Johnson Creeks. The 2011 permit does not require this monitoring (See Table 9-4). In Sherman and Johnson Creeks, no further data collection is necessary because sufficient baseline escapement and outmigration data has been collected and salmonid reproduction depends on many natural physical and chemical factors

Monitoring out-migrating pink salmon fry under the 2005 permit resulted in substantial numbers of fish kills. Estimated egg-to-fry survival rates reported from 2006 to 2010 using the prescribed methods were generally much higher than expected for natural survival, another indicator that the methods do not result in accurate data. In addition, this study does not provide useful information to detect impacts from mining operations, unless a catastrophic event were to occur within a few months' time while eggs and alevins were in the gravel. Naturally, outmigration abundance is highly variable between years and correlated with natural stream conditions that may be unrelated to mine activities. Monitoring the quality of the spawning substrate will continue in Slate Creek in the 2011 permit.

9.3.3.4 **Aquatic Vegetation**

The 2005 permit required annual visual surveys of aquatic vegetation in Sherman, Slate, and Johnson Creeks to be conducted during summer months. This requirement is not in the 2011 permit as the surveys do not produce quantitative data to assess stream health, and downstream periphyton surveys on biomass concentration, which can be used to monitor stream health, are a better indicator. Periphyton surveys will replace the aquatic vegetation surveys in Sherman and Slate Creeks to provide additional data to monitor stream health.

9.3.3.5 **Periphyton Biomass and Community Composition**

The 2005 permit did not require monitoring periphyton biomass. It is now included in the 2011 permit to replace aquatic vegetation monitoring in Sherman and Slate Creeks. Periphyton is sensitive to changes in water chemistry, and monitoring biomass and community composition will provide another data set to assess stream health.

Ten periphyton samples from stream benthos shall be collected from each reach sampled for benthic invertebrates in Slate and Sherman Creeks. Samples shall be collected annually using methods established by Barbour et al (1999) during the period late-June through early August at low stream flow and not within three weeks after peak snowmelt/outfall discharge. Annual sampling timing will depend on snowmelt rate combined with discharge from Outfall 001 and 002, and sampling conditions should be consistent in all years to compare data between years, to the extent possible. Estimate periphyton biomass densities and proportions of mean chlorophyll a, b, and c concentrations shall be reported for each reach sampled. An analysis of stream flow four weeks prior to sampling shall also be included using a local stream gage data (e.g. Johnson Creek).

9.3.4 Purpose of biological monitoring

Biological data collection is for data analysis purposes to assess the overall health of the ecosystem. This data is used to determine whether any changes are necessary during the next permit reissuance, and may be modified in the next permit if necessary.

9.4 Analytical Detection Levels

The following table presents the methods, method detection levels, and minimum levels (MLs) for metals analyses for Outfalls 001 and 002 and water column monitoring for metals. When possible, the methods utilized to analyze metals should have Method Detection Limits below the permit limits.

Table 9-7: Methods Table

Parameter (Total or Total Recoverable)	Lowest AML limit of Outfall 001 or 002	Method [a, b]	Method Detection Limit (MDL)	Minimum Level of quantification (ML) or Practical Limit of quantification (PQL)
	Units µg/l		Units µg/l	Units µg/l
Aluminum	50	200.7	20	50
		200.8 (scan)	1.0	3.2
		200.8 (sims)	1.7	5.4
Arsenic	50	200.7	8	20
		200.8 (scan)	1.4	4.5
		200.8 (sims)	0.4	1.3
		200.9	0.5	1.6
Cadmium	0.1	200.8 (sims)	0.03	0.1
Copper	1.9	200.8 (scan)	0.5	1.6
		200.8 (sims)	0.2	0.6
Chromium	8	200.7	4.0	10

Table 9-7: Methods Table

Parameter (Total or Total Recoverable)	Lowest AML limit of Outfall 001 or 002	Method [a, b]	Method Detection Limit (MDL)	Minimum Level of quantification (ML) or Practical Limit of quantification (PQL)
		200.8 (scan)	0.9	2.9
		200.8 (sims)	0.08	0.25
		200.9	0.1	0.3
Iron	690	200.7	30	100
Lead	0.5	200.8 (sims)	0.05	0.16
Manganese	42	200.7	1	10
		200.8 (scan)	0.1	2.9
		200.8 (sims)	0.02	0.25
		200.9	0.3	0.3
Mercury	0.01	1631	0.0002	0.0005
Nickel	13	200.8 (scan)	0.5	1.6
		200.8 (sims)	0.06	0.19
		200.9	0.6	1.9
Selenium	4.0	200.9	0.6	1.9
Zinc	18	200.7	2	5
		200.8 (scan)	1.8	5.7
		200.8 (sims)	0.1	0.3

Note:

a. There may also be methods for individual parameters that measure to the necessary levels. Any method approved in 40 CFR Part 136 may be utilized.

b. Method 200.8 has not been included in 40 CFR Part 136 but has been proposed for inclusion. The permittee may request the use of this method through the Alternate Test Procedures (ATP) process outlined in 40 CFR §136.4.

10.0 Best Management Practices

In accordance with AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed of. The 2011 permit requires the permittee to develop a Best Management Practices (BMP) Plan in order to prevent or minimize the potential for the release of pollutants to waters and lands of the State of Alaska through facility runoff, spillage or leaks, or erosion. The 2011 permit contains certain BMP conditions that must be included in the BMP Plan.

The intent of the BMP Plan is to recognize the hazardous nature of various substances used and produced by the facility and the way such substances may be accidentally dispersed. The BMP Plan should incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990, 42 U.S.C. 13101. The BMP Plan must be amended whenever there is a change in the facility or in the operation of the facility that materially increases the potential for an increased discharge of pollutants. The existing BMP Plan is dated March 2009. The permittee must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility which materially increases the generation of pollutants or their release or potential release to surface waters. The Plan must be kept on site and made available to the Department upon request.

11.0 Additional Permit Provisions

Appendix A of the 2011 permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

11.1 Manganese Compliance Schedule

The 2005 permit did not contain limits for manganese but did require monitoring and reporting. Data subsequent to the 2005 permit has shown manganese levels exceeding water quality standards. Once mining commenced in July 2010, the manganese levels rose significantly with the exception of a decrease in December 2010. Manganese water quality criteria are established for human health and irrigation, but there are none for aquatic life. There are no known human drinking or consumption of aquatic life instances, nor irrigation uses in Sherman or Slate Creeks. Accordingly ADEC approves and incorporates into the permit the schedule below. Since neither the mine water nor tailings treatment facility treatment plants were designed to remove manganese, the permittee is required to come into compliance with the 2011 permit limits according to following compliance scheduled.

Action	**Completion Date (months after permit effective date)**
a. Compliance alternatives analysis	1 month
b. Treatability tests	3 months
c. Select compliance alternative	4 months
d. Preliminary design report	8 months
e. Final design report and drawings	12 months
f. Construction	18 months
g. Comply with manganese limits	20 months

12.0 Other Legal Requirements

12.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) Marine Fisheries and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. EPA contacted the USFWS and an August 6, 2010 email from USFWS to EPA states, "There are no endangered or threatened species under the jurisdiction of the Fish and Wildlife Service in the project area." There are no discharges to marine waters, so EPA had no reason to consult with NOAA. A copy of the 2011 permit and fact sheet will be provided to NOAA and USF&W during the public comment period.

12.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH.

There are no marine discharges. The affected reaches of the stream near the mine are inaccessible to anadromous fish due to steep terrain and are not included on the maps in

ADF&G's anadromous fish catalog. ADF&G has provided extensive input on the biological monitoring program (Permit Part 1.5) to ensure the protection of all affected creeks.

12.3 Alaska State Consistency Determination

The State of Alaska, Department of Natural Resources (ADNR), Division of Coastal and Ocean Management (DCOM) issued a Final Consistency Determination on April 25, 2005 that determined that the activity is consistent with the approved Alaska Coastal Management Program (ACMP). Because the applicant did not propose any modification of the project, no additional ACMP process was required for this project. For more information concerning this review, please contact the State of Alaska, ADNR- DCOM.

12.4 Permit Expiration

This permit will expire five years from the effective date of the permit. The permit maybe administratively extended under 18 AAC 83.155 if all requirements of this regulation are met.

13.0 References

a. 40 CFR 136 - Guidelines establishing test procedures for the analysis of pollutants.

