ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – FINAL

Permit Number: AK0050571

Kensington Gold Project

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: March 7th, 2017
Public Comment Period Expiration Date: April 6th, 2017
Alaska Online Public Notice System

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Re-issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

COEUR ALASKA, INC.

For wastewater discharges from

Kensington Gold Project into Sherman Creek and East Fork Slate Creek
Adjacent to Lynn Canal
45 miles north of Juneau, Alaska

The Alaska Department of Environmental Conservation (Department or DEC) re-issued an APDES individual 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 Project and the development of the permit including:

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

Appeals Process

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 the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau, AK 99811-1800

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
410 Willoughby Avenue, 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 permit, fact sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The 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**	
Anchorage Office 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	***Juneau Office*** 410 Willoughby Ave., Suite 310 Juneau, AK 99801 (907) 465-5180

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1.0 APPLICANT

This fact sheet provides information on the Alaska Pollutant Discharge Elimination System (APDES) permit for the following entity:

Name of Facility:	Kensington Gold Project
APDES Permit Number:	AK0050571
Facility Location:	45 miles north of Juneau, Alaska
Mailing Address:	3031 Clinton Drive, Suite 202, Juneau, AK 99801
Facility Contact:	Mr. Kevin Eppers, Environmental Manager

Figures in APPENDIX A of this fact sheet show the location of the Kensington Gold Project along with discharge and monitoring locations and a line drawing of the water balance.

2.0 FACILITY INFORMATION

2.1 Background

The Kensington Gold Project (Kensington) is an underground gold mine located 45 miles north of Juneau, Alaska on a peninsula between Berners Bay and Lynn Canal. Coeur Alaska, Inc. (Coeur) operates the mine. Kensington started production in 2010 with an estimated mine life of 10.5 years. The permit was originally issued as a National Pollutant Discharge Elimination System (NPDES) permit in 1998 and reissued in 2005. Under the APDES Program, the permit was re-issued in2011.

Kensington processes (in a gold mill) an average of 2,000 tons of ore per day. Tailings from the mill are disposed of underground and in a tailings treatment facility (TTF) in Lower Slate Lake. Kensington produced more than 125,000 ounces of gold in 2015.

Kensington lies within the Sherman, Johnson, and Slate Creek drainages. Mine infrastructure in the Sherman Creek drainage includes an adit, waste rock dump, warehouse, and water treatment plants. Here, drainage from the mine is treated and discharged to Sherman Creek at Outfall 001. Sherman Creek drains to Lynn Canal.

A mine portal, mill, waste rock dump, and man camp are located within the Johnson Creek Drainage. The TTF is located in Slate Creek. Water from the TTF is treated and discharged to East Fork Slate Creek at Outfall 002. Johnson and Slate Creeks drain to Berners Bay.

2.2 Facility and Wastewater Description

The Kensington facility consists of the following major elements:

- An underground mine that utilizes long-hole stoping and conventional mining methods with ramps for transferring ore and waste rock to the surface;
- A mill that concentrates gold bearing minerals from the ore through crushing and grinding, gravity concentration, and flotation;
- Two tailings management systems: An underground plant that produces cemented paste backfill that is placed underground and a TTF, with an engineered dam, located in Lower Slate Lake;

- Dumps for the disposal of non-acid generating waste rock;
- Water management systems that maximize recycling and treat all waters affected by the project in accordance with pertinent federal and state legislation;
- A wharf for transporting men and materials to and from the site;
- A network of private roads;
- On-site power generation and electrical distribution;
- A man camp with showers, lavatories, and recreation and dining facilities; and
- An assortment of shops, warehouses, and offices to support mine operations.

The permit continues authorization of the discharge of treated wastewater to Sherman Creek and East Fork Slate Creek from two different outfalls. With a mean annual precipitation of 85 inches, Kensington operates at a net positive water balance thus necessitating the need to discharge excess water.

Outfall 001 consists of mine drainage that has been treated using an advanced water treatment process. This treated effluent is discharged to Sherman Creek. At Outfall 001 the treatment system has been optimized for removing suspended solids, the primary contaminant of concern, from mine drainage. Two water treatment plants [Comet Mine Water Treatment Plants (MWTPs) 1 and 2] work in parallel. Each plant has a capacity of 1,500 gallons per minute (gpm). Comet MWTP 2 was installed in 2010 to help handle seasonal high flows, which typically occur in the fall. Both plants use the same basic treatment process. Treated water from the two plants is combined before being discharged at Outfall 001.

The treatment process used at the Comet MWTPs begins with the addition and mixing of various reagents to promote coagulation and flocculation. Hydrochloric acid can be added for pH adjustment, which is sometime necessary when cemented backfill is being placed underground. After flocculation has been induced, the wastewater passes through a clarifier for the gravity separation of solids. Finally, clarified wastewater is passed through multi-media filters at high pressure for final polishing. This treatment process uses proven technology, and water quality data from the water treatment plants' effluent indicates that it performs effectively.

At Outfall 002 the treatment system is designed to remove non-soluble metals and soluble aluminum, which precipitates at a circumneutral pH, from the TTF water. The maximum capacity of the TTF water treatment plant (WTP) is 1,500 gpm. The basic treatment scheme is similar to the process used in the Comet MWTPs. Treatment begins with the addition of reagents to promote coagulation and flocculation, with the ability to add caustic or acid solutions for pH modification. The next major process is clarification. Clarified wastewater is forced through multi-media filters and, additionally, through carbon filters. The treatment process described uses proven technology, and water quality data from the water treatment plant effluent indicates that it performs effectively.

Treated effluent from Outfall 002 is discharged to East Fork Slate Creek. The discharge at Outfall 002 is necessary to maintain sufficient freeboard within the TTF, in accordance with the Alaska Department of Natural Resources *Certificate of Approval to Operate a Dam*. Inflows to the TTF include pumped tailings slurry from the mill, direct precipitation, undiverted runoff from adjacent drainage areas, and overflow from the Upper Slate Lake diversion structure (during periods of high flow). In addition, the TTF may receive seepage from graphitic phyllite (see Section 3.0.).

There are other wastewater discharges to waters of the U.S. and disposals to land at the site, not addressed in the permit, which are instead authorized under other APDES and Non-APDES permits. Storm water discharges are authorized under APDES General Permit for Storm Water Discharges for Multi-Sector General Permit Activity (AKR06AA50). The disposal of domestic wastewater to land is covered under a Wastewater Disposal Permit (2007DB0021). The management and disposal of wastewater within the TTF is governed by a Waste Management Permit (2013DB002).

3.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMRs) from June 2011 to June 2016 were reviewed to determine the facility's compliance with effluent limits. For some metals, the applicable limit in the 2011 permit depends upon hardness, as measured in the receiving water downstream of each outfall. Copper, for example, has three different monthly average limits for Outfall 001. To avoid confusion, this peculiarity should be noted before reviewing the compliance history, as some DMRs report multiple monthly average exceedances for the same parameter.

Table 1 presents permit limit exceedances for Outfall 001. For each exceedance, Coeur submitted an incident report with plans to prevent a recurrence.

Table 1: Outfall 001 Permit Limit Exceedances

Parameter	Date	Monitoring			
		Basis	Units	Permit Limit	Reported Value
pH	June 2011	Range	Standard Units	8.50	9.81
pH	August 2011	Range	Standard Units	6.50	3.40
Copper	March 2012	Monthly Average	µg/L	4.8	5.5
Copper	April 2012	Monthly Average	µg/L	2.5	3.0
Copper	April 2012	Monthly Average	µg/L	4.8	12.2
Ammonia, Total	October 2012	Monthly Average	mg/L as N	2.0	2.6
Ammonia, Total	January 2013	Daily Maximum	mg/L as N	4.0	6.0
Ammonia, Total	January 2013	Monthly Average	mg/L as N	2.0	3.8

Parameter	Date	Monitoring			
		Basis	Units	Permit Limit	Reported Value
Ammonia, Total	February 2013	Daily Maximum	mg/L as N	4.0	8.1
Ammonia, Total	February 2013	Monthly Average	mg/L as N	2.0	5.6
Ammonia, Total	May 2013	Monthly Average	mg/L as N	2.0	2.2
pH	November 2013	Range	Standard Units	8.5	10.0
Sulfate	March 2014	Daily Maximum	mg/L	200	216.0
Sulfate	April 2014	Daily Maximum	mg/L	200	219.0
Turbidity	June 2014	Daily Maximum	Chronic toxic units	5.0	24.7
Toxicity	June 2014	Daily Maximum	Chronic toxic units	1.6	4.0
Toxicity	June 2014	Monthly Average	Chronic toxic units	1.1	4.0
Toxicity	July 2014	Daily Maximum	Chronic toxic units	1.6	1.7
Toxicity	July 2014	Monthly Average	Chronic toxic units	1.1	1.7
pH	October 2014	Range	Standard Units	8.5	9.7
Manganese	October 2014	Monthly Average	µg/L	50	55.4
pH	December 2014	Range	Standard Units	8.5	9.0
Sulfate	December 2014	Daily Maximum	mg/L	200	236.0
Sulfate	January 2015	Daily Maximum	mg/L	200	205.0
Sulfate	March 2015	Daily Maximum	mg/L	200	206.0
Sulfate	April 2015	Daily Maximum	mg/L	200	210.0

There were three copper exceedances at Outfall 001 during March and April of 2012. The elevated copper concentrations were caused by mine drainage contacting cement rock fill in the underground mine. Since that time, steps have been taken to prevent water from contacting cement rock fill, and all subsequent samples have been in compliance with permit limits for copper.

Six ammonia exceedances occurred at Outfall 001 between October 2012 and May 2013. Ammonia is present in the blasting agents used underground. To manage ammonia, Kensington installed a breakpoint chlorination system and instituted best management practices to prevent a recurrence.

There were four exceedances of the toxicity limit at Outfall 001 in June and July of 2014. These exceedances were caused by elevated chlorine residuals in the breakpoint chlorination system. This problem was corrected by purchasing a more reliable test kit for free chlorine, and no exceedances for toxicity have been observed since July 2014.

Four exceedances of the sulfate limit were observed between December 2014 and April 2015. The limit for sulfate at Outfall 001 is based on a site-specific criteria for sulfate associated with sodium and magnesium in 18 AAC 70.236(b)(3). Sulfate exceedances have been triggered by various reagents used in the water treatment process that contain sodium. Where possible, Coeur has been phasing out the use of sodium containing reagents and, as a result, sulfate has come back into compliance with permit limits.

Table 2 presents permit limit exceedances for Outfall 002. For each exceedance, Coeur submitted an incident report with plans to prevent a recurrence.

Table 2: Outfall 002 Permit Limit Exceedances

Parameter	Date	Monitoring			
		Basis	Units	Permit Limit	Reported Value
Sulfate	September 2011	Daily Max	mg/L	250	262.0
Iron	January 2012	Daily Max	µg/L	1,700	2,070
Iron	January 2012	Monthly Average	µg/L	800	949
Toxicity	January 2012	Daily Max	Chronic toxic units	1.6	2
Toxicity	January 2012	Monthly Average	Chronic toxic units	1.1	2
Iron	March 2012	Daily Max	µg/L	1,700	2,600
Iron	March 2012	Monthly Average	µg/L	800	1,294
Aluminum	March 2012	Monthly Average	µg/L	71	114.1
Aluminum	May 2012	Daily Maximum	µg/L	143	258.0

Parameter	Date	Monitoring			
		Basis	**Units**	**Permit Limit**	**Reported Value**
Turbidity	August 2012	Daily Maximum	Nephelometric Turbidity Units	5.0	7.1
Aluminum	December 2012	Daily Maximum	µg/L	143	379.0
Aluminum	December 2012	Monthly Average	µg/L	71	265.5
Aluminum	January 2013	Daily Maximum	µg/L	143	375.0
Aluminum	January 2013	Monthly Average	µg/L	71	121.3
Cadmium	May 2013	Daily Maximum	µg/L	0.2	0.3
Cadmium	May 2013	Monthly Average	µg/L	0.1	0.3
Manganese	May 2013	Daily Maximum	µg/L	98	113
Manganese	May 2013	Monthly Average	µg/L	50	79
Cadmium	June 2013	Monthly Average	µg/L	0.1	0.2
Cadmium	July 2013	Monthly Average	µg/L	0.1	0.2
Total Dissolved Solids (TDS)	July 2013	Daily Maximum	mg/L	500	621
TDS	September 2013	Daily Maximum	mg/L	500	607
Manganese	March 2014	Monthly Average	µg/L	50	52

There were four iron exceedances at Outfall 002 during January and March of 2012. The iron source for these exceedances was the coagulant ferric chloride, which is used in the TTF water treatment plant. Iron has been in compliance with permit limits since March of 2012 due to Coeur's efforts to improve the management of ferric chloride in the treatment process.

Aluminum exceeded permit limits four times during December 2012 and January 2013. During these months a new aluminum based coagulant was being used on a trial basis in the TTF water treatment plant. The results of jar testing conducted previously with the coagulant demonstrated compliance with all permit limits. However, when the coagulant was introduced into the treatment process, elevated levels of aluminum in the effluent were observed. Use of the new coagulant was discontinued in January 2013, and aluminum levels have been in compliance with permit limits since that time.

