ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PROPOSED FINAL

Permit Number: AK0053341

Sumitomo Metal Mining Pogo LLC.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

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

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

SUMITOMO METAL MINING POGO LLC.

For wastewater discharges from

Pogo Mine into the Goodpaster River
Milepost 49, Pogo Mine Road
38 miles northeast of Delta Junction, Alaska

The Alaska Department of Environmental Conservation (the Department or DEC) has reissued an APDES individual permit (permit) to Sumitomo Metal Mining Pogo LLC. 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 discharges from Pogo Mine and the development of the permit including:

- information on appeal procedures
- a listing of effluent limitations, monitoring requirements, and other conditions
- technical material supporting the conditions 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 Avenue, Suite 303
Juneau, AK 99801

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, 99801

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, 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	
Fairbanks Office 610 University Ave. Fairbanks, AK 99709 (907) 451-2136	***Anchorage Office*** 555 Cordova Street Anchorage, AK 99501 (907) 269-6285

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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:	Pogo Mine
APDES Permit Number:	AK0053341
Facility Location:	38 miles northeast of Delta Junction, Alaska
Mailing Address:	PO Box 145, Delta Junction, AK 99737
Facility Contact:	Ms. Keri DePalma, Environmental Manager

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

2.0 FACILITY INFORMATION

2.1 Background

The Pogo Mine (Pogo) is an underground gold mine located 38 miles northeast of Delta Junction, Alaska. Sumitomo Metal Mining Pogo LLC operates the mine. Pogo started production in 2006. The permit is the second reissuance of the original National Pollutant Discharge Elimination System (NPDES) permit issued for the discharge, which was first issued in 2004.

Pogo processes (in a gold mill) approximately 3,000 tons of ore per day (tpd) and is permitted to feed gold ore at a rate of up to 3,500 tpd. Tailings from the mill are disposed of underground and at a drystack tailings facility on the surface. Pogo produces between 280,000 to 350,000 ounces of gold annually.

2.2 Facility and Wastewater Description

The Pogo facility consists of the following major elements:

- An underground cut-and-fill mine with conveyor access to transfer ore to the surface;
- Surface gold mill for gold recovery through gravity concentration, flotation, and cyanide leaching;
- Tailings preparation facilities, including cyanide destruction and filtration, to produce paste backfill for the underground mine workings and dewatered tailings material suitable for storage in a drystack facility on the surface;
- Two man camps—upper and lower—both with recreation and dining facilities;
- Transmission line along the Shaw Creek Hillside road and on-site electrical distribution system;
- 49 mile all-season road constructed along the Shaw Creek Hillside; and,
- A water management system that maximizes recycling and treats all waters affected by the project in accordance with pertinent federal and state requirements.

The permit authorizes the discharge of treated wastewater to the Goodpaster River at two locations (Outfall 001 and Outfall 002). The discharge from Outfall 001 consists of mine

drainage, excess precipitation, and wastewater from the incinerator scrubber. Wastewater is treated using an advanced treatment process and then is augmented with fresh water at the off-river treatment works (ORTW) and discharged to the Goodpaster River.

The ORTW is considered by the Environmental Protection Agency (EPA) to be a type of flow augmentation. Per 40 Code of Federal Regulations (CFR) 125.3(f), flow augmentation can be used only as a supplement to adequate treatment and not as a substitute. The monitoring data indicates that effluent from the treatment plant is within the technology-based effluent guidelines. If it does not meet these standards, the treated water is routed back to Mine Water Treatment Plant #3 (MWTP#3). Therefore, the Department considers the requirements for this alternative to be met. The effluent from the water treatment plant is sampled and monitored at regular intervals prior to entering the ORTW between the first and second ponds. Samples are also taken upstream of the intake to the ORTW to determine the natural condition of the river. The final effluent is sampled at Outfall 001, the discharge point from the second pond.

Monitoring also occurs at an internal outfall (Outfall 011). Monitoring data collected from Outfall 011 is used to characterize the waste stream and verify compliance with technology-based effluent limits (see Fact Sheet Section 4.1). At Outfall 011, water is sampled after treatment and prior to flow augmentation and is discharged at Outfall 001.

Spills of petroleum products have occurred underground at Pogo. These spills are typically of small volume (ten gallons or less), and reasonable efforts are made to capture and properly dispose of the spilled product. Nevertheless, it is possible that trace amounts of petroleum products could report to Outfall 011 or Outfall 001 and are, therefore, considered a potential contaminant of concern, as identified in the permit application.