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

c. Barbour, M.T, J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish, second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

d. CMRI (Colorado Minerals Research Institute). 1998. Kensington Mine Flotation and Leach Studies

e. Coeur Alaska, Inc. 2010. Re-application package

f. DEC. 2003. 18 AAC 72, the Alaska Department of Environmental Conservation's regulations for Wastewater Disposal.

g. DEC. 2008. 18 AAC 83, Alaska Department of Environmental Conservation's regulations for the Alaska Pollutant Discharge Elimination System, October 31, 2008.

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r. GOLDER 2. Golder Associates, January 18, 2011. Technical Memorandum. East Fork Slate Creek Water Quality is Protected by Two-Tiered Effluent Limitations for Hardness-Based Metals at Outfall 002 in Draft APDES Individual Permit No. AK0050571.

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APPENDIX A FACILITY INFORMATION

Facility Name and Location		
Name:	Coeur Alaska, Inc's: Kensington Gold Mine	
APDES ID Number:	AK-005057	
Location: Mailing Address:	Approximately 45 miles north of Juneau, Alaska Kensington Gold Mine 3031 Clinton Dr., suite 200 Juneau, AK 98052	
Facility Background:	The facility's previous permit was effective September 1st, 2005. The current permit application was received February 24, 2010.	
Facility Information		
Treatment Train:	Outfall 001: flocculation, settling, multi-media filtration and micro filtration, nitrate reduction. Outfall 002: chemical addition, precipitation, multi-media filtration and carbon filtration.	
Design Flow:	Outfall 001: 3000 gpm. Outfall 002: 1500 gpm.	
Existing Flow:	Outfall 001: 1500 gpm. Outfall 002: 1100 gpm.	
Months when Discharge Occurs:	All year	
Outfall 001 Location: Outfall 002 Location:	Latitude: 58° 52' x04" North Latitude: 58° 49' 58" North	Longitude: 135° x06' x55" West Longitude: 134° 57' 58" West
Receiving Water Body Information		
Receiving Water Body:	Outfall 001: Sherman Creek / Lynn Canal. Outfall 002 Slate Creek / Berners Bay	
Beneficial Uses:	All uses	