Four exceedances of cadmium were reported in May, June, and July of 2013. The source of the cadmium was graphitic phyllite—an acid generating, metal leaching rock that was unexpectedly encountered during construction of the TTF. This rock was stockpiled at the north end of the TTF, and seeps were identified during a TTF inspection on May 20, 2013. Coeur submitted an action plan to DEC on June 10, 2013 to mitigate the acid rock drainage (ARD) from the graphitic phyllite. Ultimately, this graphitic phyllite will be excavated and placed underground within paste tailings. Seepage is captured and treated in an ARD treatment plant. Since actions were taken to mitigate the ARD seepage, cadmium has been within permit limits.

Coeur has received two Notices of Violation (NOVs) from DEC. The first NOV was issued on June 18, 2013 for the unpermitted discharge of seepage from graphitic phyllite to the TTF. The NOV states that the seepage was not identified as a source in the application for the 2011 APDES permit and, therefore, was not explicitly authorized. Currently, Coeur is in compliance with the remediation plan in the NOV. During the application for permit reissuance, Coeur requested that discharges of seepage to the TTF be authorized.

The second NOV was issued on July 24, 2014 for a delay in reporting tampering with sampling equipment. Corrective actions were taken to prevent a recurrence. Chief among these was placing the compliance sampling point for Outfall 001 within a locked building. Only the environmental group at Kensington has access to this building.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

The CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. WQBELs are set as the permit limit if they are more stringent than TBELs to ensure that the receiving water quality is protected. The more stringent of TBELs or WQBELs are selected as the final permit limits. The permit contains both WQBELs and TBELs. See APPENDIX B for further discussion of the basis for the effluent limits in the permit.

Outfalls 001 and 002 discharge mine drainage and contact water from the mine site. The Environmental Protection Agency (EPA) promulgated effluent limitation guidelines (ELGs) for the ore mining and dressing point source category at 40 CFR Part 440, which include TBELs for this point source category, adopted by reference in 18 AAC 83. Subpart J is applicable to the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. The ELGs in Subpart J are applicable to Outfalls 001 and 002.

The ELGs applicable to a new source, which is a source that has commenced construction after the ELGs were established on December 3, 1982, are applicable to discharges from active mines. Table 3 identifies the parameters and TBELs required as a minimum for Outfalls 001 and 002 found in 40 CFR Part 440. See APPENDIX B through APPENDIX D for more details on the selection of the final permit limits.

Table 3: Technology-Based Effluent Limits for Outfall 001 [40 CFR § 440.104(a)]

Parameter	Units	Maximum for any 1 day	Average of daily values for 30 consecutive days	Range
Cadmium	mg/L[a]	0.10	0.05	-
Copper	mg/L	0.30	0.15	-
Lead	mg/L	0.6	0.3	-
Mercury	mg/L	0.002	0.001	-
Zinc	mg/L	1.5	0.75	-
pH	s.u.[b]	-	-	6.0-9.0
Total Suspended Solids (TSS)	mg/L	30.0	20.0	-

a. Milligrams per liter.
b. Standard units.

4.2 Basis for Effluent and Receiving Water Monitoring

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. Monitoring in a permit is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving waterbody quality. The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for reissuance, as appropriate, to the Department. Fact Sheet sections 4.3 through 4.5 summarize monitoring requirements DEC has determined necessary to implement in the permit (additional discussion about the basis for monitoring requirements can be found in APPENDIX B through APPENDIX D).

4.3 Effluent Limits and Monitoring Requirements

The permit contains effluent limits that are based on the most stringent of either TBELs or WQBELs. Table 4 summarizes the effluent limits for Outfall 001 and provides a comparison to the limits in the previous permit. (Please see APPENDIX B for more details regarding the legal and technical basis surrounding the selection of effluent limits.)

Table 4: Effluent Limits and Monitoring Frequencies for Outfall 001 (Changes in Boldface)

Parameter[b]	Hardness as mg/L $CaCO_3$ [j]	Units	Effluent Limits[a]					
			Daily Maximum		Monthly Average		Monitoring Frequency	
			2011 Permit	The Permit	2011 Permit	The Permit	2011 Permit	The Permit
Aluminum	NA	µg/L[c]	153	**155**	50	**66**	1/Week	1/Week
Ammonia, Total	NA	mg/L[d] as N	4.0	**9.0**	2.0	**4.0**	1/Week	1/Week
Arsenic	NA	µg/L	—	**—**	—	**—**	1/Month	**X**

Parameter[b]	Hardness as mg/L $CaCO_3$ [j]	Units	Effluent Limits[a]					
			Daily Maximum		Monthly Average		Monitoring Frequency	
			2011 Permit	The Permit	2011 Permit	The Permit	2011 Permit	The Permit
Cadmium	50 ≤ H < 100	µg/L	0.3	**X**	0.1	**X**	1/Week	**X**
	100 ≤ H < 200	µg/L	0.5	**X**	0.2	**X**	1/Week	**X**
	H ≥ 200	µg/L	0.8	**X**	0.3	**X**	1/Week	**X**
	H=51 [i]	µg/L	—	**0.21**	—	**0.15**	—	1/Week
Chlorine	NA	µg/L	—	**17.4**	—	**7.3**	—	**Continuous**
Copper	50 ≤ H < 100	µg/L	7.3	**X**	2.5	**X**	1/Week	**X**
	100 ≤ H < 200	µg/L	14	**X**	4.8	**X**	1/Week	**X**
	H ≥ 200	µg/L	26.9	**X**	9.2	**X**	1/Week	**X**
	H=51 [i]	µg/L	**—**	**7.5**	**—**	**2.3**	—	1/Week
Chromium, Total	NA	µg/L	—	**—**	—	**—**	1/Month	**X**
Iron	NA	µg/L	1,850	**1,840**	690	**705**	1/Week	1/Week
Lead	50 ≤ H < 100	µg/L	2.3	**X**	0.8	**X**	1/Week	**X**
	100 ≤ H < 200	µg/L	5.6	**X**	1.8	**X**	1/Week	**X**
	H ≥ 200	µg/L	13.4	**X**	4.4	**X**	1/Week	**X**
	H=51 [i]	µg/L	—	**2.2**	—	**1.1**	—	1/Week
Manganese	NA	µg/L	98	**150**	50	50	1/Week	1/Week
Mercury	NA	µg/L	0.02	0.02	0.01	0.01	1/Month	**1/Week**
Nickel	50 ≤ H < 100	µg/L	52.9	**X**	21.2	**X**	1/Week	1/Week
	100 ≤ H < 200	µg/L	95.0	**X**	38.1	**X**	1/Week	1/Week
	H ≥ 200	µg/L	170.3	**X**	68.5	**X**	1/Week	1/Week
Nitrate	NA	mg/L as N	20	**X**	10	**X**	1/Week	1/Week
Selenium	NA	µg/L	—	**—**	—	**—**	1/Month	**X**
Silver	NA	µg/L	—	**—**	—	**—**	1/Month	**X**
Zinc	50 ≤ H < 100	µg/L	66.6	**X**	29.1	**X**	1/Week	**X**
	100 ≤ H < 200	µg/L	119.8	**X**	52.4	**X**	1/Week	**X**
	H ≥ 200	µg/L	215.6	**X**	94.3	**X**	1/Week	**X**
	H=51 [i]	µg/L	—	**68**	—	**23**	—	1/Week

Parameter[b]	Hardness as mg/L $CaCO_3$ [j]	Units	Effluent Limits[a]					
			Daily Maximum		Monthly Average		Monitoring Frequency	
			2011 Permit	The Permit	2011 Permit	The Permit	2011 Permit	The Permit
Sulfate associated with Na & Mg	NA	mg/L	200	200	200	200	1/Week	1/Week
TDS	NA	mg/L	1,000	1,000	1,000	1,000	1/Week	1/Week
Turbidity, effluent	NA	NTU[f]	See Permit	See Permit	See Permit	See Permit	1/Week	1/Week
Turbidity, natural condition	NA	NTU	—	—	—	—	1/Week	1/Week
Hardness	NA	mg/L $CaCO_3$	—	—	—	—	1/Week	1/Week
pH	NA	s.u.[g]	See Permit	See Permit	See Permit	See Permit	Continuous	Continuous
TSS	NA	mg/L	30	30	20	20	1/Day	**1/Week**
Flow	NA	gpm	—	**3,000**	—	—	Continuous	Continuous
Temperature	NA	°C	—	—	—	—	1/Week	1/Week
Dissolved Oxygen (DO)	NA	mg/L	—	—	—	—	1/Week	1/Week
Whole Effluent Toxicity (WET)	NA	TU_c[h]	1.6	1.6	1.1	1.1	1/Month	1/Month

a. Changes in limits or monitoring requirements are shown in boldface. An "X" indicates that a limit or monitoring requirement has been removed from the permit. A line indicates that the permit limit or monitoring did/does not apply to the previous/current permit.
b. All metals shall be measured as total recoverable.
c. Micrograms per liter.
d. Milligrams per liter.
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 (SO4), total alkalinity, hardness, pH, and electric conductivity.
f. Nephelometric Turbidity Units.
g. Standard units.
h. Chronic toxic units.
i. Hardness 15th percentile calculated from sample results for the period of record.
j. Hardness value to derive the hardness-based limit. For parameters that are not hardness contingent, hardness is denoted as not applicable (NA).

As required under 18 AAC 83.435, a reasonable potential analysis was conducted on five years of monitoring data collected during the previous permit period to determine if effluent from Outfall 001 has reasonable potential to exceed Alaska Water Quality Standards (WQS).

Effluent limits must be developed for parameters that have a reasonable potential to exceed WQS. Analysis of recent data resulted in a number of changes to the effluent limits in the permit. Some limits have become more stringent, while other limits have become less stringent. For parameters that did not demonstrate reasonable potential, limits or monitoring requirements may have been revised or removed. To justify these less stringent limits in the permit, the Department is required to conduct an anti-backsliding analysis, which is provided in Permit Part 6.0.

Table 5 summarizes the effluent limits for Outfall 002 and provides a comparison to the limits in the previous permit.

Table 5: Effluent Limits and Monitoring Frequencies for Outfall 002 (Changes in Boldface)

Parameter[b]	Hardness as mg/L $CaCO_3$ [j]	Units	Effluent Limits[a]					
			Daily Maximum		Monthly Average		Monitoring Frequency	
			2011 Permit	The Permit	2011 Permit	The Permit	2011 Permit	The Permit
Aluminum	NA	µg/L[c]	143	**160**	71	**57**	1/Week	1/Week
Ammonia, Total	NA	mg/L[d] as N	3.5	**X**	1.7	**X**	1/Week	1/Week
Arsenic	NA	µg/L	—	**—**	—	**—**	1/Month	**X**
Cadmium	H < 30	µg/L	0.2	**X**	0.1	**X**	1/Week	**X**
	H ≥ 30	µg/L	0.2	**X**	0.1	**X**	1/Week	**X**
	H=74 [i]	µg/L	—	**0.36**	—	**0.12**	—	1/Week
Chlorine[k]	NA	µg/L	—	**19**	—	**11**	—	**1/Week**
Copper	H < 30	µg/L	7.3	**X**	2.5	**X**	1/Week	**X**
	H ≥ 30	µg/L	14	**X**	4.8	**X**	1/Week	**X**
	H=74 [i]	µg/L	**—**	**10.5**	**—**	**5.6**	—	1/Week
Chromium, Total	NA	µg/L	—	**—**	—	**—**	1/Month	**X**
Chromium VI	NA		16	**X**	8	**X**		**X**
Iron	NA	µg/L	1,700	**1,840**	800	**650**	1/Week	1/Week
Lead	H < 30	µg/L	0.9	**X**	0.5	**X**	1/Week	**X**
	H ≥ 30	µg/L	1.1	**X**	0.6	**X**	1/Week	**X**
	H=74 [i]	µg/L	—	**3.6**	—	**1.8**	—	1/Week
Manganese	NA	µg/L	98	**145**	50	**50**	1/Week	1/Week
Mercury	NA	µg/L	0.02	0.02	0.01	0.01	1/Week	1/Week
Nickel	H < 30	µg/L	26	**X**	13	**X**	1/Week	1/Week
	H ≥ 30	µg/L	31	**X**	15	**X**	1/Week	1/Week
Nitrate	NA	mg/L	—	—	—	—	1/Week	1/Week
Selenium	NA	µg/L	8.2	**X**	4.1	**X**	1/Week	1/Week
Silver	H < 30	µg/L	0.4	**X**	0.2	**X**	1/Week	**X**
	H ≥ 30	µg/L	0.5	**X**	0.25	**X**	1/Week	**X**
	H=74 [i]	µg/L	—	—	—	—	—	1/Week
Zinc	H < 30	µg/L	37	**X**	18	**X**	1/Week	**X**
	H ≥ 30	µg/L	43	**X**	22	**X**	1/Week	**X**

Parameter[b]	Hardness as mg/L $CaCO_3$ [j]	Units	Effluent Limits[a]					
			Daily Maximum		Monthly Average		Monitoring Frequency	
			2011 Permit	The Permit	2011 Permit	The Permit	2011 Permit	The Permit
	H=74 [i]	µg/L	—	**93**	—	**32**	—	1/Week
Sulfate	NA	mg/L	250	250	250	250	1/Week	1/Week
TDS	NA	mg/L	500	500	500	500	1/Week	1/Week
Turbidity, effluent	NA	NTU[f]	See Permit	See Permit	See Permit	See Permit	1/Week	1/Week
Turbidity, natural condition	NA	NTU	—	—	—	—	1/Week	1/Week
Hardness	NA	mg/L $CaCO_3$	—	—	—	—	1/Week	1/Week
pH	NA	s.u.[g]	See Permit	See Permit	See Permit	See Permit	Continuous	Continuous
TSS	NA	mg/L	30	30	20	20	1/Day	**1/Week**
Flow	NA	gpm	1,500	1,500	—	—	Continuous	Continuous
Temperature	NA	°C	—	—	—	—	1/Week	1/Week
Dissolved Oxygen (DO)	NA	mg/L	—	—	—	—	1/Week	1/Week
Whole Effluent Toxicity (WET)	NA	TU_c[h]	1.6	1.6	1.1	1.1	1/Month	1/Month

a. Changes in limits or monitoring requirements are shown in boldface. An "X" indicates that a limit or monitoring requirement has been removed from the permit. A line indicates that the permit limit or monitoring did/does not apply to the previous/current permit.
b. All metals shall be measured as total recoverable.
c. Micrograms per liter.
d. Milligrams per liter.
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 (SO4), total alkalinity, hardness, pH, and electric conductivity.
f. Nephelometric Turbidity Units.
g. Standard units.
h. Chronic toxic units.
i. Hardness 15th percentile calculated from sample results for the period of record.
j. Hardness value to derive the hardness-based limit. For parameters that are not hardness contingent, hardness is denoted as not applicable (NA).
k. Limits and Monitoring for chlorine at Outfall 002 is not applicable until the installation of the breakpoint chlorination system is installed and approved for operation by the Department.