The discharge from Outfall 002 consists of domestic wastewater (human body wastes from toilets and urinals and wastewater from sinks, showers, laundries, safety showers, and eyewash stations). This effluent stream is discharged to the Goodpaster River after treatment to tertiary domestic wastewater treatment standards.

3.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMRs) from May 2011 to May 2016 were reviewed to determine the facility's compliance with effluent limits. Table 1 and Table 2 present permit limitation exceedances for Outfalls 001 and 002.

Table 1: Outfall 001 Permit Limit Exceedances

Parameter	Date	Units	Monitoring		
			Basis	Permit Limit	Reported Value
Dilution Factor	November 2013	N/A	Daily Maximum	25	32
Lead	August 2014	µg/L[a]	Daily Maximum	1.3	2.33
Copper	August 2014	µg/L	Daily Maximum	4.5	5.20
Cyanide	April 2016	µg/L	Daily Maximum	20	24

a. Micrograms per liter.

An exceedance of the dilution factor limit occurred in 2013. A fiber optic cable that is used to control the dilution ratio was accidentally cut. Pumps were run in manual while the cable was repaired, and log sheets indicate that the dilution factor may have been exceeded during this time period.

There were exceedances of lead and copper in 2014. A follow up investigation initially targeted scrubber water from the incinerator. However, a mass balance analysis indicated that the introduction of the scrubber water was unlikely to trigger an exceedance of effluent limits. The exact cause of these exceedances have not been identified; however, no exceedances of permit effluent limits for metals have reoccurred.

Pogo reported two exceedances of the daily maximum for weak acid dissociable (WAD) cyanide in April 2016. The analytical method used for cyanide at Pogo (SM 4500-CN I) is based on colorimetry. It has been established that tannins, naturally present in the Goodpaster River, create interferences that reduce the precision of this analytical method. A follow up investigation suggests that high concentrations of tannins in the Goodpaster River in April were the most likely cause of the reported WAD cyanide exceedances.

Table 2: Outfall 002 Permit Limit Exceedances

Parameter	Date	Units	Monitoring		
			Basis	Permit Limit	Reported Value
Fecal Coliform Bacteria	June 2011	#/100 mL[a]	Monthly Average	200	666
Fecal Coliform Bacteria	June 2011	#/100 mL	Daily Maximum	400	30,000
Fecal Coliform Bacteria	July 2011	#/100 mL	Daily Maximum	400	570
Fecal Coliform Bacteria	August 2011	#/100 mL	Daily Maximum	400	9,000
Fecal Coliform Bacteria	September 2011	#/100 mL	Daily Maximum	400	200,000

a. Number per 100 milliliters.

There was a series of fecal coliform bacteria exceedances at Outfall 002 in 2011. The company took a number of corrective actions in response to these exceedances. These include increased effluent sampling, inspection and cleaning of the treatment system and replacement of wear items and sand filters, hauling decant water offsite for disposal, and the purchase and installation of a new UV system. Since these corrective actions were undertaken, Pogo has been in compliance with all permit limits at Outfall 002.

On June 6, 2012, Pogo entered into a Compliance Order by Consent (COBC) with DEC. The purpose of the COBC was to perform corrective actions and to resolve violations of the APDES Permit. The COBC was amended on October 1, 2013 and again on June 30, 2014. Pogo fully complied with the COBC. This included the payment of an economic recovery fee, the completion of the corrective action requirements to address the fecal coliform bacteria exceedances at Outfall 002 described above, and the construction of a new water treatment plant, MWTP#3. DEC authorized Pogo to operate MWTP#3 on January 8, 2016. Pogo fully complied with all provisions of the COBC, and the COBC was terminated on December 31, 2015.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

The Clean Water Act (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. A WQBEL is designed to ensure that the Water Quality Standards (WQS) of a waterbody are met and may be more stringent than TBELs. Both the TBELs in 40 CFR § 440 (adopted by reference in 18 AAC 83.010) and WQBELs are included in the permit. A detailed discussion of the basis for the effluent limits contained in AK0053341 is provided in APPENDIX B.

Outfall 001 discharges mine drainage and contact water from the mine site. 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. Subpart J is applicable to the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. The ELGs in Subpart J are applicable to Outfall 001.

The discharge at Outfall 001 is subject to the new source performance standards at 40 CFR § 440.104(a). These ELGs are applicable to a source that commenced construction after December 3, 1982. Table 3 identifies the parameters and TBELs for Outfall 001 found in 40 CFR Part 440.

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.