Figure 1: Kensington Gold Mine Map

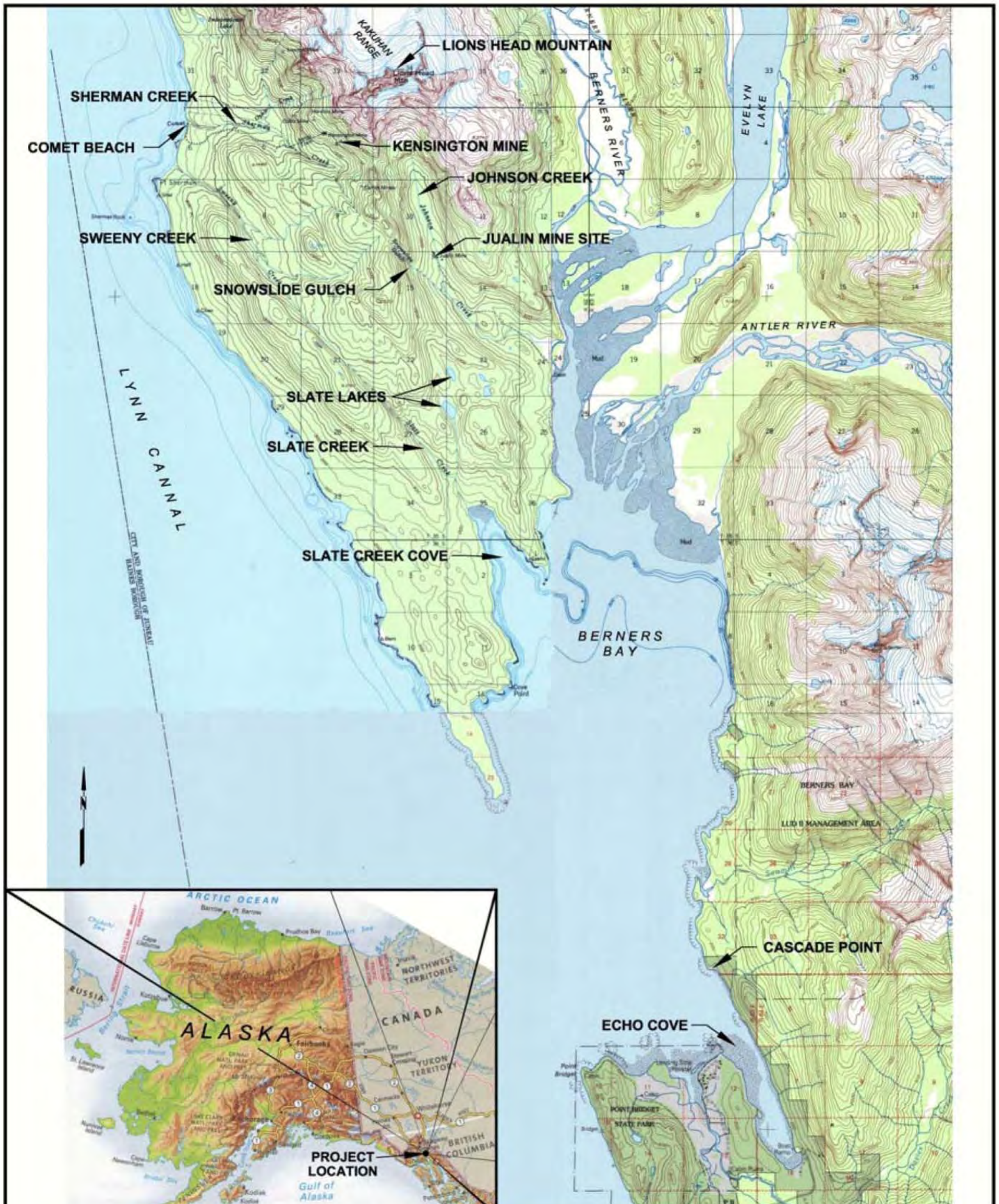


FIGURE 1.2
GENERAL PROJECT AREA

Figure 2: Mine Water Treatment Plant Process Flow Diagram

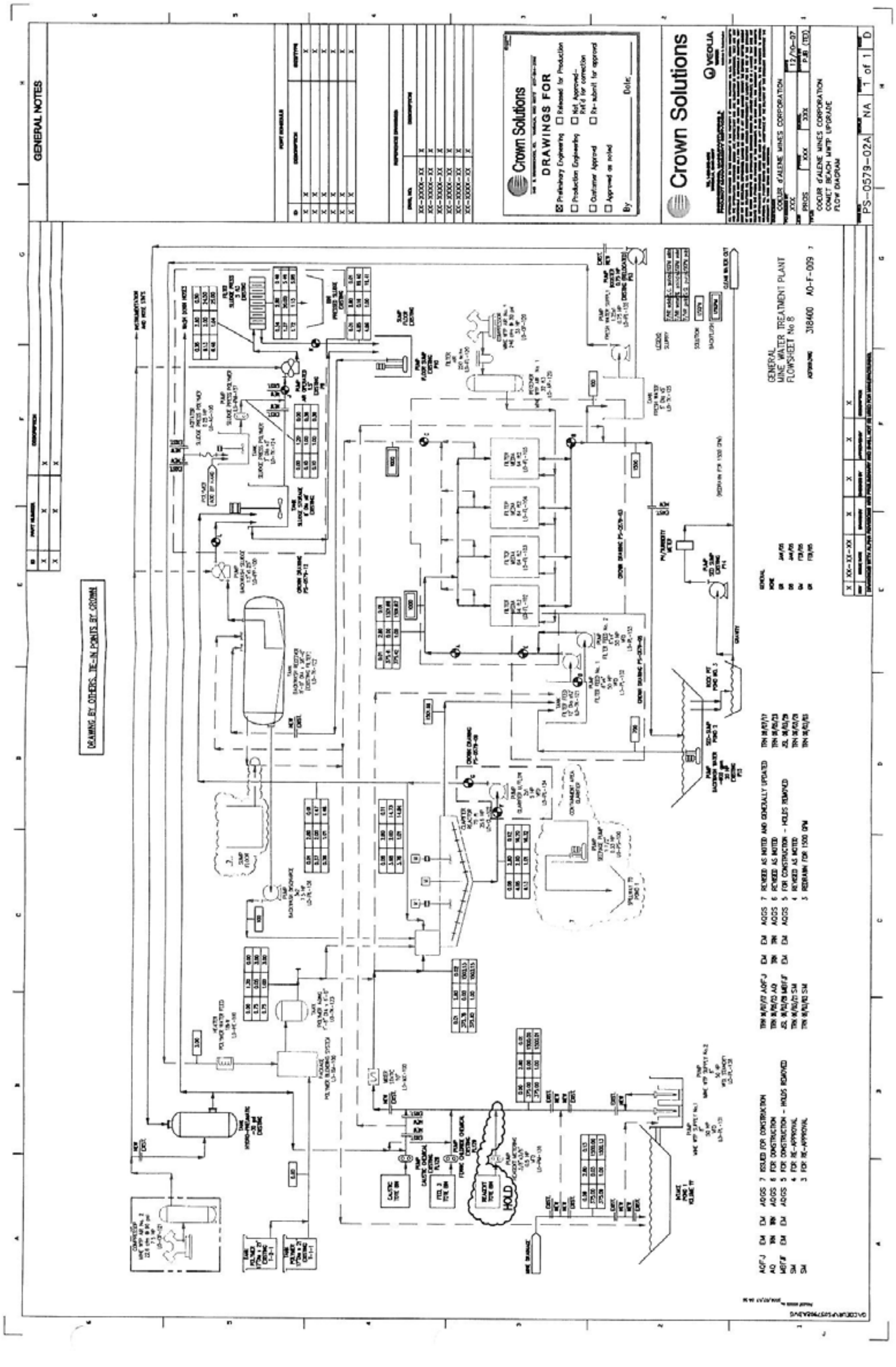
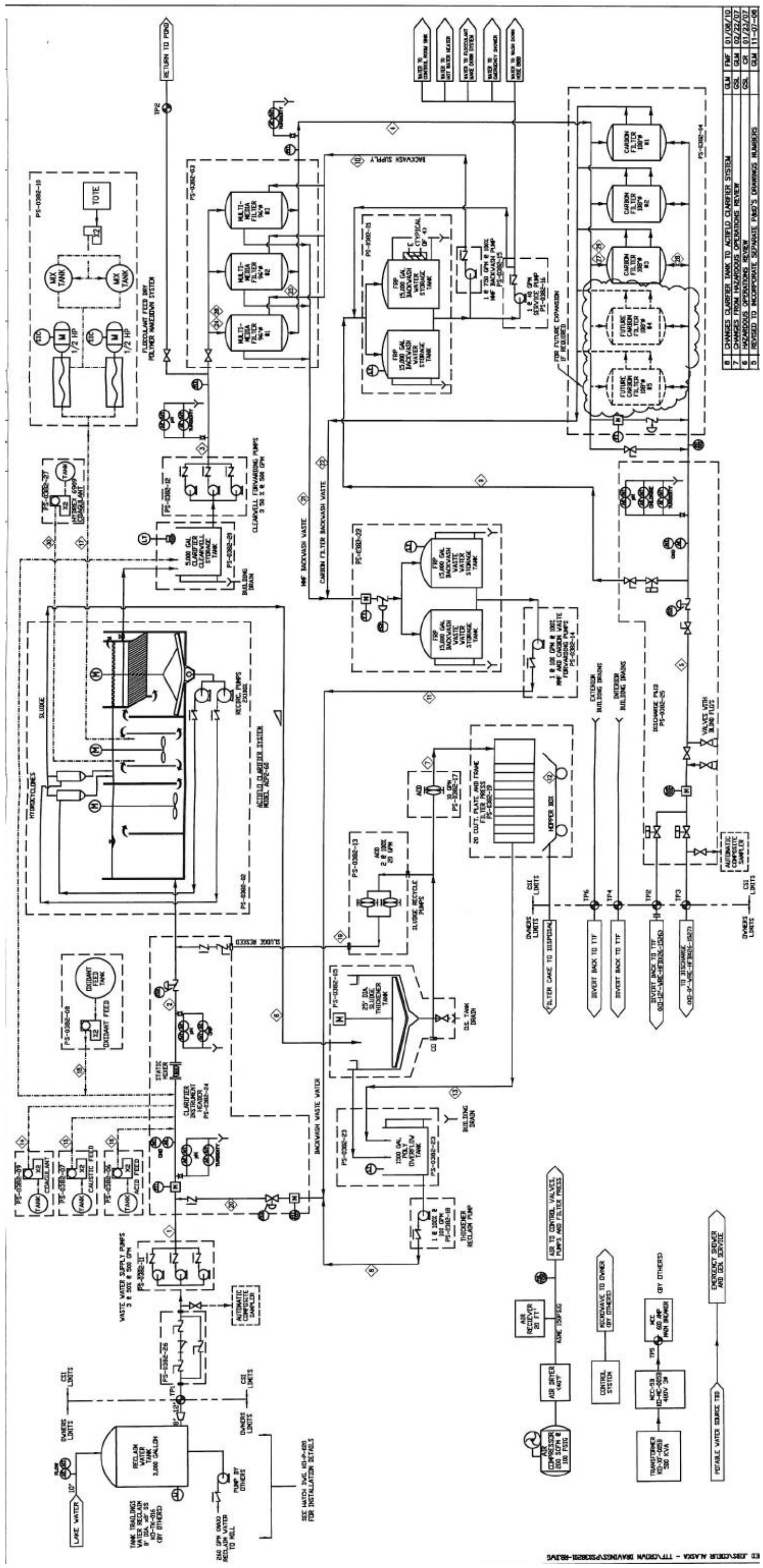


Figure 3: Tailings Treatment Facility Process Flow Diagram



APPENDIX B Basis for Effluent Limits – Outfalls 001 and 002

I. Statutory and Regulatory Basis For Limits

The Clean Water Act (CWA) provides the basis for effluent limits and other conditions in the 2011 permit. ADEC evaluates the discharges with respect to the CWA and 18 AAC 83 to determine which conditions to include in the 2011 permit.

This section discusses the basis for and the development of metals, ammonia, pH, total dissolved solids, and total suspended solids limitations in the draft permit. A determination is made of whether Technology-Based Effluent Limits (TBELs) or Water Quality-based Effluent Limits (WQBELs) must be incorporated into the permit. If TBELs exceed water quality standards, then ADEC must include WQBELs in the permit. The 2011 permit limits will reflect whichever requirements (technology-based or water quality-based) limits are more stringent. The discussions describe the development of:

1) technology-based effluent limits (Section III)
2) water quality-based effluents limits (Section IV)
3) reasonable potential (RP) to exceed water quality standards (Section V) and
4) a summary of the effluent limits developed for the draft permit (Section VI) for
    a) Outfall 001
    b) Outfall 002

II. Procedure to determine permit limits

The following steps are taken when determining permit limits. These steps are described in detail in later sections.

1) Analyze monitoring data and remove outliers (if any).
2) Determine if there are a sufficient number of valid data points (i.e. greater than 10).
3) For greater than 10 data points, calculate individual coefficients of variation (CVs).
4) Create a table showing TBELs and WQBELs.
5) Determine if there is a reasonable potential (RP) to exceed the water quality criteria (WQC) (which varies with receiving water hardness for some metals).
6) Calculate maximum daily limits (MDLs) and average monthly limits (AMLs) for WQBELs where pollutants show a potential to exceed the water quality criteria. These limits are determined using a) the waste load allocations (WLAs), which are the acute and chronic WQC when no mixing zone is authorized; b) the long term averages (LTAs), which are derived from the CV, WLAs, and statistical modification of the WLA such that there is probability of 1% of exceeding the WLA; and c) multipliers that allow for a 1% chance of an effluent exceeding a calculated daily maximum value and a 5% chance of an effluent exceeding a calculated average monthly value.
7) Select the lowest of either the technology-based or water-quality based limits for the permit.

III. Technology-Based Effluent Limits

Section 301(b) of the CWA requires industrial dischargers to meet technology-based effluent limitation guidelines (ELG's) established by EPA. These are enforceable through their incorporation into an APDES permit. For dischargers in industrial categories for which EPA has not yet issued an ELG, and for types of discharges not covered by an applicable ELGs, best professional judgment (BPJ) is used to establish technology-based effluent limits. The 1972 amendments to the CWA established a two-step approach for imposing technology-based controls. In the first phase, industrial dischargers were required to meet a level of pollutant control based on the best practicable control technology currently available (BPT). The second level of pollutant control was based on the best available technology economically achievable (BAT). In 1977, enactment of Section 301(b)(2)(E) of the CWA allowed the application of best conventional pollutant control technology (BCT) to supplement BPT standards for conventional pollutants with cost effectiveness constraints on incremental technology requirements that exceed BPT. The BPT/BAT/BCT system of standards does not apply to a new source, which is defined by EPA as a source, the construction of which is commenced after the publication of proposed regulations prescribing a standard of performance, which will be applicable to the source. Direct dischargers that are new sources must meet new source performance standards (NSPS), which are based on the best available demonstrated control technology.