As required under 18 AAC 83.435, a reasonable potential analysis was conducted on five years of sample data collected during the previous permit period to determine if effluent from Outfall 001 has reasonable potential to exceed Alaska Water Quality Standards (WQS).

Effluent limits must be developed for parameters that have a reasonable potential to exceed WQS. Analysis of recent data resulted in a number of changes to the effluent limits in the permit.

Some limits have become more stringent, while other limits have become less stringent. For parameters that did not demonstrate reasonable potential, limits or monitoring requirements may have been revised or removed. To justify these less stringent limits in the permit, the Department is required to conduct an anti-backsliding analysis, which is provided in Permit Part 6.0.

4.4 Influent and Effluent Monitoring

The permit requires monitoring of the effluent to determine compliance with TBELs and WQBELs. None of the TBELs in 40 CFR § 440.104(a) require influent monitoring. The monitoring requirements for each outfall are summarized in Table 6.

Table 6: Influent and Effluent Monitoring

Outfall	Monitor Influent?	Monitor Effluent?	Sampled Parameters for TBEL Compliance						
			Copper	Zinc	Lead	Mercury	Cadmium	pH	TSS
001	No	Yes	✓	✓	✓	✓	✓	✓	✓
002	No	Yes	✓	✓	✓	✓	✓	✓	✓

At Outfall 001, effluent samples are collected from the effluent stream after the last treatment process and prior to discharge into Sherman Creek. At Outfall 002, samples are collected after the last treatment process and prior to discharge into East Fork Slate Creek.

The permittee shall also consult and review APDES Application Form 2C, which contains specific effluent monitoring requirements due to be submitted in the application for permit reissuance (180 days prior to the permit expiration date). A copy of Form 2C can be found at http://dec.alaska.gov/water/wwdp/index.htm.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than required under the permit. If additional samples are used for averaging, the permittee must use a sufficiently sensitive Environmental Protection Agency (EPA) approved test method that quantifies the pollutants to a level lower than applicable limits or water quality standards or use the most sensitive test method available, per Title 40 Code of Federal Regulations (CFR) § 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), adopted by reference at 18 AAC 83.010(f). Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limitations on WET when a discharge has reasonable potential to cause or contribute to exceedances of WQS. The permit requires monthly WET testing at Outfall 001 and Outfall 002 and have limits based on a reasonable potential to exceed WQS.

WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. The tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day or 48 hour exposure. Chronic toxicity monitoring shall be conducted by the permittee according to the methods and species approved by the EPA in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition* (October 2002).

4.5 Water Column Monitoring

The permit requires water column monitoring in four waterbodies that receive discharges from point and non-point sources. These include Sherman Creek, Slate Creek, Johnson Creek, and Ophir Creek. Sherman Creek is the receiving water for discharges from Outfall 001, and East Fork Slate Creek is the receiving water for discharges from Outfall 002. Much of the infrastructure for the mine is located within the Johnson Creek drainage. Storm water runoff that discharges to Johnson Creek is managed under the MSGP, but receiving water monitoring in Johnson Creek is required under APDES permit AK0050571. Finally, Ophir Creek, a tributary of Sherman Creek, receives runoff from a waste rock pile. Receiving water monitoring is required to verify that the designated uses for these four waterbodies are protected from the pollutants of concern.

Table 7 contains parameters that must be monitored in the receiving waters. Receiving water sampling must be conducted monthly (minimum). Monitoring locations are shown in the figures in APPENDIX A. Monitoring is conducted both upstream and downstream of any mining related disturbance.

Table 7: Receiving Water Monitoring Parameters

Parameter	Units	Minimum Sample Frequency	Sample Type
Aluminum [a]	µg/L	1/Month	Grab
Ammonia, Total [a]	µg/L	1/Month	Grab
Arsenic [a]	µg/L	1/Month	Grab
Cadmium [a]	µg/L	1/Month	Grab
Chromium [a]	µg/L	1/Month	Grab
Chlorine	µg/L	1/Month	Grab
Copper [a]	µg/L	1/Month	Grab
Iron [a]	µg/L	1/Month	Grab
Lead [a]	µg/L	1/Month	Grab
Manganese [a]	µg/L	1/Month	Grab
Mercury [a]	µg/L	1/Month	Grab
Nickel [a]	µg/L	1/Month	Grab
Selenium [a]	µg/L	1/Month	Grab
Silver [a]	µg/L	1/Month	Grab
Zinc [a]	µg/L	1/Month	Grab
Sulfate [b]	mg/L	1/Month	Grab
Chloride	µg/L	1/Month	Grab
Turbidity	NTU	1/Month	Grab

Parameter	Units	Minimum Sample Frequency	Sample Type
TDS	mg/L	1/Month	Grab
TSS	mg/L	1/Month	Grab
pH	s.u.	1/Month	Grab
Dissolved Oxygen	mg/L	1/Month	Grab
Temperature	°C	1/Month	Grab
Nitrate, as N	mg/L	1/Month	Grab
Conductivity	µS/cm [c]	1/Month	Grab
Hardness, as $CaCO_3$	mg/L	1/Month	Grab
Color	Color units	1/Month	Grab

Notes:

a. Must be measured as total recoverable. Receiving water metals analysis shall be dissolved unless otherwise specified.
b. Sulfates shall be Total Sulfates except for Sherman Creek which shall be sulfates associated with magnesium and sodium
c. Microsiemens per centimeter

4.6 Sediment Monitoring

The permit also requires annual sediment monitoring and a multifaceted biomonitoring program to verify that the designated uses of the receiving waters have been protected. Sediment samples are collected in lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek, lower Slate Creek, and lower Johnson Creek. Sediment samples are analyzed for physical and chemical parameters and for toxicity to aquatic life. Sediment is required to be monitored for the parameters in Table 8 at a frequency of once per year.

Table 8: 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

Parameter	Units	Preparation Method	Analysis Method	Sediment MDL[a]
Zinc	mg/kg	PSEP[b]	ICP[d]	15.0
Total Solids	%	—	PSEP[b], pg 17	0.1
Total Volatile Solids	%	—	PSEP[b], pg 20	0.1
Total Organic Carbon	%	—	PSEP[b,f], pg 23	0.1
Total Sulfides	mg/kg	—	PSEP[b], pg 32	1
Grain Size	—	—	Modified ASTM with Hydrometer	N/A

Notes:

a. Dry weight basis.
b. From *Recommended Protocols for Measuring Selected Environmental Variables*.
c. From *Graphite Furnace Atomic Absorption Spectrometry* (1986).
d. From *Inductively Coupled Plasma Emission Spectrometry* (1986).
e. From *Mercury Digestion and Cold Vapor Atomic Absorption Spectrometry* (1986).
f. From *Recommended Methods for Measuring TOC in Sediments* (1993).

4.7 Biomonitoring

The biomonitoring program at Kensington includes benthic invertebrate monitoring and studies on periphyton biomass and community composition. Benthic invertebrate samples are collected annually in lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek, Lower Slate Creek, West Fork Slate Creek, and upper Johnson Creek. The abundance and diversity of benthic organisms is an indicator of stream health.

The quality of spawning substrate for anadromous fish is monitored annually in Lower Slate Creek. Sediment samples are collected at two locations and are monitored annually for changes in composition.

Periphyton biomass and community composition is monitored annually in the inlet creek to Upper Slate Lake, East Fork Slate Creek, West Fork Slate Creek, Lower Slate Creek, and Lower Sherman Creek. A minimum of six samples are collected for each reach and analyzed for periphyton biomass densities and proportions of mean chlorophyll a, b, and c concentrations.

The sediment monitoring and biomonitoring programs are managed, through a contract with Coeur, by the Alaska Department of Fish & Game, Division of Habitat (ADF&G). ADF&G provided recommendations to improve the biomonitoring program during the permit reissuance, and DEC has incorporated these recommendations into the permit. Table 9 summarizes changes to the biomonitoring program from the previous permit.

Table 9: Changes to the Biomonitoring Program

Monitoring Program	2011 Permit Requirement	2017 Permit Requirement	Rationale
Sediment Toxicity	Sediment samples to be tested for acute toxicity to aquatic life	Discontinued.	Results from previous samples did not provide meaningful

Monitoring Program	2011 Permit Requirement	2017 Permit Requirement	Rationale
			results for biomonitoring objectives.
Benthic Invertebrates	Sample every third or fourth site within the delineated reach.	Sample opportunistically.	Refinement of biomonitoring program.
Benthic Invertebrates	Samples shall be delineated to the genus level (except for oligochaetes to order).	Identify worms to class Oligochaeta, nonbiting midges to family Chironomidae, and all others to genus.	Refinement of biomonitoring program.
Benthic Invertebrates	Calculate and report sample statistics for each sample.	Summarize the sample results for each sample site, not each sample.	Refinement of biomonitoring program.
Resident Fish Population	Monitor the abundance and condition of Dolly Varden char annually in the inlet creek to Upper Slate Lake and East Fork Slate Creek.	Resident fish population monitoring discontinued.	The use of fish abundance is not a valid measure of the health of this ecosystem. ADF&G reports few fish captures, limited fish habitat, uncertainties about the residency of fish, and disruptions to fish passage caused by the Upper Slate Lake diversion pipeline. Eleven years of population data has been collected, which provides enough baseline information to assess the future reclamation success of the TTF.
Resident Fish Whole Body Metals	Monitor the concentration of nine elements in Dolly Varden char collected from the inlet creek to Upper Slate Lake, East Fork Slate Creek, and Lower Slate Creek.	Resident fish whole body metals monitoring discontinued.	There are too many uncertainties about the residency of Dolly Varden char to allow for meaningful comparisons between samples.

5.0 RECEIVING WATERBODY

5.1 Description of Receiving Waterbodies

The permit authorizes the discharge of treated wastewater into Sherman Creek and East Fork Slate Creek from Outfall 001 and Outfall 002, respectively.

Sherman Creek drains about 4.2 square-miles to the east shore of Lynn Canal (Figure 2). A waterfall about 1,200 feet upstream of the mouth prevents anadromous fish passage to the middle and upper reaches. Middle Sherman Creek is the reach between the Lower Sherman Creek waterfall barrier and the Comet Road bridge, and Upper Sherman Creek is the reach between the Comet Road bridge and the headwaters. At Middle Sherman Creek, the treated effluent is discharged via Outfall 001. Upper Sherman Creek is upstream of the mine influence.

Slate Creek drains about four square miles into Slate Cove on the northwest side of Berners Bay (Figure 3). Two waterfalls about a half-a-mile upstream of the mouth prevent anadromous fish passage to the West and East Forks. There are two lakes in this drainage; Lower Slate and Upper Slate Lakes, both upstream of East Fork Slate Creek. Kensington operates the TTF in Lower Slate Lake and discharges treated effluent via Outfall 002 in East Fork Slate Creek. West Fork Slate Creek and Upper Slate Creek are upstream of the mine influence.

5.2 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the WQS. The state's WQS are composed of use classifications, numeric and narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each waterbody 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 waterbody. The antidegradation policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies 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). Neither Sherman Creek nor East Fork Slate Creek have been reclassified under 18 AAC 70.230. Therefore, Sherman and East Fork Slate Creeks must be protected for all fresh water designated use classes listed in 18 AAC 70.020(a)(1). These include:

1. domestic water supply – 18 AAC 70.020(b)(1)(A)(i)
2. agriculture water supply – 18 AAC 70.020(b)(1)(A)(ii)
3. aquaculture water supply – 18 AAC 70.020(b)(1)(A)(iii)
4. industrial uses – 18 AAC 70.020(b)(1)(A)(iv)
5. contact recreation – 18 AAC 70.020(b)(1)(B)(i)
6. secondary recreation – 18 AAC 70.020(b)(1)(B)(ii)
7. growth and propagation of fish, shellfish, other aquatic life, and wildlife – 18 AAC 70.020(b)(1)(C)

Some waterbodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Site-specific water quality criteria have been established for Sherman Creek in 18 AAC 70.236(b)(3), but have not been established for East Fork Slate Creek. Table 10 summarizes the site-specific criteria for Sherman Creek.