Outfall 002 discharges domestic wastewater from the site. The CWA requires a publicly owned treatment works (POTW) to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required technology-based performance level, referred to as “secondary treatment,” that all POTWs were required to meet by July 1, 1977. “Secondary treatment” TBELs are established in 40 CFR § 133.102 [which are adopted by reference at 18 AAC 83.010(e)]. The TBELs apply to all POTWs and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of the pollutants biochemical oxygen demand, 5-day (BOD_5), TSS, and pH.

Per 40 CFR § 125.3(c)(2), the Department is setting case-by-case best professional judgment (BPJ) under section 402(a)(1) of the CWA to implement technology-based secondary treatment requirements for the discharge from Outfall 002. The secondary treatment requirements found in 40 CFR § 133.102 were promulgated specifically for POTWs. While secondary requirements are only directly apply to POTWs, the Department is applying secondary treatment standards to Outfall 002 as these standards provide the most relevant baseline pollutant control guidelines for this identical wastestream.

In addition to the federal standards in 40 CFR § 133.102, Alaska has imposed additional standards for secondary treatment. These standards are found in the definition of secondary treatment at 18 AAC 72.990(59) and include a maximum daily limit for BOD_5 and TSS. Table 4 identifies the parameters and case-by-case BPJ established TBELs for Outfall 002.

Table 4: Technology-Based Effluent Limits for Outfall 002

Parameter	Units	Maximum Daily Limit	7-day Average	30-day Average	Range
BOD_5	mg/L	60	45	30	-
TSS	mg/L	60	45	30	-
pH	mg/L	-	-	-	6.0-9.0
Minimum removal rates for BOD_5 and TSS	%	-	-	85	-

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 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).

4.3 Effluent Limits and Monitoring Requirements

The permit contains effluent limits that are the most stringent of either TBELs or WQBELs and a flow limit based on the design of the treatment systems. Monitoring frequencies are based on the nature and effect of a pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples must be included in calculations and used for averaging if they are conducted using the Department-approved, significantly sensitive test methods (generally found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]) and if the MDLs are less than the effluent limits or the applicable compliance evaluation level.

Table 5 summarizes the effluent limits and monitoring requirements 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 5: Effluent Limits and Monitoring Requirements for Outfall 001

Parameter[c]	Units	Effluent Limits[a,b]					
		Daily Maximum		Monthly Average		Monitoring Frequency[d]	
		2011 Permit	2017 Permit	2011 Permit	2017 Permit	2011 Permit	2017 Permit
Arsenic	µg/L	—	X	—	X	1/month	X
Cadmium[e]	µg/L	0.2	0.2	0.1	0.1	1/week	1/month
Copper[e]	µg/L	4.5	6.5	2.2	2.8	1/week	1/week
Cyanide[f]	µg/L	6.9	9.0	4.7	4.1	1/week	1/week
Lead[e]	µg/L	1.3	1.4	0.5	0.4	1/week	1/week
Manganese	µg/L	—	109	—	50	1/month	1/week
Mercury[g]	µg/L	0.02	0.02	0.01	0.01	1/month	1/month
Zinc[e]	µg/L	43.0	60	16.8	19	1/month	1/month
TDS	mg/L	—	X	—	X	1/month	X
Turbidity, effluent	NTU[h]	see permit	no change	see permit	no change	1/month	1/month
Turbidity, natural condition	NTU	—	—	—	—	1/month	1/month
Sulfate	mg/L	—	X	—	X	1/month	X
pH	s.u.[i]	see permit	no change	see permit	no change	1/week	1/week
Outfall Flow[j]	gpm	15,600	15,800	X	X	continuous	continuous
Temperature	°C[k]	X	—	X	—	X	1/week
Hardness, as $CaCO_3$	mg/L	—	—	—	—	1/month	1/month
Whole Effluent Toxicity (WET)	TU_c[l]	see permit	no change	see permit	no change	1/year	1/year

a. An "X" indicates that a limit or monitoring requirement is not included in the permit.
b. A "—" indicates that there is a monitoring requirement but no limit.
c. All metals shall be measured as total recoverable unless otherwise noted.
d. If there is no discharge from Outfall 011 for 72 hours, routine sampling of Outfall 001 is not required. However, when discharge from Outfall 011 commences, a sample from Outfall 001 is required within 36 hours of the commencement of the discharge.
e. Hardness-based limits using a hardness of 44 mg/L $CaCO_3$, the 15th percentile of background data.
f. Cyanide must be analyzed as weak acid dissociable (WAD) cyanide.
g. Mercury must be analyzed and reported as total.
h. Nephelometric Turbidity Units.
i. Standard units.
j. See Permit Part 1.3.3.
k. Degrees Celsius.
l. Chronic toxic units.