At 40 CFR Part 440, EPA has established ELGs for the Ore Mining and Dressing Point Source Category. Subpart J of these guidelines, titled *Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory*, became effective on December 3, 1982. The ELG is applicable to mines that produce gold bearing ores from open-pit or underground operations and to mills that use the froth-flotation process, alone or in conjunction with other processes, for the beneficiation of gold. At 40 CFR §440.104, New Source Performance Standards are used to provide the technology-based effluent limitations for copper, zinc, lead, mercury, cadmium, pH and total suspended solids (TSS).

At the Kensington Gold Mine, discharge of mine drainage through Outfall 001 to Sherman Creek was previously permitted based on the NSPS. Discharge through Outfall 002 to East Fork Slate Creek is a new discharge and is subject to the NSPS. These technology-based NSPS are presented in Table B-13-1

Table B-13-1: NSPS for Mine Drainage

Pollutant	Daily Maximum Concentration (mg/L)	Average Monthly Concentration (mg/L)
Copper	fin0.3	0.15
Zinc	1.5	0.75
Lead	0.6	0.3
Mercury	0.002	0.001
Cadmium	0.1	0.05
pH	6.0 to 9.0 s.u.	
TSS	30	20

NSPS at 40 CFR §440.104(b) also prohibits the discharge of process wastewaters from mills that use the froth-flotation process for the beneficiation of gold, except in two circumstances:

a) Where the annual precipitation falling on the treatment facility and on the drainage area contributing surface runoff to the treatment facility exceeds evaporation. Under this situation the facility may discharge the difference between precipitation to the treatment facility and evaporation, subject to the pollutant limits in Table B-13-1 or,
b) Where contaminant build up in water recycled through the mill causes interference with the ore recovery process, and the interference cannot be eliminated through appropriate treatment of the recycled water. Under this situation the facility may discharge an amount necessary to correct the interference problem, after installation of appropriate treatment. Such a discharge would also be subject to the pollutant limits of Table B-13-1.

With the recycle stream and other “losses” such as infiltration, evaporation, and water retained in the tailings, discharges through Outfall 002 at the Kensington Mine are equivalent to the natural flow into the TTF and are subject to the NSPS of Table B-13-1, meeting the first exception, above.

IV. Water Quality-Based Effluent Limits Evaluation

Section 301(b)(1)(C) of the CWA and state regulations at 18 AAC 83.435 require permits to include limits for all pollutants or parameters which are or may be discharged at a level which will cause or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality. If WQBELs are necessary, they must be stringent enough to ensure that WQS are met, and they must be consistent with any available waste load allocation. For pollutants with technology-based effluent limits, ADEC must also determine if the technology-based effluent limits will be protective of the corresponding water quality criteria.

The regulations require that this evaluation be made using procedures which account for existing controls on point and non-point 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 WQS are met and must be consistent with any available wasteload allocation.

When evaluating the effluent to determine if WQBELs are needed based on chemical-specific numeric criteria, a projection of the effluent water concentration for each pollutant of concern is made. The chemical-specific concentration of the effluent and ambient water are factors used to project the receiving water concentration. If the projected concentration of the effluent exceeds the numeric criterion for a specific chemical, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable WQS, and a WQBEL is required.

ADEC must also consider the State's Antidegradation Policy, at 18 AAC 70.015 and discussed in Section 8.0.

To determine appropriate WQBELs, ADEC uses the following general approach.

- Determine the appropriate water quality criteria,
- Develop the wasteload allocations (WLA), and
- Establish effluent limits.

The following sections provide detailed discussion of each step. Sections V.a and V.b show the derivation of specific WQBELs for Outfalls 001 and 002, respectively.

a. Water Quality Criteria

The first step in developing WQBELs is to determine the applicable water quality criteria in the Alaska Administrative Code at 18 AAC 70. Applicable criteria are based on the beneficial uses of the receiving water. The beneficial uses for East Fork Slate Creek and Sherman Creek are the freshwater use classes (1) (A, B, and C), as established at 18AAC 70.050 - (A) water supply (drinking, culinary, and food processing; agriculture, including irrigation and stock watering; aquaculture; and industrial), (B) water recreation (contact and secondary), and (C) growth and propagation of fish, shellfish, other aquatic life, and wildlife. To protect all uses, permit limits are established based on the most stringent of the water quality criteria applicable to those uses.

Effluent limits for metals must be expressed as total recoverable concentrations (18 AAC 83.525); therefore, metals criteria in the APDES permit are expressed as total metal concentrations. Also, some metals standards are hardness-based. In calculating these standards, an increase in hardness results in higher criteria. This is because at a higher hardness, these metals are less toxic. Permit limits for the 2011 permit are determined at hardnesses of 25, 30, 50, 100 and 200 mg/L $CaCO_3$. Outfall 001 the hardnesses used are 50 for ambient water ranging from 50-100 mg/L, 100 for water ranging from 100-200 mg/L, and 200 for water at 200 mg/L or higher. For Outfall 002 a hardnesses of 25 and 30 mg/L $CaCO_3$ are used, which is based on the 5th-percentile hardness of the historic receiving water values in Slate Creek. The 5^{th} percentile value of 25 mg/L was derived from background data for the 2005 permit, and this limit is retained in the 2011 permit. A 5^{th} percentile value of 30 mg/L was calculated from data at downstream site SLB because this is where the effluent is mixed with Upper Slate Lake water and where the first aquatic life occurs. For this station data from 2005 to 2009 was used to determine the 5th percentile hardness. Formulas for deriving hardness dependant criteria are presented in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2008).

The standards are provided in Table B-13-2 and Table B-13-3

Table B-13-2: Dissolved WQS converted to Total or Total Recoverable (TR)

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality Standard (TR)[a]	
			Acute	Chronic
Aluminum	N/A	µg/L	750	87
Ammonia – Sherman Creek	N/A	mg/L	5.62	2.43
Ammonia – Slate Creek	N/A	mg/L	4.64	2.1
Arsenic	N/A	µg/L	10	10
Cadmium	25	µg/L	0.52	0.1
	30	µg/L	0.63	0.11
	50	µg/L	1.1	0.2
	100	µg/L	2.1	0.3
	200	µg/L	4.3	0.4
Chromium VI	N/A	µg/L	16	11
Copper	25	µg/L	3.79	2.85
	30	µg/L	4.50	3.33
	50	µg/L	7.3	5.2
	100	µg/L	14	9.3
	200	µg/L	26.9	16.9
Iron	N/A	µg/L	None	1000
Lead	25	µg/L	14	0.54
	30	µg/L	17.63	0.69
	50	µg/L	33.8	1.3
	100	µg/L	81.6	3.2
	200	µg/L	197.3	7.7
Manganese[b]	N/A	µg/L	-	_
Mercury	N/A	µg/L	2.4	0.012
Nickel	25	µg/L	145.2	16.1
	30	µg/L	169	18.8
	50	µg/L	261	29
	100	µg/L	469	52
	200	µg/L	843	94

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality Standard (TR)[a]	
			Acute	Chronic
Selenium	N/A	µg/L	20	5
Silver	25	µg/L	0.37	None
	30	µg/L	0.51	None
	50	µg/L	1.23	None
	100	µg/L	4.1	None
	200	µg/L	13.4	None
Zinc	25	µg/L	37	37
	30	µg/L	43.2	43.2
	50	µg/L	66.6	66.6
	100	µg/L	120	120
	200	µg/L	216	216

Note: a. TR = Total Recoverable
b. Manganese has a Human Health criterion of 50 µg/L.