Table 10:Site-Specific Criteria for Sherman Creek [18 AAC 70.236(b)(3)]

Watershed	Reach of Water Affected	Water Quality Parameter	Designated Use Class Affected	Water Quality Standard in 18 AAC 70.020(b)(4)	Site-Specific Criteria
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(A)(i)	TDS from all sources may not exceed 500 mg/L. Neither chlorides nor sulfates may exceed 250 mg/L.	TDS from all sources may not exceed 1,000 mg/L. Chlorides may not exceed 200 mg/L. Sulfates associated with magnesium and sodium many not exceed 200 mg/L.
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(A)(iii)	TDS may not exceed 1,000 mg/L. A concentration of TDS may not be present in water if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life (see note 12).	TDS may not exceed 1,000 mg/L
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(C)	TDS may not exceed 1,000 mg/L. A concentration of TDS may not be present in water if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life (see note 12).	TDS may not exceed 1,000 mg/L

5.3 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. None of the receiving waters associated with Kensington are included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report,* July 15, 2010, as impaired or listed as a CWA 303(d) waterbody requiring a Total Maximum Daily Load (TMDL). Accordingly, a TMDL has not been developed or approved for any of the applicable receiving waters.

5.4 Mixing Zone Analysis

No mixing zone is authorized under the permit.

6.0 ANTIBACKSLIDING

Per 18 AAC 83.480(a), except as provided in (b) of the section, "when a permit is renewed or reissued, interim effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changes since the permit was issued, and the change in circumstances would constitute cause for permit modification or revocation and reissuance under 18 AAC 83.135."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation. Since the previous permit was issued, new information has been collected to characterize the effluent and determine limits for Outfall 001 and Outfall 002. An analysis of five years of the most recent effluent and receiving water data resulted in changes to effluent limits.

CWA 402(o)(B)(i) provides exception to antibacksliding provisions if information which was not available at the time of permit issuance and would have justified the application of a less stringent effluent limitation at the time of permit issuance. Outfall 001 and Outfall 002 did have some limitations that are less stringent or removed (where no reasonable potential was indicated) based on the collection and statistical analysis of new effluent data which satisfies the condition for antibacksliding exception under CWA 402(o)(B)(i).

CWA §303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions: the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations. Since the receiving waters for Outfall 001 and Outfall 002 do not have TMDLs, further evaluation under CWA §303(d)(4)(A) provision is not required.

CWA §303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or ELGs. Since the receiving waters for Outfall 001 and Outfall 002 meets water quality to support the waterbody's designated uses, further evaluation under this provision is not required.

An analysis of Outfall 001 sample data showed that there is no potential to exceed WQS for arsenic, cadmium, chromium, lead, mercury, nickel, nitrate, selenium, silver, and zinc. Consequently, the permit no longer requires limits for those parameters where ELGs do not apply, including nickel and nitrate. Monitoring requirements for arsenic, chromium, selenium and silver, which did not have limits in the previous permit, were removed. The following parameters had daily maximum and/or monthly average limits increased including, aluminum, cadmium, copper, iron, lead, manganese and zinc.

Similar to Outfall 001, Outfall 002 also has new information that has been collected to characterize the effluent and determine permit limits. An analysis of Outfall 002 sample data showed that there is no potential to exceed WQS for ammonia, arsenic, chromium, copper, lead, mercury, nickel, nitrate, selenium, silver, and zinc. Consequently, the permit no longer requires limits for those parameters where effluent limit guidelines do not apply including ammonia, chromium total, chromium VI, nickel, nitrate, selenium, and silver. Monitoring requirements, which did not have limits in the previous permit, including arsenic, chromium total, and chromium VI were removed. The following parameters had daily maximum and/or monthly average limits increased including, aluminum, cadmium, copper, iron and lead.

For metals with hardness-based limits, the previous permit implemented scaled limits based on specified hardness ranges for cadmium, copper, lead, nickel, silver and zinc. The permit has eliminated scaled hardness-based limits and based the limits on the 15th percentile hardness value that was determined from receiving water hardness data for the period of record. An analysis of the effluent data for the affected parameters for the period of record indicates that compliance with non-scaled hardness-based limits are achievable. The effect of removing the scaled hardness-based limits increased or decreased the limit in comparison to the most stringent (lowest hardness scale) limit of the previous permit.

Sediment and biomonitoring, as described in Fact Sheet Sections 4.6 and 4.7, have been modified at the request of ADF&G. Specific changes to this monitoring program are described in Table 10. ADF&G provided recommendations to modify the sediment and biomonitoring program based on the monitoring results and analysis of data collected from the previous the permit cycle.

The analysis of five years of the most recent effluent and receiving water data and resulting in changes to reasonable potential and effluent limits constitutes new information that justifies the imposition of permit conditions different from the existing permit. With the exception of monitoring frequencies, which were adjusted based on new effluent performance data, all other permit effluent limits, standards, and conditions in AK0050571 are at least as stringent—if not more so—as in the previously issued permit and are consistent with 18 AAC 83.480. Accordingly, no further backsliding analysis is required for the permit issuance.

7.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy.

The Antidegradation Policy of the WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation Policy.

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 the Department's Policy and Procedure Guidance for Interim Antidegradation Implementation Methods, dated July 14, 2010. Using these requirements and policies, the Department determines whether a waterbody, or portion of a waterbody, is classified as Tier 1, Tier 2, or Tier 3, where a higher numbered tier indicates a greater level of water quality protection. At this time, no Tier 3 waters have been designated in Alaska. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 water, which is the next highest level of protection and is more rigorous than a Tier 1 analysis.

The state's Antidegradation Policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (i.e., Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that five specific requirements of the Antidegradation Policy at 18 AAC 70.015(a)(2)(A)-(E) are met. The Department's findings follow:

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.

   Based on the evaluation required per 18 AAC 70.015(a)(2)(D), the Department has determined that the most reasonable and effective pollution prevention, control, and treatment methods are being used and that the localized lowering water of quality is necessary.

   Kensington contributes substantial economic benefit to local and state economies by providing employment opportunities, business to supporting industries, and annual payments to local government and the State. In 2014, Kensington had 320 full-time employees and paid $41 million in wages and benefits. Kensington is the second largest private employer in southeast Alaska. Average annual wages are among the highest in the City and Borough of Juneau. The operation of the mine supports local businesses that sell products or provide services. These businesses include corporations owned by Alaska Natives, such as Goldbelt, Incorporated.

   Kensington is the second largest payer of property taxes in the City and Borough of Juneau. In 2014, Kensington paid $1.6 million dollars in local property taxes. In addition, employees living in Juneau helped to fund local government through the payment of property taxes and sales tax (Juneau has a local sales tax of five percent).

   Annual payments from Kensington to the State of Alaska include corporate taxes, the mining license tax, and royalty payments for mining on state land. Collectively, the mining industry in Alaska accounts for 15% of Alaska's non-petroleum corporate income tax receipts. In 2015, Kensington produced more than 126,000 ounces of gold, which represents more than $150 million dollars in gross metal value at current prices. Coeur is actively exploring for new ore zones to extend the life and increase the productivity of the mine. In 2014, Coeur budgeted $6.2 million dollars for exploration.

   As noted above, the operation of Kensington is important to the economies of the City and Borough of Juneau and to the state of Alaska. The Department finds that authorization of the mine's discharge accommodates important economic activity and that this requirement is met.

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 WET limit in 18 AAC 70.030.

   The permit prohibits violation of the water quality criteria in 18 AAC 70.020. The permit establishes effluent limits and monitoring for discharges at Outfall 001 and Outfall 002 to ensure that the applicable water quality criteria for Sherman Creek and East Fork Slate Creek are met

   Discharges authorized under AK0050571 will not violate applicable water quality criteria, as allowed under 18 AAC 70.235. Under this regulation, the Department may establish a site-specific water quality criteria that modifies a water quality criterion set for a water body. Pursuant to 18 AAC 70.235(b), the Department has established site-specific criteria for Sherman Creek (see Fact Sheet Section 5.1 for details).

   Historic WET test results indicate that the discharge is not toxic and therefore reducing water quality will not violate the WET limit. WET testing is required annually for outfalls 001 and 002. If WET tests reveal the discharge has toxicity, the permittee shall perform accelerated testing and identify the source of the toxicity. The permittee must notify DEC of the exceedance in writing within 14 days of receipt of test results. WET results from this permit issuance will be used when the permittee applies for reissuance of the permit to ensure the applicable criteria of 18 AAC 70.030 are met. The Department finds that the reduced water quality will not violate applicable water quality criteria at the point of discharge authorized for Outfall 001 and Outfall 002.

   The Department finds that the reduced water quality will not violate applicable water quality criteria and that the finding is met.

3. **18 AAC 70.015(a)(2)(C).** The resulting water quality will be adequate to fully protect existing uses of the water.

   Analysis of effluent monitoring data collected from five years during the permit cycle shows that discharges are adequately controlled to protect existing water body uses. The effluent limits, which are set to be protective of the water quality criteria, required by the permit ensures that all uses are fully protected.

   The permit requires the collection of biomonitoring samples in both receiving waters. The sample results of the biomonitoring study are published annual as a part of the Annual Water Quality Monitoring Summary (permit part 1.6). ADF&G further evaluates the biomonitoring results to identify and assess potential effect of mining to local aquatic life in an annually published report titled, “Aquatic Studies at Kensington Gold Mine” (DFG, 2015). The reports indicate that aquatic life was protected for the previous permitting period and that variability of aquatic life population density and variability are within the expected ranges of seasonal variability.

   The Department concludes that the resulting water quality will be adequate to fully protect existing uses and that the finding is met.

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.

EPA promulgated ELGs for the ore mining and dressing point source category at 40 CFR Part 440, Subpart J identifies the parameters and TBELs required for outfalls 001 and 002 are described in Fact Sheet Section 4.1. An evaluation of effluent data indicates that water treatment at Outfalls 001 and 002 substantially exceeds minimum treatment performance requirements of the ELGs applicable to this facility.

The permittee is required to implement a best management practices (BMP) plan. The BMP Plan includes pollution prevention measures and controls appropriate for each facility and discharge. The design, construction, and performance of the water treatment plants has also been reviewed and approved by the Department consistent with 18 AAC 72.

The permittee is required to maintain and operate wastewater treatment systems that discharge through Outfall 001 and Outfall 002, respectively. The design and operation of the water treatment facilities are subject to Department review and approval prior to discharge. A description of the water treatment facilities for Outfall 001 and Outfall 002 is summarized in Permit Section 2.2. Water treatment facility performance is determined by the effluent monitoring results that are in compliance with permit effluent limits.

The Department finds that the most effective methods of prevention, control, and treatment are the practices and requirements set out in the permit and currently in use at this mine. The Department finds this criterion is met

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.

   Applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.990(30) (as amended June 26, 2003) and in the July 14, 2010 DEC guidance titled "*Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*." Accordingly, there are three parts to the definition, which are:

   - (A) any federal technology-based effluent limitation identified in 40 CFR § 125.3 and 40 CFR § 122.29, as amended through August 15, 1997, adopted by reference;
   - (B) minimum treatment standards in 18 AAC 72.040; and
   - (C) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter.

   The first part of the definition includes all applicable federal technology-based ELGs. EPA promulgated ELGs for the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores point source category at 40 CFR Part 440 Subpart J (adopted by reference at 18 AAC 83.010(g)(3)). The ELGs applicable to a new source, which is a source that has commenced construction after the ELGs were established on December 3, 1982, are applicable to discharges from active mines, and these ELGs apply to outfalls 001 and 002.

   For both outfalls, all applicable federal and state technology-based ELGs have been incorporated into the permit. Therefore, the Department concludes that this requirement is met.

   The second part of the definition 18 AAC 70.990(B) (2003) appears to be in error, as 18 AAC 72.040 describes discharges to sewers and not minimum treatment. The correct reference appears to be the minimum treatment standards found at 18 AAC 72.050, which refers to domestic wastewater discharges only. No discharge of domestic wastewater is authorized under the permit; therefore, further analysis under this regulation is not required.

The third part of the definition 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 implementing BMPs, as well as other permit requirements, will control the discharge and satisfy all applicable federal and state requirements.

The Department finds that the treatment required in the permit achieves the highest statutory and regulatory requirements, and this finding is met.

8.0 OTHER PERMIT CONDITIONS

8.1 Electronic Reporting (E-Reporting) Rule

The Permittee is responsible for electronically submitting DMRs and other reports in accordance with 40 CFR §127. The start dates for e-reporting are provided in 40 CFR §127.16. DEC has established a website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm that contains general information. As DEC implements the E-Reporting Rule, more information will be posted on this webpage. The permittee will be further notified by DEC in the future about how to implement the conditions in 40 CFR §127.

8.2 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the Quality Assurance Project Plan (QAPP) within 60 days of the effective date of the final permit. Additionally, the permittee must submit a letter to the Department within 120 days of the effective date of the permit stating that the plan has been implemented within the required time frame. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The plan shall be retained on site and made available to the Department upon request.

8.3 Best Management Practices Plan

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 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 plant site runoff, spillage or leaks, or erosion. The permit contains certain BMP conditions that must be included in the BMP plan. The permit requires the permittee to develop or update and implement a BMP plan within 60 days of the effective date of the final permit. The Plan must be kept on site and made available to the Department upon request.

8.4 Standard Conditions

Appendix A of the 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.