Table B-13-3: Summary of Water Quality Criteria for Non-toxic Pollutants and Pollutant Characteristics Applicable to Discharges to East Fork Slate Creek and Sherman Creek [a]

Pollutant	Most Stringent Applicable Water Quality Criteria
TDS	TDS may not exceed 500 mg/L in East Fork Slate Creek and 1000 mg/L in Sherman Creek below the discharge of the Kensington Mine adit drainage to tidewater.
Sulfate	Sulfates may not exceed 250 mg/L, although site–specific criteria for Sherman Creek at 18 AAC 70.236(b) limit sulfates associated with magnesium and sodium to 200 mg/L in Sherman Creek.
pH	May not be less than 6.5 or greater than 8.5 and may not vary more than 0.5 pH units from natural conditions
Residues	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for use; cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines
Sediment	No measurable increase in concentration of settleable solids above natural conditions, as measured by the volumetric Imhoff cone method.
Turbidity	May not exceed 5 nephelometric turbidity units (NTUs) above natural conditions when the natural turbidity is 50 NTU or less

Pollutant	Most Stringent Applicable Water Quality Criteria
Nitrate	10 mg/L as N – primary MCL for drinking water
Whole Effluent Toxicity	An effluent may not impart chronic toxicity to aquatic organisms
Note: a. From 18 AAC 70.020(b), except site-specific criteria for Sherman Creek established at 18 AAC 70.236(b) and whole effluent toxicity standards established at 18 AAC 70.030(a).	

V. Reasonable Potential Analysis

A determination is made to see whether technology-based limits or effluent maximum values multiplied by "reasonable potential multiplier (RPM)" are greater than the water quality criteria. If greater, then the more stringent of the technology-based or water quality based criterion is used to determine permit limits. All pollutants in 40 CFR §440.104 must be included in the reasonable potential analysis.

Outfall 001 data from September 2005 to October 2009 was used in the analysis, which showed there was no potential for arsenic, chromium, mercury, nickel, selenium or silver to exceed water quality criteria at the point of discharge. However, the mine was not in full operation during this period; therefore, some of the metals retain limits and some have to only be monitored in the 2011 permit.

For Outfall 002, the predicted water quality, however, is based on limited analysis of tailings slurry. ADEC, therefore, determined that it is appropriate to establish limits for all of the same pollutants addressed at Outfall 001. The permit limits in the 2005 permit were determined based on a hardness of 25 mg/l. For the 2011 permit new data has enabled an additional set of limits for when the receiving water hardness at monitoring location SLB, downstream of the outfall, exceeds 30 mg/l. Accordingly the 2011 permit has limits determined at 25 mg/l hardness for receiving water hardness below 30 mg/l, and limits determined at 30 mg/l for all receiving water hardnesses equal to or greater than 30 mg/l. Unlike Outfall 001, chromium and silver limits remain in the 2011 permit for Outfall 002

VI. Wasteload Allocation (WLA) Development

WLAs must be developed to establish the allowable loadings of each pollutant that may be discharged without causing or contributing to exceedances of WQS in the receiving waters. WLAs are typically established in three ways

- based on a mixing zone, or
- based on total maximum daily load (TMDL), or
- by determining the end-of-pipe WLA that will allow attainment of applicable water quality criteria.

The permittee has not applied for mixing zones and no TMDLs have been developed for East Fork Slate Creek or Sherman Creek. Neither creek is included on the State's current CWA

§303(d) list of impaired waters. The acute and chronic water quality criteria are therefore applied at the end-of-pipe and become the WLAs.

Water quality standards are based on different criteria which are applicable to different time frames; therefore, it is not possible to compare the WQS or the WLAs directly to determine which results in the most stringent limits. For example, acute criteria are applied as a one-hour average, chronic criteria are applied as a four-day average, and ammonia is based on a 30-day period.

A WLA addresses variability in effluent quality and is the single level of receiving water quality necessary to provide protection against long-term or chronic effects. A WLA is calculated using the following mass balance equation where C is the applicable water quality criterion, B is the background or ambient concentration of the pollutant in the receiving water, and D is the available dilution.

$$WLA = C + D\,[C - B] \quad (1)$$

In the circumstances where no credit is allowed for dilution, as at Outfalls 001 and 002, D equals zero (no mixing zone), and the WLA for each pollutant is set equal to the most stringent applicable water quality criteria, assuring that the discharge will not contribute to an exceedance of that standard.

VII. Long Term Average (LTA)

To allow for comparison, the acute and chronic WLAs are statistically converted to long term average (LTA) concentrations. Long term average values are determined using coefficients of variation (CV). ADEC used a 99th percentile for calculating the LTA for this permit development, as recommended in EPA's *Technical Support Document for Water Quality-Based Toxics Control* (TSD). For Outfall 001 the CV varies for each pollutant because it was determined from actual effluent data; see Table B-13-4. For Outfall 002 the CV is the default value from the TSD of 0.6, because there has been no discharge from this outfall and no actual effluent data. WLAs and LTAs for Outfall 001 are shown in Table B-13-5 and for Outfall 002 in Table B-13-6.

For each WLA based on an aquatic life criterion, the acute and chronic LTAs are calculated using the following equations from the TSD.

Chronic: $LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$

Where for the chronic LTA

$$\sigma^2 = \ln\left[\frac{CV^2}{4} + 1\right]$$

Acute: $LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$

Where for the acute LTA $\sigma^2 = \ln(CV^2 + 1)$

and for the acute and chronic LTA

z = 2.326 for the 99th percentile occurrence probability

Table B-13-4: Outfall 001 CVs

Parameter	CV		Parameter	CV
Aluminum	1.95		Lead	1.98
Ammonia	1.47		Manganese	0.57
Arsenic	0.12		Mercury	0.82
Cadmium	1.20		Nickel	0.97
Chromium	0.04		Selenium	0.58
Copper	1.55		Silver	0.99
Iron	1.20		Zinc	0.80

Table B-13-5: WLAs and LTAs for Outfall 001

Pollutant	Receiving Water Hardness [a]	WLA		LTA	
		Acute	Chronic	Acute	Chronic
Aluminum	N/A	750 µg/L	87 µg/L	89	18
Cadmium	50 mg/L	1.1 µg/L	0.2 µg/L	0.18	0.05
	100 mg/L	2.1 µg/L	0.3 µg/L	0.37	0.09
	200 mg/L	4.3 µg/L	0.4 µg/L	0.75	0.14
Copper	50 mg/L	7.3 µg/L	5.2 µg/L	1.0	1.32
	100 mg/L	14 µg/L	9.3 µg/L	2.0	2.4
	200 mg/L	27 µg/L	17 µg/L	3.8	4.32
Chromium	No RP therefore no WLA or LTA				
Iron	N/A	—	1.0 mg/L	—	0.32
Lead	50 mg/L	34 µg/L	1.3 µg/L	4.0	0.27
	100 mg/L	82 µg/L	3.2 µg/L	9.6	0.66
	200 mg/L	197 µg/L	7.7 µg/L	23.2	1.6
Manganese	N/A	—	50 µg/L	—	27.2
Mercury	N/A	2.4 µg/l	0.012 µg/l	0.6	0.005
Nickel	50 mg/L	261 µg/L	29 µg/L	54.6	11.1
	100 mg/L	469 µg/L	52 µg/L	98.2	19.9
	200 mg/L	843 µg/L	94 µg/L	176	35.7
Selenium	No RP therefore no WLA or LTA				
Silver	No RP therefore no WLA or LTA				
Zinc	50 mg/L	67 µg/L	67 µg/L	16.7	29.4
	100 mg/L	120 µg/L	120 µg/L	30.0	52.82
	200 mg/L	216 µg/L	216 µg/L	54.0	95.0
Ammonia	N/A	5.62 mg-N/L	2.43 mg-N/L	1.804	1.282

Note:
a. N/A means the parameter is not hardness dependent.

Table B-13-6: WLAs and LTAs for Outfall 002

Pollutant	Receiving Water Hardness [a]	WLA		LTA	
		Acute	Chronic	Acute	Chronic
Aluminum	N/A	750 µg/L	87 µg/L	241	46
Cadmium	25 mg/L	0.52 µg/L	0.1 µg/L	0.17	0.05
	30 mg/L	0.6 µg/L	0.1 µg/L	0.2	0.06
Chromium VI	N/A	16 µg/L	11 µg/L	5.1	5.8
Copper	25 mg/L	3.8 µg/L	2.9 µg/L	1.2	1.5
	30 mg/L	4.5 µg/L	3.3 µg/L	1.4	1.76
Iron	N/A	—	1.0 mg/L	—	0.53
Lead	25 mg/L	14 µg/L	0.54 µg/L	4.5	0.29
	30 mg/L	17.6 µg/L	0.7 µg/L	5.7	0.36
Manganese	N/A	—	50 µg/L	—	26.4
Mercury	N/A	2.4 µg/l	0.012 µg/l	0.8	0.006
Nickel	25 mg/L	145 µg/L	16 µg/L	46.6	8.52
	30 mg/L	169.4 µg/L	18.8 µg/L	54.4	9.94
Selenium	N/A	20 µg/L	5 µg/L	6.4 µg/L	2.6
Silver	25 mg/L	0.37 µg/L	—	0.12	—
	30 mg/L	0.51 µg/L	-	0.16	-
Zinc	25 mg/L	37 µg/L	37 µg/L	11.9	19.5
	30 mg/L	43.2 µg/L	43.2 µg/L	13.9	22.78
Ammonia	N/A	4.64 mg-N/L	2.1 mg-N/L	1.49	1.108

Note:
a. N/A means Not Applicable – the parameter is not hardness dependent.