8.5 Compliance Schedule

A white residue in the Sherman Creek substrate sporadically occurs originating from Outfall 001 and ending near the mouth of the creek. An ADF&G biomonitoring study of Sherman Creek conducted in 2015 observed a lower abundance of sensitive taxa and lower proportions of sensitive aquatic insects in Lower Sherman Creek benthic macroinvertebrate samples in comparison to the previous year, which suggests that the residue may have a detrimental effect on the macroinvertebrate population.

Accordingly, the following compliance schedule (as allowed per 18 AAC 70.910) is designed to implement a regular monitoring schedule for residue detection and documentation, additional studies to determine the source and cause of residue formation and, if necessary, possible modification to the effluent treatment system to prevent future residue formation from occurring in Sherman Creek. In order to comply with the water quality standards in 18 AAC 70.020(b)(8) and 18 AAC 70.020(b)(11), the permittee shall comply with the following schedule:

Table 11: Compliance Schedule for Outfall 001

Action Number	Action	Completion Date (months after permit effective date)
1	Summary of Work Completed to Date	1 month
2	Prepare a Monitoring Plan	3 months
3	Implement the Monitoring Program	6 months
4	Conduct water treatment modification alternative analysis	10 months
5	Conduct water treatment modification bench scale testing (includes toxicity testing)	14 months
6	Preliminary water treatment modification report	17 months
7	Conduct temporary full-scale water treatment modification testing	22 months
8	Review monitoring data and evaluate results	24 months
9	Final water treatment modification report	26 months
10	Construction of water treatment modification system	31 months
11	Full implementation of system	36 months

9.0 OTHER CONSIDERATIONS

9.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with USFWS or NMFS regarding permitting actions. However, DEC values input from the Services on ESA concerns, and on September 26, 2016, DEC solicited USFWS and NMFS for feedback about ESA impacts associated with the permit and has not received a response.

9.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NMFS when any activity to be permitted, funded, or undertaken by a federal agency has the potential to adversely affect (reduce quality and/or quantity of) Essential Fish Habitat (EFH). EFH includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity.

As a state agency, DEC is not required to consult with NMFS regarding permitting actions. However, DEC is concerned with protecting EFH, and on September 26, 2016, DEC solicited NMFS for feedback on EFH impacts associated with the permit and has not received a response.

9.3 Permit Expiration

The permit will expire five years from the effective date of the permit.

10.0 REFERENCES

Bragdon-Cook, Kathryn. 1993. Recommended Methods for Measuring TOC in Sediments. Puget Sound Dredged Disposal Authority Annual Review. May 1993.

DEC (Alaska Department of Environmental Conservation). 2003. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation. June 26, 2003.

DEC. 2008a. 18 AAC 83, Alaska Pollutant Discharge Elimination System. State of Alaska, Department of Environmental Conservation. October 31, 2008.

DEC. 2008b. 18 AAC 70, Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. State of Alaska, Department of Environmental Conservation. December 12, 2008.

DEC. 2009a. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation. September 19, 2009.

DEC. 2009b. 18 AAC 72, Wastewater Disposal. State of Alaska, Department of Environmental Conservation. December 23, 2009.

DEC. 2010a. Interim Antidegradation Implementation Methods, Effective July 14, 2010. State of Alaska, Department of Environmental Conservation, Policy and Procedure No. 05.03.103.

DEC. 2010b. Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report. July 15, 2010.

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DFG. 2015. Aquatic Studies at Kensington Gold Mine, 2015. Technical Report No. 16-03. February 2016

EPA (U.S. Environmental Protection Agency). Recommended Protocols for Measuring Selected Environmental Variables. Puget Sound Estuary Program, as updated by Washington Department of Ecology. EPA 910/9-86-157.

EPA (U.S. Environmental Protection Agency). 1986. Graphite Furnace Atomic Absorption Spectrometry. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA SW-846.

EPA. 1986. Inductively Coupled Plasma Emission Spectrometry. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA SW-846.

EPA. 1986. Mercury Digestion and Cold Vapor Atomic Absorption Spectrometry. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA SW-846.

EPA. 1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

EPA. 1993. Guidance Manual for Developing Best Management Practices (BMP). Office of Water, October 1993, EPA 833-B-93-004.

EPA. 1996b. The Metals Translator: Guidance for Calculation a Total Recoverable Permit Limit from a Dissolved Criterion. June 1996, EPA 823-B-96-007.

EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. October 2002, EPA 821-F-02-013.

EPA. 2010. NPDES Permit Writer's Manual. EPA, Office of Water, Office of Wastewater Management, Permits Division. Washington, DC. September 2010. EPA 833-K-10-001.

APPENDIX A. FACILITY INFORMATION

Figure 1: Kensington Gold Project Location Map

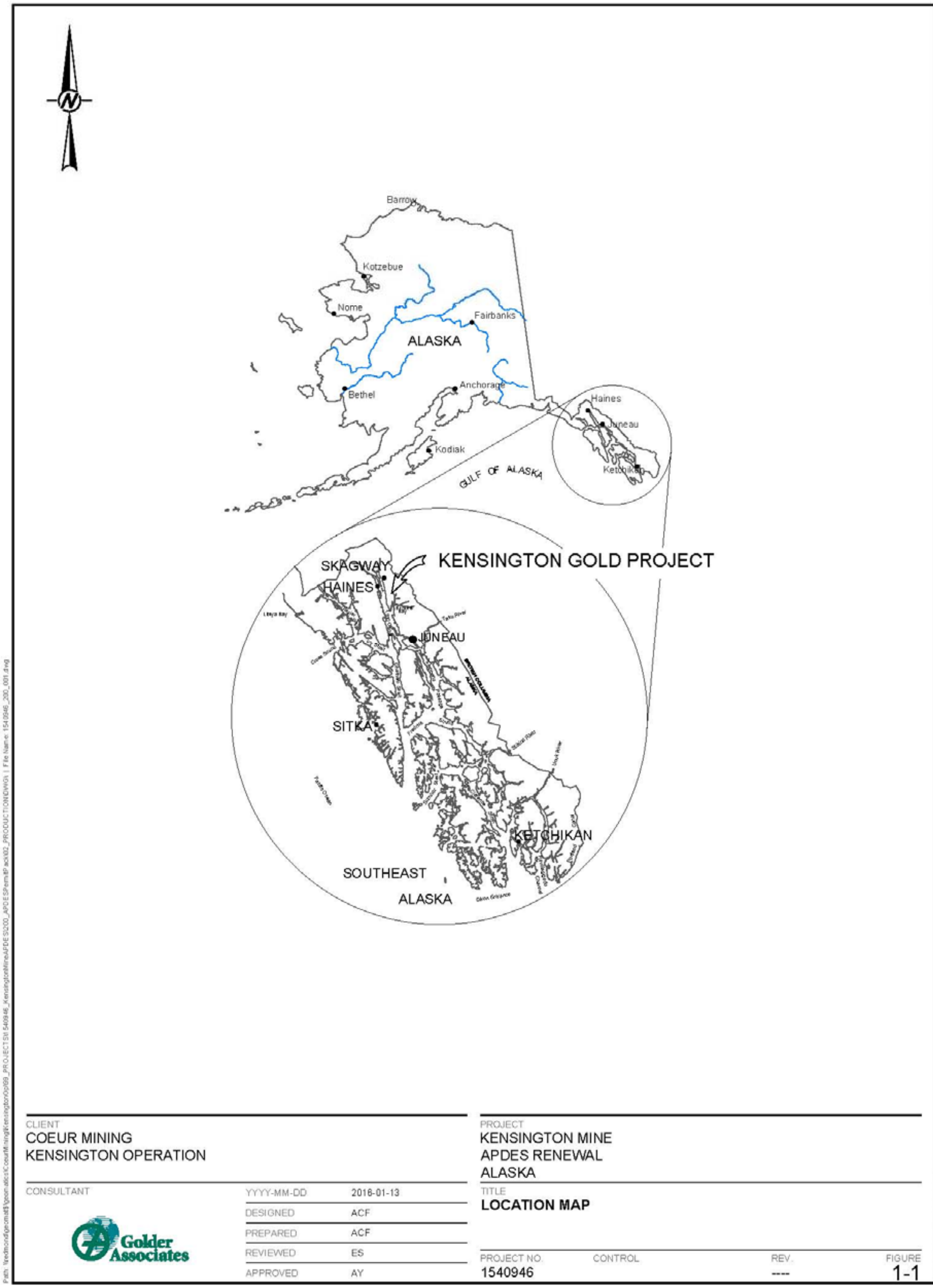


Figure 2: Site Map—Outfall 001

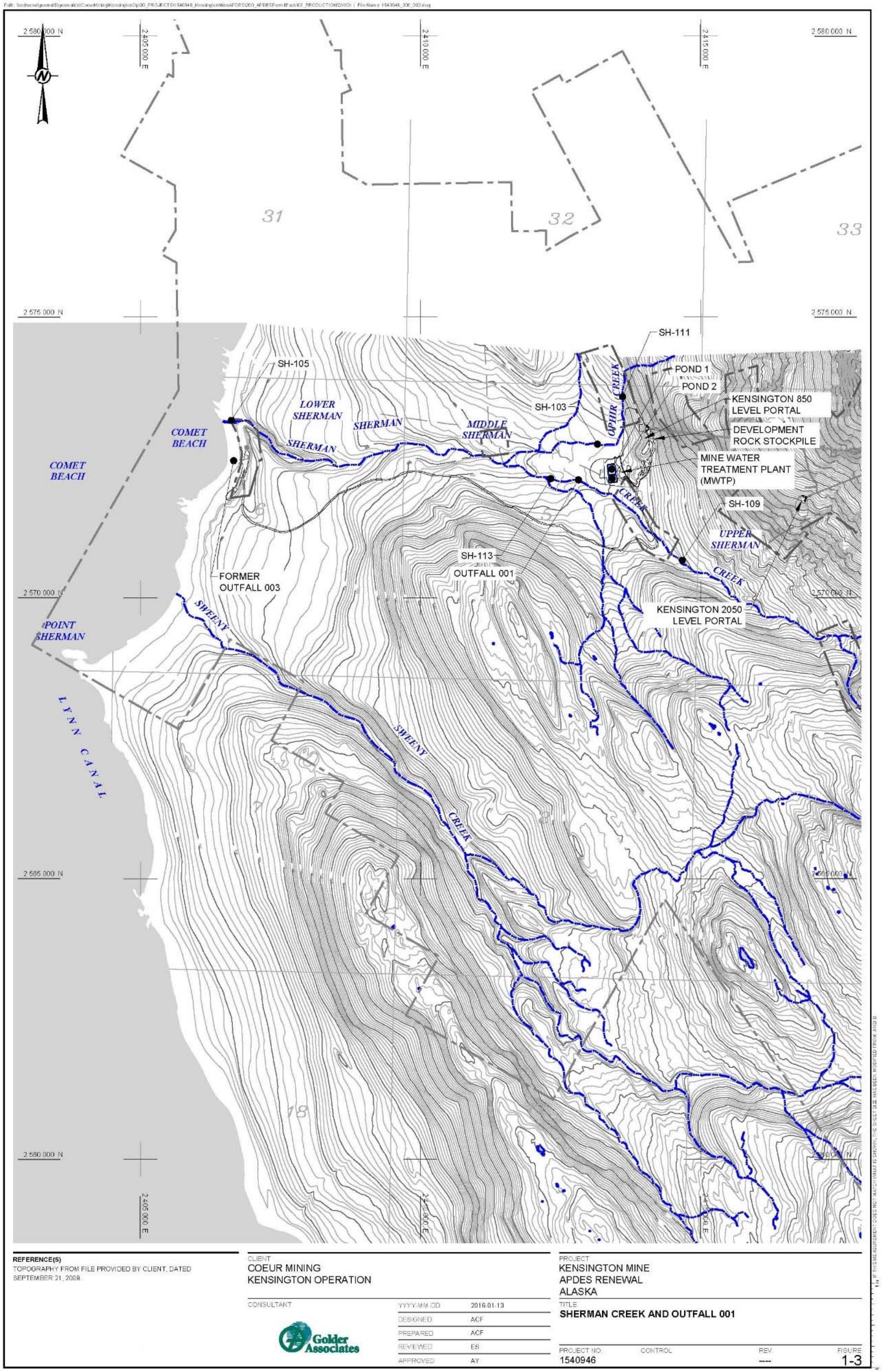


Figure 3: Site Map—Outfall 002

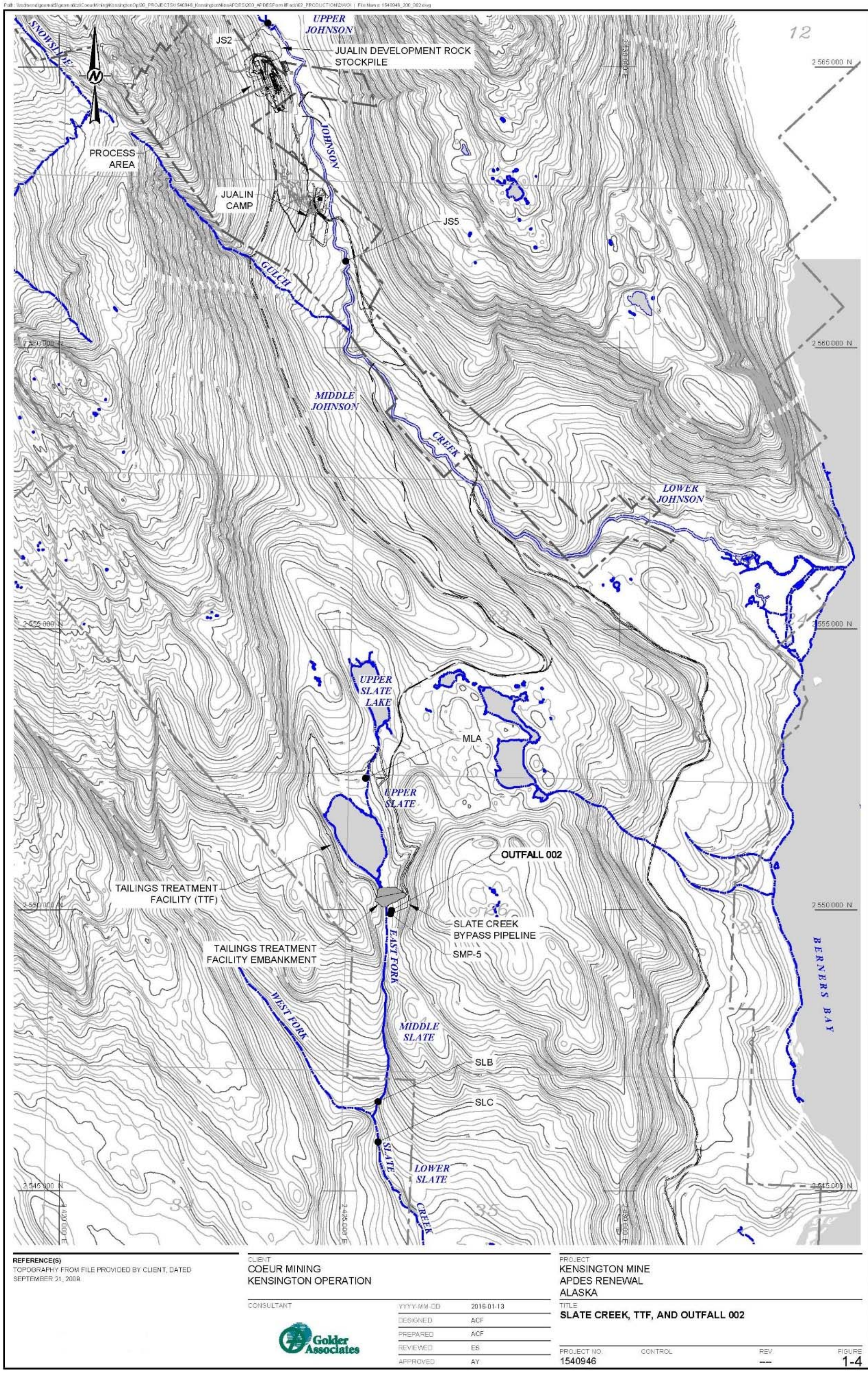
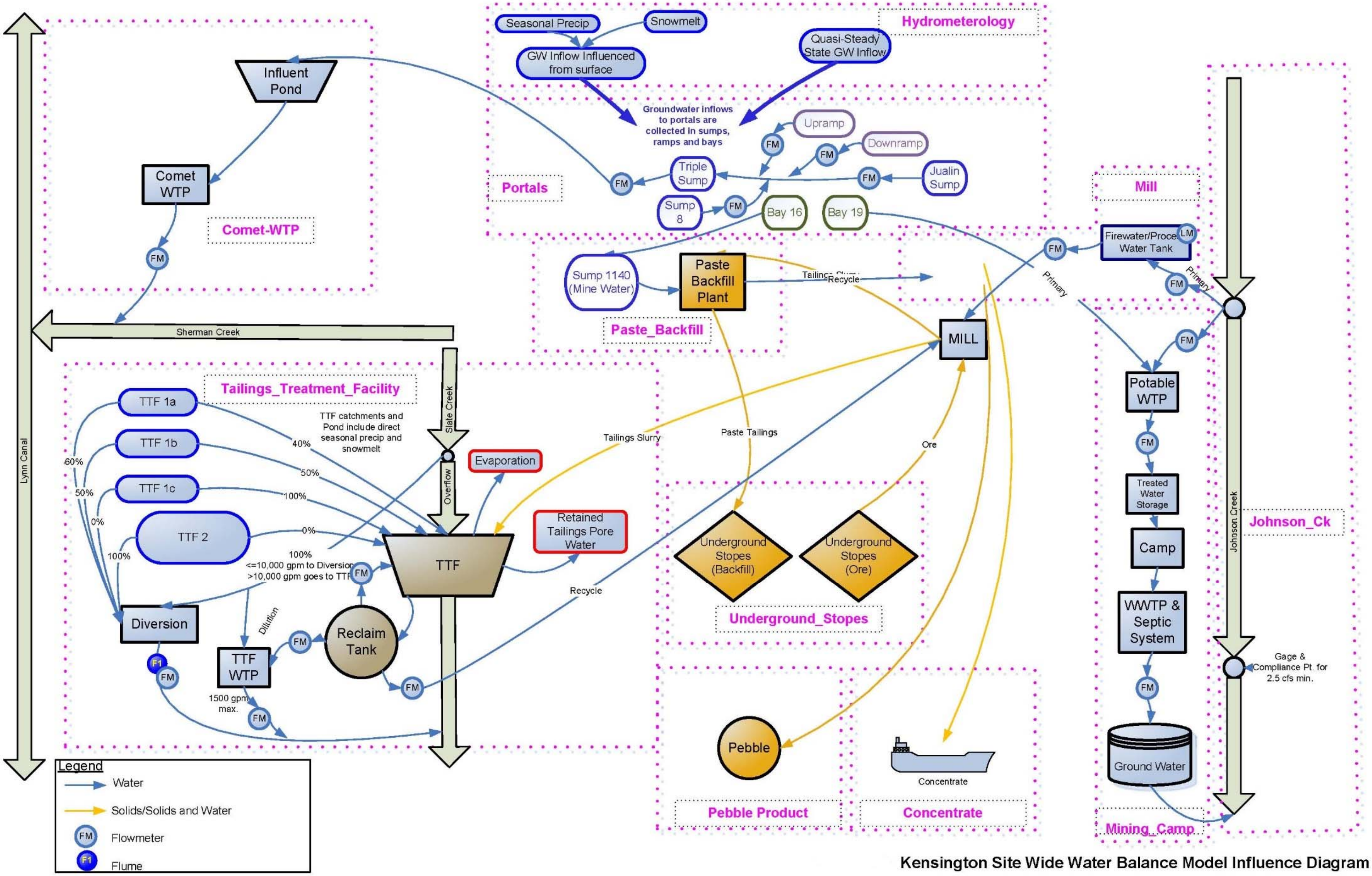


Figure 4: Line Drawing



APPENDIX B. BASIS FOR EFFLUENT LIMITS

The Clean Water Act (CWA) requires facilities to meet effluent limits based on available wastewater treatment technology, specifically, technology-based effluent limits (TBELs). TBELs are promulgated nationally by the Environmental Protection Agency (EPA) via Effluent Limitation Guideline (ELG) rulemakings and establish performance standards for all facilities within an industrial category or subcategory. The Alaska Department of Environmental Conservation (DEC or the Department) may find, by analyzing the effect of an effluent discharge on the receiving water body, that TBELs are not sufficiently stringent to meet State water quality standards (WQS). In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBEL), which are designed to ensure that the WQS of the receiving water body are met.

TBELs for facilities do not limit every parameter that may be present in the effluent. Depending on where the facility draws its water and how it handles its wastewater, the effluent may contain other pollutants not regulated by TBELs. When TBELs do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a WQS for the water body. If a pollutant causes or contributes to an exceedance of a WQS, a WQBEL for the pollutant must be established in the permit.

B-I Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the legal basis for the effluent limitations and other conditions in the permit. The Department evaluates the discharges with respect to these sections of the CWA and the relevant Alaska Pollutant Discharge Elimination System (APDES) regulations to determine which conditions to include in the permit.

In general, the Department first determines if any federally-promulgated TBELs have been developed that must be considered as minimum permit limits. The Department then evaluates the effluent quality expected to result from these controls to see if the discharge could result in any exceedances of the WQS in the receiving water. If reasonable potential exists that exceedances could or will occur, the Department must include WQBELs in the permit. The final selected permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent.

B-II Outfalls 001 and 002 - Technology-Based Evaluation

Section 301(b) of the CWA requires industrial dischargers to meet technology-based ELGs established by EPA. These are enforceable through their incorporation into an APDES permit. Direct dischargers that are new sources must meet New Source Performance Standards (NSPS), which are based on the best available demonstrated control technology. These NSPS apply to a source that has commenced construction after the ELGs were established and, as such, are directly applicable to the discharge of treated mine drainage and contact water from outfalls 001 and 002 at Kensington.

In 40 CFR Part 440 Subpart J EPA established ELGs for the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores point source category. These ELGs apply NSPS to a new source mine, which is a source that has commenced construction after the ELGs were established on December 3, 1982. The NSPS that apply to Kensington are shown in Table B-1.

Table B-1: Technology-Based Effluent Limits for Outfalls 001 and 002

Parameter	Units	Maximum for any 1 day	Average of daily values for 30 consecutive days	Range
Cadmium	mg/L[a]	0.10	0.05	-
Copper	mg/L	0.30	0.15	-
Lead	mg/L	0.6	0.3	-
Mercury	mg/L	0.002	0.001	-
Zinc	mg/L	1.5	0.75	-
pH	s.u.[b]	-	-	6.0-9.0
Total Suspended Solids (TSS)	mg/L	30.0	20.0	-

a. Milligrams per liter.
b. Standard units.

B-III Water Quality-Based Evaluation

In addition to the TBELs discussed above, the Department evaluated the Kensington discharges to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires permit limits necessary to meet WQS.

Under 18 AAC 83.435, the Department must implement Section 301(b)(1)(C) of the CWA. It requires that APDES permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state WQS, including state narrative criteria for water quality." The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

To determine if WQBELs are needed and to develop those limits when necessary, the Department follows guidance in the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (RPA Guidance, 2014). The water quality-based analysis consists of the following three step sequence:

1. Identify the applicable water quality criteria (see Section B-III.A);
2. Determine if there is "reasonable potential" for the discharge to exceed a water quality criterion in the receiving water (see APPENDIX C);
3. If there is "reasonable potential" or where a parameter has a technology-based limit and it requires dilution to meet WQS, develop effluent limits based on the WLA (see Section APPENDIX D).

The following sections provide a detailed discussion of each step.

B-III.A Water Quality Criteria

The first step in determining if WQBELs are needed is to identify the applicable water quality criteria. Alaska's WQS are found at 18 AAC 70. The applicable criteria are determined based on the beneficial uses of the receiving water.

The beneficial uses for Sherman Creek, the receiving water of Outfall 001, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

1. domestic water supply – 18 AAC 70.236(b)(3)

2. agriculture water supply – 18 AAC 70.020(b)(1)(A)(ii)
3. aquaculture water supply – 18 AAC 70.236(b)(3)
4. industrial uses – 18 AAC 70.020(b)(1)(A)(iv)
5. contact recreation – 18 AAC 70.020(b)(1)(B)(i)
6. secondary recreation – 18 AAC 70.020(b)(1)(B)(ii)
7. growth and propagation of fish, shellfish, other aquatic life, and wildlife – 18 AAC 70.236(b)(3)

In accordance with 18 AAC 70.235, Sherman Creek has site-specific water quality criteria for domestic water supply [18 AAC 70.020(b)(1)(A)(i)], aquaculture water supply [18 AAC 70.020(b)(1)(A)(iii)], and growth and propagation of fish, shellfish, other aquatic life, and wildlife [18 AAC 70.020(b)(1)(C)].

The beneficial uses for East Fork Slate Creek, the receiving water of Outfall 002, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

1. domestic water supply – 18 AAC 70.020(b)(1)(A)(i)
2. agriculture water supply – 18 AAC 70.020(b)(1)(A)(ii)
3. aquaculture water supply – 18 AAC 70.020(b)(1)(A)(iii)
4. industrial uses – 18 AAC 70.020(b)(1)(A)(iv)
5. contact recreation – 18 AAC 70.020(b)(1)(B)(i)
6. secondary recreation – 18 AAC 70.020(b)(1)(B)(ii)
7. growth and propagation of fish, shellfish, other aquatic life, and wildlife – 18 AAC 70.020(b)(1)(C)

For a given pollutant, different uses may have different criteria. To protect all beneficial uses, the reasonable potential analysis and permit limits are based on the most stringent water quality criteria for protecting those uses. For Sherman Creek, the most stringent applicable criteria are summarized in Table B-2.

Table B-2: Most Stringent of the Water Quality Criteria Applicable to Kensington Discharges Into Sherman Creek (Outfall 001)

Parameter[a] (µg/L unless otherwise noted)	Acute	Chronic	
	Aquatic Life Criterion	Aquatic Life Criterion	Human Health Criterion
Aluminum	750	87	N/A
Ammonia as N	18.43	4.17	N/A
Arsenic	340	150	10
Cadmium[b]	1.08	0.17	5
Chlorine, Total Residual	19	11	N/A
Chromium, Total	N/A	N/A	100
Copper[b]	7.46	5.27	200
Iron	N/A	1,000	5,000
Lead[b]	34.6	1.36	50
Manganese	N/A	N/A	50
Mercury	2.4	0.012	0.05
Nickel[b]	266.7	29.65	200
Nitrate as N	N/A	N/A	10,000
Selenium	20	5	10
Silver	1.2	N/A	N/A
Zinc	68.05	68.05	2,000

Parameter[a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Chronic Human Health Criterion
Sulfate (mg/L)[c]	N/A	200	250
Total Dissolved Solids (TDS, mg/L)	N/A	N/A	1,000
pH (s.u.)	within the range of 6.5 - 8.5		
a. Criteria for metals have been converted to total recoverable. b. Hardness-based limits using a hardness of 51 mg/L $CaCO_3$, the 15th percentile of background data. c. 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.			