Acute and chronic LTAs are compared, and the most stringent is used to develop the daily maximum and monthly average permit limits.

VIII. Permit Limit Derivation

The LTA concentration is calculated for each WLA and compared. The most stringent LTA concentration is then used to develop the permit maximum daily limit (MDL) and average monthly limit (AML). The MDL is based on the CV of the data and the probability basis while the AML is dependent upon these two variables and the monitoring frequency. As recommended in the TSD, ADEC used a probability basis of 95 percent for the AML calculation and 99 percent for the MDL calculation. The MDL and AML are calculated using the following equations from the TSD (Table 5-2 of the TSD may also be used).

Using equations from the TSD, the MDL and the AML are calculated as follows.

$\boldsymbol{MDL} = LTA \times e^{[z\sigma - 0.5\sigma^2]}$

= LTA x 3.115

where, $\sigma^2 = \ln(\mathrm{CV}^2 + 1)$

z = 2.326 for the 99th percentile probability basis

CV varies per parameter for Outfall 001

and, $\boldsymbol{AML} = LTA \times e^{[z\sigma_n - 0.5\sigma_n^2]}$

where, $\sigma_n^2 = \ln\left(\frac{CV^2}{n} + 1\right)$

z = 1.645 for the 95th percentile probability basis

n = number of sampling events required per month (here, n is set equal to 4, as recommended by the TSD whenever 4 or fewer samples per month are collected)

CV varies per parameter for Outfall 001

For Outfall 001 the AML = LTA x 1.553

Example for cadmium for Outfall 001 at a hardness of 50 mg/l, the chronic LTA is the lowest LTA (=0.05):

For the MDL, $\sigma^2 = \ln(\mathrm{CV}^2 + 1)$= ln(1.2*1.2+1) = 0.89, σ = 0.94

$$MDL = LTA \times e^{[z\sigma - 0.5\sigma^2]}$$

MDL = 0.05 * exp[2.326*0.94 – 0.5*0.89] = 0.28 µg/L

For the AML, $\sigma_n^2 = \ln\left(\frac{CV^2}{n} + 1\right)$ = ln{[(1.2*1.2)^2 / 4]+1} = 0.42, σ = 0.65

$$AML = LTA \times e^{[z\sigma_n - 0.5\sigma_n^2]}$$

AML = 0.05*exp[1.645*0.65-0.5*0.42] = 0.118 µg/L

IX. Effluent Limits – Outfalls 001 and 002

Table B-13-7 and Table B-13-8 provide a summary of the effluent limits applicable to Outfalls 001 and 002 in the 2011 permit. Table B-13-7 includes the “non-metal” pollutants (except ammonia) while Table B-13-8 includes limits for ammonia and metals.

Table B-13-7: Proposed Effluent Limits (Non-Metals Except Ammonia)

Parameter	Units	MDL	AML
pH	s.u.	6.5 – 8.5	
TSS	mg/L	30	20
TDS (Outfall 001)	mg/L	1,000	1,000
TDS (Outfall 002)	mg/L	500	500
Turbidity	NTUs	See Note a.	
Sulfate [b] (Outfall 001)	mg/L	200	200
Sulfate (Outfall 002)	mg/L	250	250
Nitrate	mg/L as N	20	10
Chronic Toxicity	TU_c	1.6	1.1

Note:

a. The turbidity must not be more than 5 NTUs greater than the background levels in samples taken from Sherman Creek for Outfall 001 and the influent to the TTF diversion pipeline for Outfall 002, within a reasonable time of effluent sampling.

b. The sulfate limit for Sherman Creek applies only to sulfates associated with magnesium and sodium.

Table B-13-8: Proposed Water Quality Based Limits Outfall 001 for Metals and Ammonia

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limits (WQBELS)	
			MDL	AML
Aluminum	—	µg/L	153	50
Total Ammonia	—	mg/L as N	4.0	2.0
Cadmium	50-100	µg/L	0.3	0.1
	100-200	µg/L	0.5	0.2
	>200	µg/L	0.8	0.3
Copper	50-100	µg/L	7.3	2.5
	100-200	µg/L	14	4.8
	>200	µg/L	27	9
Iron	—	µg/L	1850	690
Lead	50	µg/L	2.3	0.8

Table B-13-8: Proposed Water Quality Based Limits Outfall 001 for Metals and Ammonia

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limits (WQBELS)	
			MDL	AML
	100	µg/L	5.6	1.8
	200	µg/L	13	4.4
Manganese	—	µg/L	98	50
Mercury	—		0.02	0.01
Nickel	50	µg/L	53	21
	100	µg/L	95	38
	200	µg/L	171	69
Zinc	50	µg/L	67	29
	100	µg/L	120	52
	200	µg/L	216	94

Table B-13-9: Proposed Water Quality-Based Limits Outfall 002 for Metals and Ammonia

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limits (WQBELS)	
			MDL	AML
Aluminum	—	µg/L	143	71
Total Ammonia	—	mg/L as N	3.5	1.7
Cadmium	< 30	µg/L	0.2	0.1
	≥ 30	µg/L	0.2	0.1
Chromium VI	—	µg/L	16	8
Copper	< 30	µg/L	3.8	1.9
	≥ 30	µg/L	4.5	2.2
Iron	—	µg/L	1700	800
Lead	< 30	µg/L	0.9	0.5
	≥ 30	µg/L	1.1	0.6
Manganese	—	µg/L	98	50
Mercury	—	µg/L	0.02	0.01
Nickel	< 30	µg/L	26	13
	≥ 30	µg/L	31	15

Table B-13-9: Proposed Water Quality-Based Limits Outfall 002 for Metals and Ammonia

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limits (WQBELS)	
			MDL	AML
Selenium	—	µg/L	8.2	4.1
Silver	< 30	µg/L	0.4	0.2
	≥ 30	µg/L	0.5	0.25
Zinc	< 30	µg/L	37	18
	≥ 30	µg/L	43	22

X. Metals and non-metals discussion

a. TSS

At 40 CFR Part 440, adopted by reference at 18 AAC 83.010(g)(3), EPA established NSPS for TSS in mine drainage of 30 mg/L (MDL) and 20 mg/L (AML). The limits for TSS of 40 CFR Part 440 will therefore be applied to Outfalls 001 and 002.

b. TDS, Sulfate

The WQS at 18 AAC 70 contain water quality criteria for TDS not to exceed 500 mg/L and sulfate not to exceed 250 mg/L. These are the limits applied to the discharge at Outfall 002 to Slate Creek. ADEC established site-specific criteria for Sherman Creek at 18 AAC 70.235 of TDS not to exceed 1000 mg/L and sulfates not to exceed 200 mg/L. The site-specific sulfate criteria apply only to sulfates associated with sodium and magnesium. These are the limits applied to Outfall 001 to Sherman Creek. These limits are applied to both the average monthly limit and the maximum daily limit based on the “not to exceed” provision of the standards.

c. Turbidity

The WQS prohibit an increase of greater than 5 NTUs in receiving waters above natural conditions, when the natural turbidity is 50 NTUs or less. Because natural turbidity levels in both the Sherman Creek and East Fork Slate Creek drainages are well below 50 NTUs, the 2011 permit requires that turbidity in the discharges be no greater than 5 NTUs above background. Limits are included in the permit for Outfalls 001 and 002.

d. Ammonia

The WQS contain acute and chronic water quality standards for the protection of aquatic life. The criteria upon which the standards are based are contained in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2003). Acute criteria are based on the pH, and chronic criteria are dependent on the pH and temperature of the receiving waters and whether the receiving waters support salmonids and early life stages of fish. Based on water quality monitoring performed by the Permittee, ADEC used a pH value of 8.0 for lower Sherman Creek, a pH of 8.1 for East Fork Slate Creek, and temperature ranges not to exceed 14 °C for both Sherman Creek and East Fork Slate Creek. Both creeks support early life stages of fish, salmonids in particular. Although 14 °C may be a higher temperature than that which actually occurs in the creeks, water quality criteria are not temperature sensitive until temperatures exceed 14 °C.