For East Fork Slate Creek, the most stringent applicable criteria are summarized in Table B-3.

Table B-3: Most Stringent of the Water Quality Criteria Applicable to Kensington Discharges Into East Fork Slate Creek (Outfall 002)

Parameter[a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Chronic Human Health Criterion
Aluminum	750	87	N/A
Ammonia as N	12.74	3.29	N/A
Arsenic	340	150	10
Cadmium[b]	1.57	0.22	5
Chlorine, Total Residual	19	11	N/A
Chromium, Total	N/A	N/A	100
Copper[b]	10.54	7.21	200
Iron	N/A	1,000	5,000
Lead[b]	55.62	2.17	50
Manganese	N/A	N/A	50
Mercury	2.4	0.012	0.05
Nickel[b]	363.54	40.42	200
Nitrate as N	N/A	N/A	10,000
Selenium	20	5	10
Silver	2.3	N/A	N/A
Zinc	92.8	92.8	2,000
Sulfate (mg/L)	N/A	N/A	250
Total Dissolved Solids (TDS, mg/L)	N/A	N/A	500
pH (s.u.)	within the range of 6.5 - 8.5		
a. Criteria for metals have been converted to total recoverable. b. Hardness-based limits using a hardness of 74 mg/L $CaCO_3$, the 15th percentile of background data.			

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Department used to determine if the discharge authorized in the permit has the reasonable potential (RP) to cause or contribute to a violation of State Water Quality Standards (WQS). The Department used the basic process described in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) (*RPA Guidance)* to determine RP for any pollutant to exceed a water quality criterion (WQC).

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of WQC for a given pollutant, the Department compares the maximum projected receiving water body concentration to the criteria for that pollutant. RP to exceed exists if the projected receiving water body concentration exceeds the criteria, and a WQBEL must be included in the permit (18 AAC 83.435).

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the discharge. For criteria that are expressed as maxima, the 85^{th} percentile of the ambient data is generally used as an estimate of the worst-case. If ambient data are not available, DEC uses 15% of the most stringent pollutant's criteria as a worst-case estimate. This section discusses how the maximum projected receiving waterbody concentration is determined.

Reasonable Potential Analysis

Reasonable potential was evaluated for outfalls 001 and 002. For each parameter, the Department compared the maximum projected concentration to the criteria for that pollutant to determine if there is "reasonable potential" to cause or contribute to an exceedance of a water quality criterion for each pollutant present in the discharge. If the projected concentration exceeds a criterion, there is "reasonable potential," and a limit must be included in the permit. The Department used the *RPA Guidance* to conduct the reasonable potential analysis. When a mixing zone is authorized, RP is evaluated at the boundary of an authorized mixing zone. However, this permitting action does not authorize a mixing zone, so RP is evaluated at the end of pipe prior to the effluent mixing with receiving waters.

Outfall 001

For Outfall 001, the maximum expected effluent concentrations were compared directly to the most stringent water quality criteria.

C_e (Maximum expected effluent concentration or MEC): The maximum expected effluent concentration was calculated using the statistical approach recommended in Section 2.4 of the *RPA Guidance*. In this approach, a maximum expected effluent concentration is derived by multiplying the maximum observed effluent concentration by a reasonable potential multiplier (RPM):

C_e = MEC = (maximum observed effluent concentration) x RPM

The RPM accounts for uncertainty in the effluent data. The RPM depends upon the amount of effluent data, the statistical distribution assigned to the data, and the variability of the data as measured by the coefficient of variation (CV). Effluent data for each pollutant of concern was analyzed in ProUCL—a statistical software package developed under the direction of EPA—and the statistical distributions and corresponding CVs that best fit the data were selected.

There are three equations in the *RPA Guidance* for calculating the RPM. Each equation is valid for certain statistical distributions or sample populations. These three equations—with the citation to the Section in the *RPA Guidance* in which they appear are:

Equation 2.4.1.1 (RPM for Small or Insufficient Data Sets)

$$\text{RPM} = \frac{\exp(z_{99}\hat{\sigma} - 0.5\hat{\sigma}^2)}{\exp(p_n\hat{\sigma} - 0.5\hat{\sigma}^2)}$$

Where,

$z_{99} =$ the z-statistic at the 99th percentile = 2.326

$\hat{\sigma} =$ $[\ln(CV^2 + 1)]^{1/2}$

$\hat{\sigma}^2 =$ $\ln(CV^2 + 1)$

$\mathrm{CV} =$ coefficient of variation (generally assumed to be 0.6 for small data sets)

$p_n =$ the z-statistic at the 95 percent confidence level = $(1\text{-}0.95)^{(1/n)}$

$n =$ the number of valid samples

Equation 2.4.2.1 (RPM for Non-Parametric, Normal, or Gamma Statistical Distributions)

$$\mathrm{RPM} = \frac{\exp(\hat{\mu}_n + z_{99}\hat{\sigma})}{\exp(\hat{\mu}_n + p_n\hat{\sigma})}$$

Where,

$\hat{\mu}_n =$ the mean calculated by ProUCL

$\hat{\sigma} =$ the standard deviation calculated by ProUCL

Equation 2.4.2.2 (RPM for Lognormal or Log-ROS Statistical Distributions)

$$\mathrm{RPM} = \frac{\exp(z_{99}\hat{\sigma}_y - 0.5\hat{\sigma}_y{}^2)}{\exp(p_n\hat{\sigma}_y - 0.5\hat{\sigma}_y{}^2)}$$

Where,

$\hat{\sigma}_y =$ the lognormal standard deviation calculated by ProUCL

$\hat{\sigma}_y{}^2 =$ the lognormal variance (square of the standard deviation calculated by ProUCL)

Table C-1 shows the assigned statistical distribution, references the equation used to calculate the RPM, and lists the calculated RPM for each parameter at Outfall 001.

Table C-1: RPM Calculation for Outfall 001

Parameter	Statistical Distribution	Equation	RPM
Aluminum	Lognormal	2.4.2.2	1.0
Ammonia as N	Log-ROS	2.4.2.2	1.0
Arsenic	N/A – user defined CV due to N < 10	2.4.1.1	1.1
Cadmium	Lognormal	2.4.2.2	1.0
Chlorine	Normal	2.4.2.2	1.0
Chromium, Total	N/A – user defined CV due to N < 10	2.4.1.1	1.1
Copper	Lognormal	2.4.2.2	1.0
Iron	Lognormal	2.4.2.2	1.0
Lead	N/A – user defined CV due to N < 10	2.4.1.1	1.0
Manganese	Lognormal	2.4.2.2	1.0
Mercury	Lognormal	2.4.2.2	1.2
Nickel	Lognormal	2.4.2.2	1.0
Nitrate as N	Lognormal	2.4.2.2	1.0
Selenium	Lognormal	2.4.2.2	1.0
Silver	N/A – user defined CV due to N < 10	2.4.1.1	1.1
Zinc	Log-ROS	2.4.2.2	1.0
Sulfate	Lognormal	2.4.2.2	1.0
TDS	Lognormal	2.4.2.2	1.0

Reasonable Potential Summary: Results of the reasonable potential analysis for Outfall 001 are provided in Table C-2.

Table C-2: Reasonable Potential Determination for Outfall 001

Parameter[a] (µg/L unless otherwise noted)	Effluent Data					Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
	Max Observed Effluent Conc.	Coefficient of Variation (CV)	Number of Samples	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)[b]		
Aluminum	113	0.86	312	1.0	113	87.0	yes
Ammonia as N	8.13	0.46	992	1.0	8.13	4.2	yes
Arsenic	<2.5	0.6	187	1.1	<2.64	10	no
Cadmium[c]	0.1	0.21	312	1.0	0.1	0.2	no
Chlorine	50	0.52	578	1.0	50	11	yes
Chromium, Total	7.9	0.6	188	1.1	8.71	100	no
Copper[c]	12.7	2.64	312	1.0	12.7	5.3	yes
Iron	1970	1.1	312	1.0	1970	1000	yes
Lead[c]	0.5	0.6	312	1.0	0.5	1.4	no
Manganese	512	1.56	321	1.0	512	50	yes
Mercury	0.01	0.98	177	1.2	0.01	0.012	no
Nickel[c]	4.3	0.93	312	1.0	4.3	29.7	no
Nitrate as N	16.1	0.80	312	1.0	16.1	10,000	no
Selenium	4.2	0.27	186	1.0	4.41	5.0	no
Silver	0.1	0.6	187	1.1	0.11	1.3	no
Zinc[c]	53.4	1.54	312	1.0	53.4	68	no
Sulfate (mg/L)	236	0.68	246	1.0	246.78	200	yes
TDS (mg/L)	818	0.28	313	1.0	818	1,000	yes

a. Criteria for metals have been converted to total recoverable.
b. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.
c. Hardness-based limits using a hardness of 51 mg/L $CaCO_3$, the 15th percentile of background data.

Outfall 002

For Outfall 002, the maximum expected effluent concentrations were compared directly to the most stringent water quality criteria.

C_e (maximum expected effluent concentration or MEC): The method used to determine the MEC for Outfall 002 is identical to the method previously described for Outfall 001. Table C-3 shows the assigned statistical distribution, references the equation used to calculate the RPM, and lists the calculated RPM for each parameter at Outfall 002.

Table C-3: RPM Calculation for Outfall 002

Parameter	Statistical Distribution	Equation	RPM
Aluminum	Lognormal	2.4.2.2	1.0
Ammonia as N	Log-ROS	2.4.2.2	1.0
Arsenic	N/A – user defined CV due to N < 10	2.4.1.1	1.1
Cadmium	Log-ROS	2.4.2.2	1.0
Chromium, Total	N/A – user defined CV due to N < 10	2.4.1.1	1.0
Copper	Log-ROS	2.4.2.2	1.0
Iron	Log-ROS	2.4.2.2	1.0
Lead	N/A – user defined CV due to N < 10	2.4.1.1	1.0
Manganese	Lognormal	2.4.2.2	1.0
Mercury	Log-ROS	2.4.2.2	1.0
Nickel	Log-ROS	2.4.2.2	1.0
Nitrate as N	Lognormal	2.4.2.2	1.0
Selenium	N/A – user defined CV due to N < 10	2.4.1.1	1.0
Silver	N/A – user defined CV due to N < 10	2.4.1.1	1.0
Zinc	Log-ROS	2.4.2.2	1.0
Sulfate	Lognormal	2.4.2.2	1.0
TDS	Lognormal	2.4.2.2	1.0

Reasonable Potential Summary: Results of the reasonable potential analysis for Outfall 002 are provided in Table C-4.

Table C-4: Reasonable Potential Determination for Outfall 002

Parameter[a] (µg/L unless otherwise noted)	Effluent Data					Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
	Max Observed Effluent Conc.	Coefficient of Variation (CV)	Number of Samples	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)[b]		
Aluminum	379.0	1.39	288	1.0	383.95	87.0	yes
Ammonia as N	1.73	0.55	288	1.0	1.74	3.3	no
Arsenic	<2.5	0.6	184	1.1	<2.64	10	no
Cadmium[c]	0.29	2.34	288	1.0	0.29	0.2	yes
Chromium, Total	<2.5	0.6	286	1.0	0.0	100	no
Copper[c]	3.2	0.52	288	1.0	3.22	7.2	no
Iron	2600	1.42	288	1.0	2634	1000	yes
Lead[c]	<0.16	0.6	288	1.0	<0.16	2.2	no
Manganese	420	1.52	304	1.0	420	50	yes
Mercury	0.01	0.61	288	1.0	0.01	0.012	no
Nickel[c]	11.6	0.65	288	1.0	11.69	40.4	no
Nitrate as N	5.34	0.74	288	1.0	5.38	10,000	no
Selenium	1.3	0.6	288	1.0	1.31	5.0	no
Silver	0.04	0.6	288	1.0	0.04	2.4	no
Zinc[c]	22.7	1.46	288	1.0	23.01	92.8	no
Sulfate (mg/L)	309	0.11	288	1.0	309.42	250	yes
TDS (mg/L)	621	0.1	289	1.0	621.7	500	yes

a. Criteria for metals have been converted to total recoverable.
b. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.
c. Hardness-based limits using a hardness of 74 mg/L $CaCO_3$, the 15th percentile of background data.

APPENDIX D. EFFLUENT LIMITS CALCULATION

Once the Alaska Department of Environmental Conservation (the Department or DEC) determines that the effluent has a reasonable potential to exceed State Water Quality Standards (WQS) or a parameter has a technology-based effluent limit (WQBEL) that exceeds WQS, a water quality-based effluent limit for the pollutant is developed. Outfalls 001 and 002 were shown to have reasonable potential to exceed WQS so WQBELs were developed.

The first step in calculating a permit limit is development of a wasteload allocation (WLA) for the pollutant. The WLA is the concentration of the pollutant that may be discharged while still ensuring that the downstream water quality criterion is met.

Outfall 001

The derivation of WQBELs for Outfall 001 is described below.