Based on the applicable water quality standard for ammonia and using the statistical methodology presented in the TSD, ADEC established the limits summarized in Table B-13-8 and Table B-13-9 for discharges to Sherman Creek and East Fork Slate Creek through Outfalls 001 and 002, respectively.

e. **Nitrate**

The 2011 permit includes WQBELs for nitrate of 20 mg/L (MDL) and 10 mg/L (AML) based on the WQS. The limits derived using the statistical methodology presented in the TSD.

f. **pH**

The AWQS limits discharges to receiving waters to the pH range of 6.5 to 8.5 s.u. This will be used as the end-of-pipe pH limits (see Table B-13-7). The pH limit for Outfalls 001 and 002 are unchanged from the 2005 permit. The 2011 permit requires continuous monitoring for pH. The regulations at 40 CFR 401.17 entitled “pH Effluent limits under continuous monitoring” requires that the permittee shall maintain the pH within the range except that excursions from the range are permitted subject to the following limits:

- The total time during which the pH values are outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and
- No individual excursion from the range of pH values shall exceed 60 minutes.

These provisions have been incorporated into the permit for monitoring and reporting.

g. **Aluminum**

The 2011 permit includes WQBELs for aluminum, derived using the statistical methodology presented in the TSD and based on the AWQS. For Outfall 001 the 2011 permit limits are 153 µg/L (MDL) and 50 µg/L (AML). The *aluminum limits for Outfall 002 are unchanged from the 2005 permit at 143 µg/L (MDL) and 71 µg/L* (AML).

Ambient aluminum levels in East Fork Slate Creek exceed the statewide criteria. The permittee may pursue site-specific criteria for aluminum based on studies to determine the actual effects of aluminum on aquatic organisms in the Slate Creek drainage.

h. **Arsenic**

For Outfall 001 arsenic was monitored during the 2005 permit cycle was not detected. However, the mine was not in an operating mode at this time. Arsenic will therefore be monitored at both Outfall 001 and 002 to provide data when the mine is operating.

i. **Cadmium**

EPA's New Source Performance Standards (NSPS) 40 CFR 440.104 Subpart J contains limits for cadmium in mine drainage and mill discharges of 100 µg/L (MDL) and 50 µg/L (AML). Based on AWQS, which are hardness dependant, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-8 and Table B-13-9 are also applicable to discharges from Outfalls 001 and 002 respectively. Because the WQBELs for cadmium are more stringent than the NSPS, they are included in the 2011 permit, to assure protection of water quality criteria for East Fork Slate Creek and Sherman Creek.

j. **Chromium**

For the 2005 permit WQBELs for hexavalent chromium (Cr VI) of 16 µg/L (MDL) and 8 µg/L (AML) were derived using the statistical methodology presented in the TSD and based on AWQS. However, the permit had a requirement that total chromium be monitored because there is a very short holding time for hexavalent chromium of 24 hours. It was required that if total chromium exceeded the chronic aquatic life criteria for hexavalent chromium of 11 µg/L, then hexavalent chromium was to be monitored for at the next required sampling event. An analysis of the total chromium data for Outfall 001 by the statistical methods in the TSD showed that there was no reasonable potential for an exceedence of the water quality standard for hexavalent chromium. No limits are therefore proposed for the 2011 permit, however monthly monitoring for total chromium will still be required. The chromium limits for Outfall 002 are unchanged from the 2005 permit.

k. **Copper**

EPA's NSPS 40 CFR 440.104 Subpart J contains limits for copper in mine drainage and mill discharges of 300 µg/L (MDL) and 150 µg/L (AML). Based on AWQS, which are hardness dependant, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-8 and Table B-13-9 are also applicable to discharges from Outfalls 001 and 002 respectively. Because the WQBELs for copper are more stringent than the technology-based limits, they are included in the 2011 permit, to assure protection of aquatic life in East Fork Slate Creek and Sherman Creek.

l. **Iron**

The 2011 permit includes WQBELs for iron based on AWQS and derived using the statistical methodology presented in the TSD. The proposed limits for Outfall 001 are 1850 µg/L (MDL) and 690 µg/L (AML) and for Outfall 002, 1700 µg/L (MDL) and 800 µg/L (AML). These limits assure protection of aquatic life in East Fork Slate Creek and Sherman Creek. The iron limits for Outfall 002 are unchanged from the 2005 permit at 1700 µg/L (MDL) and 800 µg/L (AML).

m. **Lead**

EPA's NSPS 40 CFR 440.104 Subpart J contains limits for lead in mine drainage and mill discharges of 600 µg/L (MDL) and 300 µg/L (AML). Based on AWQS for lead, which are hardness dependant, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-8 and Table B-13-9 are also applicable to discharges from Outfalls 001 and 002 respectively. Because the WQBELS for lead are more stringent than the NSPS, they are included in the 2011 permit.

n. **Manganese**

The manganese water quality criterion is for human health; there is no criterion for aquatic life. The 2011 permit includes limits for manganese based on AWQS and derived using the recommendations for calculating permit limits for human health presented in the TSD, Section 5.4.4. Because human health criteria are based on periods between 1 month and 70 years, the AML is set to the water quality criterion of 50 ug/L, and the MDL determination based upon the number of samples per month (4) and the CV (0.57). From Table 5-3 of the TSD the multiplier is 1.96 and the MDL is then 98 ug/L. The 2005 permit required monitoring for manganese but no limits.

o. **Mercury**

EPA's NSPS 40 CFR 440.104 Subpart J contains limits for mercury in mine drainage and mill discharges of 2 µg/L (MDL) and 1 µg/L (AML). Based on AWQS for mercury, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-8 and Table B-13-9 are also applicable to discharges from Outfalls 001 and 002 respectively. Because the WQBELs for mercury are more stringent than the NSPS, they are included in the 2011 permit. The mercury limits for Outfalls 001and 002 are unchanged from the 2005 permit at 0.02 µg/L (MDL) and 0.01 µg/L (AML). These limits will assure protection of water quality in East Fork Slate Creek and Sherman Creek.

p. **Nickel**

The 2011 permit includes the WQBEL for nickel, which is hardness dependent. Based on AWQS for nickel, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-8 and Table B-13-9 are applicable to discharges from Outfalls 001 and 002 respectively.

q. **Selenium**

The 2011 permit includes WQBELs for selenium; see Table B-13-9 with limits applicable to discharges from Outfalls 002. These limits are based on AWQS and derived using the statistical methodology presented in the TSD. The limits are unchanged from the 2005 permit at 8.2 µg/L (MDL) and 4.1 µg/L (AML). These limits will assure protection of water quality for East Fork Slate Creek and Sherman Creek. For Outfall 001 there is no reasonable potential to exceed the water quality standards so there are no limits and monitoring is changed to monthly.

r. **Silver**

Based on AWQS, which are hardness dependant, and using the statistical methodology presented in the TSD, there is no reasonable potential to exceed water quality criteria for silver at Outfall 001. The 2011 permit includes the WQBELs for silver, which are hardness dependent. Based on AWQS for silver, and using the statistical methodology presented in the TSD, the WQBELs found in Table B-13-9 are applicable to discharges from Outfall 002.