End-of-Pipe WLAs

In the absence of dilution, the applicable water quality criterion becomes the WLA. Establishing the criterion as the WLA ensures that the Permittee's discharge does not contribute to an exceedance of the criterion. There may be up to three different WLAs for a given pollutant if there are acute, chronic, and human health water quality criteria for the pollutant. These WLAs include the acute WLA (WLA_{acute}), chronic WLA ($WLA_{chronic}$), and the human health WLA (WLA_{hheath}).

Long Term Averages (LTAs)

Acute, chronic, and human health standards apply over different time frames; therefore, it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. The acute criteria are applied as a one-hour average, the chronic criteria are applied as a four-day average, and human health criteria generally apply over a lifetime of exposure. To allow for comparison, long term average (LTA) loads are calculated from the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 3 of the *RPA Guidance* to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability [using the Coefficient of Variation (CV)], sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.

The maximum daily limit is based on the CV of the data and the probability basis, while the average monthly limit is dependent on these two variables and the monitoring frequency. As recommended in the *RPA Guidance*, the Department used a probability basis of 95 percent for average monthly limit calculation and 99 percent for the maximum daily limit calculation.

The following is a summary of the steps to derive water quality-based effluent limits. Copper is used as an example.

Step 1- Determine the WLA

In this case, where there is no dilution, the acute, chronic, and human health criteria become the WLAs. As shown in Table B-2, the acute, chronic, and human health water quality criteria for copper are 7.5, 5.3, and 200 µg/L, respectively. Accordingly, the respective WLAs are:

$WLA_{acute} = 7.5$ µg/L

$WLA_{chronic} = 5.3$ µg/L

$WLA_{hhealth} = 200$ µg/L

<u>Step 2 - Determine the Long-Term Average (LTA)</u>

From Section 3.3 in the *RPA Guidance*,

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z_{99}\sigma)}$$

Where,

$\sigma^2 = \ln(CV^2 + 1)$

$\sigma^2 = \ln(2.637^2 + 1)$

$\sigma^2 = 2.0736$

$z_{99} = 2.326$ for 99th percentile probability basis

$\boldsymbol{LTA_{acute} = 0.74}$ **µg/L**

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5{\sigma_4}^2 - z_{99}\sigma_4)}$$

Where,

$${\sigma_4}^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$${\sigma_4}^2 = \ln\left(\frac{2.637^2}{4} + 1\right)$$

${\sigma_4}^2 = 1.0074$

$\boldsymbol{LTA_{chronic} = 0.85}$ **µg/L**

<u>Step 3 - Most Limiting LTA</u>

To protect a waterbody from both acute and chronic effects, the most limiting of the calculated LTAs is used to derive the effluent limitations. LTA_{acute} is the most limiting LTA.

<u>Step 4 - Calculate the Permit Limits</u>

The *RPA Guidance* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The MDL and the AML for aquatic life are calculated as follows:

$$\text{MDL}_{aquatic} = LTA_{acute} * e^{(z_{99}\sigma - 0.5\sigma^2)}$$

Where,

$\sigma^2 = 2.0736$ (as previously calculated)

$\boldsymbol{MDL_{aquatic} = 7.46}$ **µg/L**

$$\text{AML}_{aquatic} = LTA_{acute} * e^{(z_{95}\sigma_n - 0.5{\sigma_n}^2)}$$

Where,

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

$$\sigma_n^2 = \ln\left(\frac{2.637^2}{4} + 1\right)$$

$$\sigma_n^2 = 1.0074$$

z_{95} = 1.645 for 95$^{\text{th}}$ percentile probability basis

n = number of sampling events per month for copper = 4

$$\boldsymbol{AML_{aquatic} = 2.33\ \mu g/L}$$

The procedure for developing effluent limits for human health effects is different than for acute and chronic effects to aquatic life. The Department uses the procedure in Section 3.4.2 of the *RPA Guidance*. For copper,

$$\text{AML}_{hhealth} = WLA_{hhealth} = \mathbf{200\ \mu g/L}$$

$$\text{MDL}_{hhealth} = AML_{hhealth} \cdot \frac{e^{(z_{99}\sigma - 0.5\sigma^2)}}{e^{(z_{95}\sigma_n - 0.5\sigma_n^2)}}$$

Where,

$\sigma^2 = 2.0736$ (as previously calculated)

$\sigma_n^2 = 1.0074$ (as previously calculated)

$$\boldsymbol{\text{MDL}_{hhealth} = 641.36\ \mu g/L}$$

In this case, the MDL and AML for human health are less protective than the corresponding limits for acute and chronic effects to aquatic life. Consequently, the human health based limits were rejected in favor of the more stringent limits based on acute and chronic effects.

Table D-1 summarizes the water quality-based effluent limit calculations for Outfall 001.

Table D-1: Water Quality-Based Effluent Limit Calculations for Outfall 001

Parameter (µg/L unless otherwise noted)	**Most Stringent Water Quality Criterion**	**CV**	**WLA_{acute}**	**$WLA_{chronic}$**	**$WLA_{hhealth}$**	**$LTA_{limiting}$**	**MDL**	**AML**
Aluminum	87	0.86	750	87	N/A	36.47	155	66
Ammonia as N (mg/L)	4.2	0.46	18.43	4.17	N/A	3.44	9	4
Cadmium	10	0.6	1.08	0.17	5.0	0.13	0.21	0.15
Chlorine	11	0.52	19	11	N/A	6.25	17.4	7.3
Copper	5.3	2.64	7.5	5.3	200	0.74	7.5	2.3
Iron	1,000	1.1	N/A	1,000	5,000	346	1,840	705
Lead	1.4	0.6	34.9	1.36	50	0.720	2.2	1.1
Manganese	50	1.56	N/A	N/A	50	N/A	150	50
Mercury	0.1	0.98	2.4	0.01	0.05	0.0	0.02	0.01
Zinc	68	1.54	68.05	68.05	2,000	9.63	68	23
Sulfate (mg/L)	200	0.68	200	N/A	200	57.4	200	200
TDS (mg/L)	1,000	0.28	N/A	N/A	1,000	N/A	1,000	1,000

Outfall 002

The following is a summary of the steps to derive water quality-based effluent limits for Outfall 002. Copper is used as an example.

Step 1- Determine the WLA

In this case, where there is no dilution, the acute, chronic, and human health criteria become the WLAs. As shown in Table B-3, the acute, chronic, and human health water quality criteria for copper are 10.5, 7.2, and 200 µg/L, respectively. Accordingly, the respective WLAs are:

$$WLA_{acute} = 10.5 \text{ µg/L}$$

$$WLA_{chronic} = 7.2 \text{ µg/L}$$

$$WLA_{hhealth} = 200 \text{ µg/L}$$

Step 2 - Determine the Long-Term Average (LTA)

From Section 3.3 in the *RPA Guidance*,

$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z_{99}\sigma)}$

Where,

$\sigma^2 = \ln(CV^2 + 1)$

$\sigma^2 = \ln(0.5209^2 + 1)$

$\sigma^2 = 0.2401$

$z_{99} = 2.326$ for 99th percentile probability basis

$\boldsymbol{LTA_{acute} = 3.8\ \mu g/L}$

$LTA_{chronic} = WLA_{chronic} * e^{(0.5{\sigma_4}^2 - z_{99}\sigma_4)}$

Where,

$${\sigma_4}^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$${\sigma_4}^2 = \ln\left(\frac{0.5209^2}{4} + 1\right)$$

${\sigma_4}^2 = 0.0.0656$

$\boldsymbol{LTA_{chronic} = 4.11\ \mu g/L}$

<u>Step 3 - Most Limiting LTA</u>

To protect a waterbody from both acute and chronic effects, the most limiting of the calculated LTAs is used to derive the effluent limitations. LTA_{acute} is the most limiting LTA.

<u>Step 4 - Calculate the Permit Limits</u>

The *RPA Guidance* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The MDL and the AML for aquatic life are calculated as follows:

$\mathrm{MDL}_{aquatic} = LTA_{acute} * e^{(z_{99}\sigma - 0.5\sigma^2)}$

Where,

$\sigma^2 = 0.2401$ (as previously calculated)

$\boldsymbol{MDL_{aquatic} = 10.54\ \mu g/L}$

$\mathrm{AML}_{aquatic} = LTA_{acute} * e^{(z_{95}\sigma_n - 0.5{\sigma_n}^2)}$

Where,

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

$${\sigma_n}^2 = \ln\left(\frac{0.5209^2}{4} + 1\right)$$

${\sigma_n}^2 = 0.0656$

z_{95} = 1.645 for 95th percentile probability basis

n = number of sampling events per month for copper = 4

$\boldsymbol{AML_{aquatic} = 5.61\ \mu g/L}$

The procedure for developing effluent limits for human health effects is different than for acute and chronic effects to aquatic life. The Department uses the procedure in Section 3.4.2 of the *RPA Guidance*. For copper,

$AML_{hhealth} = WLA_{hhealth} = \mathbf{200\ \mu g/L}$

$$MDL_{hhealth} = AML_{hhealth} \cdot \frac{e^{(z_{99}\sigma - 0.5\sigma^2)}}{e^{(z_{95}\sigma_n - 0.5\sigma_n{}^2)}}$$

Where,

σ^2 = 0.2401 (as previously calculated)

$\sigma_n{}^2$ = 0.0656 (as previously calculated)

$\boldsymbol{MDL_{hhealth} = 376\ \mu g/L}$

In this case, the MDL and AML for human health are less protective than the corresponding limits for acute and chronic effects to aquatic life. Consequently, the human health based limits were rejected in favor of the more stringent limits based on acute and chronic effects.

Table D-2 summarizes the water quality-based effluent limit calculations for Outfall 002.

Table D-2: Water Quality-Based Effluent Limit Calculations for Outfall 002

Parameter (µg/L unless otherwise noted)	**Most Stringent Water Quality Criterion**	**CV**	**WLA_{acute}**	**$WLA_{chronic}$**	**$WLA_{hhealth}$**	**$LTA_{limiting}$**	**MDL**	**AML**
Aluminum	87	1.39	750	87	N/A	24.57	160	57
Cadmium	0.2	2.34	1.57	0.22	5.0	0.04	0.36	0.12
Copper	7.2	0.52	10.54	7.21	200	3.8	10.5	5.6
Iron	1,000	1.42	N/A	1,000	5,000	277	1840	650
Lead	2.2	0.6	55.62	2.17	50	1.14	3.6	1.8
Manganese	50	1.52	N/A	N/A	50	N/A	145	50
Mercury	0.1	0.61	2.4	0.01	0.05	0.01	0.02	0.01
Zinc	92.8	1.46	92.8	92.8	2,000	13.66	93	32
Sulfate	250	0.11	N/A	N/A	250	N/A	250	250
TDS	500	0.1	N/A	N/A	500	N/A	500	500

Summary of Permit Effluent Limitations

As discussed in APPENDIX B, technology-based and water quality-based limits have been applied to the outfall discharges. The following tables summarize the permit limits and the basis for each limit for outfalls 001 and 002.

Table D-3: Outfall 001 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Aluminum	μg/L	155	Chronic WQS	66	Chronic WQS
Total Ammonia, as N	mg/L	9.0	Chronic WQS	4.0	Chronic WQS
Cadmium	μg/L	0.21	Chronic WQS	0.15	Chronic WQS
Chlorine	μg/L	17.4	Chronic WQS	7.3	Chronic WQS
Copper	μg/L	7.5	Acute WQS	2.3	Acute WQS
Iron	μg/L	1,840	Chronic WQS	705	Chronic WQS
Lead	μg/L	2.2	Chronic WQS	1.1	Chronic WQS
Manganese	μg/L	150	Human Health WQS	50	Human Health WQS
Mercury	μg/L	0.02	Chronic WQS	0.01	Chronic WQS
Zinc	μg/L	68	Acute WQS	23	Acute WQS
Sulfate	mg/L	200	Acute WQS	200	Acute WQS
TDS	mg/L	1,000	Human Health WQS	1,000	Human Health WQS
Turbidity, effluent	μg/L	See Permit	Human Health WQS	See Permit	Human Health WQS
pH[a]	mg/L	See Permit	WQS	See Permit	WQS
TSS	mg/L	30	WQS	20	WQS
Outfall Flow	gpd	3,000	Design Capacity	---	---
WET	TU_c	1.6	Toxicity	1.1	Toxicity
a. 40 CFR § 401.17.					

Table D-4: Outfall 002 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Aluminum	µg/L	160	Chronic WQS	57	Chronic WQS
Cadmium	µg/L	0.36	Chronic WQS	0.12	Chronic WQS
Copper	µg/L	10.5	Acute WQS	5.6	Acute WQS
Iron	µg/L	1840	Chronic WQS	650	Chronic WQS
Lead	µg/L	3.6	Chronic WQS	1.8	Chronic WQS
Manganese	µg/L	145	Human Health WQS	50	Human Health WQS
Mercury	µg/L	0.02	Chronic WQS	0.01	Chronic WQS
Zinc	µg/L	93	Acute WQS	32	Acute WQS
Sulfate	mg/L	250	Human Health WQS	250	Human Health WQS
TDS	mg/L	500	Human Health WQS	500	Human Health WQS
Turbidity, effluent	µg/L	See Permit	WQS	See Permit	WQS
pH[a]	mg/L	See Permit	WQS	See Permit	WQS
TSS	mg/L	30	WQS	20	WQS
Outfall Flow	gpd	1,500	Design Capacity	---	---
WET	TU_c	1.6	Toxicity	1.1	Toxicity

a. 40 CFR § 401.17.