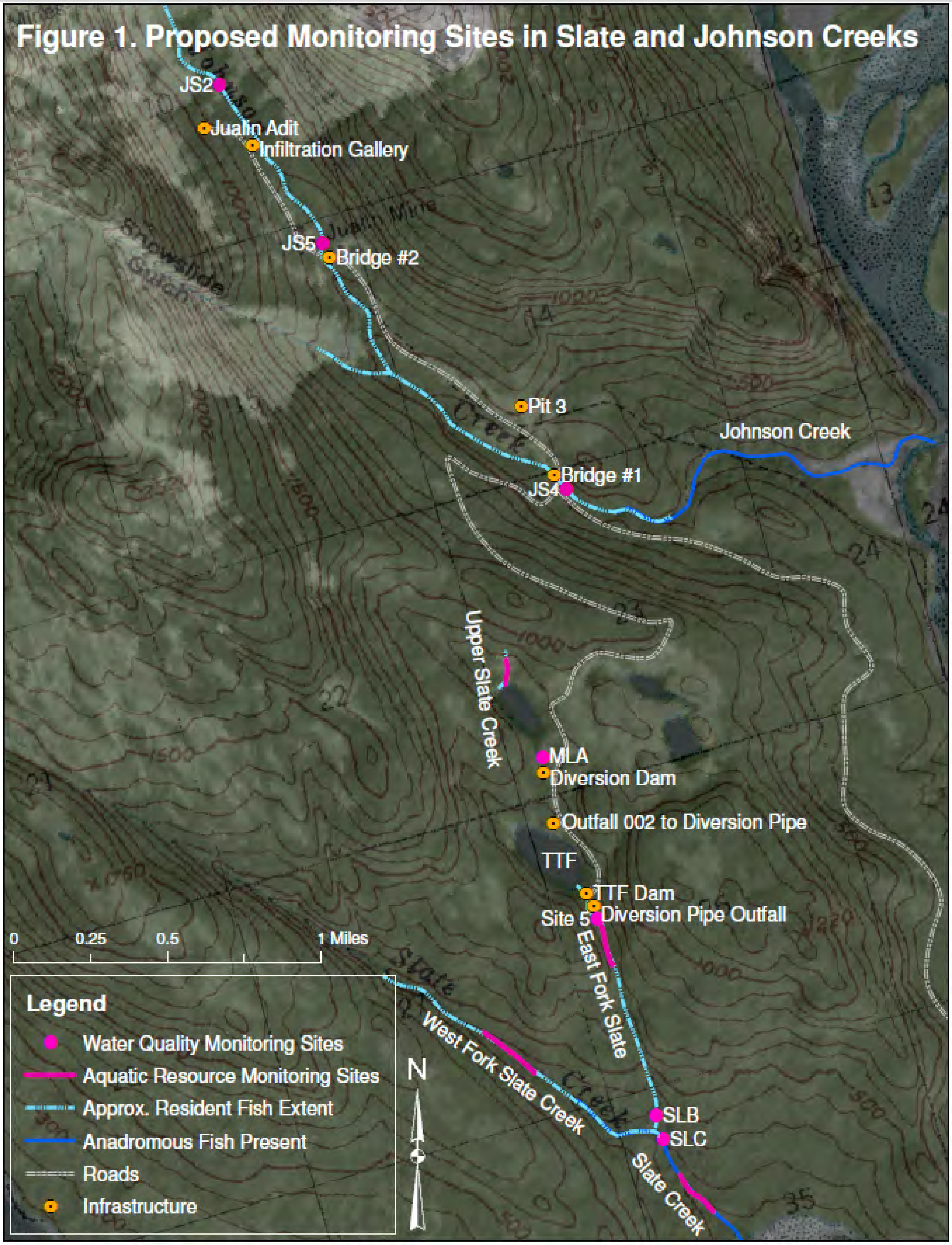
s. **Zinc**

EPA's New Source Performance Standards (NSPS) 40 CFR 440.104 Subpart J contains limits for zinc in mine drainage and mill discharges of 1500 µg/L (MDL), and 750 µg/L (AML). Based on AWQS, which are hardness dependent, and using the statistical methodology presented in the TSD, the WQBELs are found in Table B-13-8 and Table B-13-9 with limits applicable to discharges from Outfalls 001 and 002 respectively. Because the water quality-based limits for zinc are more stringent than the technology-based standards, they are included in the 2011 permit and are applicable to Outfalls 001 and 002. Since there is no reasonable potential to exceed the water quality standards for Outfall 001, the monitoring frequency is reduced from weekly to monthly in the permit, but the effluent limits are still included.

t. **Whole Effluent Chronic Toxicity (WET)**

Chronic WET testing is included in the 2011 permit on a monthly basis. The testing will occur at Outfalls 001 and 002 so that the full effects of the discharge into Sherman Creek and East Fork Slate Creek will be determined. The permit limits for chronic toxicity are unchanged for outfalls 001 and 002 at 1.6 TU_c (MDL) and 1.1 TU_c (AML).

APPENDIX C – MONITORING LOCATIONS



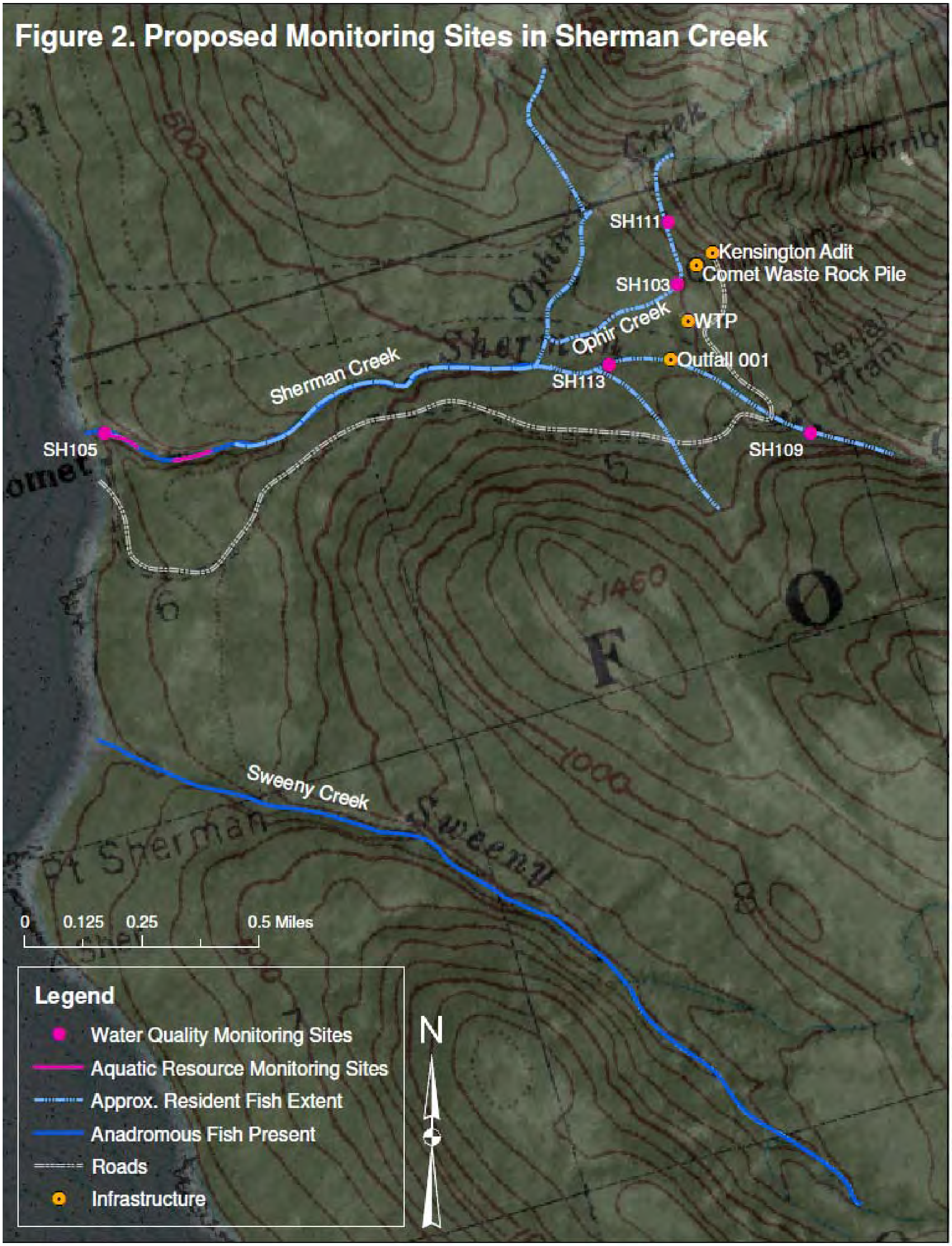


Figure 2. Proposed Monitoring Sites in Sherman Creek
SH111
Kensington Adit
Comet Waste Rock Pile
SH103
WTP
Ophir Creek
Outfall 001
Sherman Creek
SH113
SH105
SH109
Sweeny Creek
0
0.125
0.25
0.5 Miles
Legend
Water Quality Monitoring Sites
Aquatic Resource Monitoring Sites
Approx. Resident Fish Extent
Anadromous Fish Present
Roads
Infrastructure
N