As required under 18 AAC 83.435, a reasonable potential analysis was conducted to determine if effluent from Outfall 001 has reasonable potential to exceed Alaska WQS. The CWA requires that effluent limits be developed for parameters that have a reasonable potential to exceed WQS and parameters that are subject to TBELs. Parameters with both a technology-based limit under

40 CFR § 440.104(a) and an Alaska WQS (i.e, cadmium, copper, lead, mercury, zinc, and pH) have limits.

An analysis of five years of sample data showed that there is no potential to exceed WQS for arsenic, TDS, and sulfate. Consequently, the permit no longer requires monitoring for these parameters.

Analysis of recent data resulted in a number of changes to the effluent limits in the permit. The analysis showed that manganese has the potential to exceed WQS, so this parameter now has an effluent limit. The limits for copper, cyanide, lead, zinc, and outfall flow have changed from the previous permit. Some limits have become more stringent, while other limits have become less stringent. The Department determined that it was appropriate to impose less stringent limits for some of these parameters. To justify these changes, the Department is required to conduct an antibacksliding analysis. This analysis is included in Section 6.0.

Table 6 summarizes the limits and monitoring requirements for Outfall 011 and provides a comparison to the limits in the previous permit.

Table 6: Internal Outfall Limits and Monitoring Requirements for Outfall 011

Parameter[c]	Units	Limits[a, b]					
		Daily Maximum		Monthly Average		Monitoring Frequency	
		2011 Permit	2017 Permit	2011 Permit	2017 Permit	2011 Permit	2017 Permit
Aluminum	µg/L	—	X	—	X	1/quarter	X
Arsenic	µg/L	—	—	—	—	1/quarter	1/quarter
Cadmium	µg/L	100	100	50	50	1/quarter	1/quarter
Chromium, Total	µg/L	—	X	—	X	1/quarter	X
Copper	µg/L	300	300	150	150	1/quarter	1/quarter
Cyanide[d]	µg/L	—	—	—	—	1/week	1/week
Iron	µg/L	1,639	1,639	817	817	1/week	1/quarter
Lead	µg/L	600	600	300	300	1/quarter	1/quarter
Manganese	µg/L	X	—	X	—	X	1/quarter
Mercury[e]	µg/L	2	2	1	1	1/quarter	1/quarter
Nickel	µg/L	—	X	—	X	1/quarter	X
Selenium	µg/L	—	—	—	—	1/quarter	1/quarter
Silver	µg/L	—	X	—	X	1/quarter	X
Zinc	µg/L	1,500	1,500	750	750	1/quarter	1/quarter
Total Suspended Solids (TSS)	mg/L	30	30	20	20	1/week	1/quarter
TDS	mg/L	—	—	—	—	1/quarter	1/quarter
Sulfate	mg/L	—	—	—	—	1/quarter	1/quarter
Chlorides	mg/L	—	X	—	X	1/quarter	X
pH	s.u.	see permit	no change	see permit	no change	1/week	1/week
Outfall flow	gpm	600	800	X	X	continuous	continuous
Hardness as $CaCO_3$	mg/L	—	—	—	—	1/week	1/quarter

a. An "X" indicates that a limit or monitoring requirement is not included in the permit.
b. A "—" indicates that there is a monitoring requirement but no limit.
c. All metals shall be measured as total recoverable unless otherwise noted.
d. Cyanide must be analyzed as weak acid dissociable (WAD) cyanide.
e. Mercury must be analyzed and reported as total.

Outfall 011 is an internal monitoring point. Here, effluent is sampled after treatment and prior to flow augmentation and discharge via Outfall 001. Monitoring and effluent limits are required for seven parameters to demonstrate compliance with TBELs. These parameters are copper, zinc, lead, mercury, cadmium, pH, and TSS. The Department has also retained the iron limit from the previous permits. Outfall 011 requires a limit on outfall flow; this limit is based on the design capacity of the treatment system. The Department, in its discretion, requires monitoring and effluent limits for other parameters to characterize the effluent from the treatment process.

A reasonable potential analysis was conducted to inform the development of monitoring requirements for Outfall 011. This analysis showed that a number of the parameters included in the previous permit have no potential to exceed WQS at Outfall 011, even prior to dilution at the ORTW. Consequently, there are no limits for aluminum, chromium, nickel, silver, and chlorides in the permit. Monitoring requirements for all of the above mentioned parameters are also absent from the permit. Finally, the monitoring frequencies for several parameters have been reduced due to the demonstrated performance of the treatment system.

A RPA of the five metals with technology based standards (copper, zinc, lead, mercury, and cadmium) demonstrated that these parameters have no reasonable potential to exceed WQS. Monitoring data for the other two parameters with TBELs (pH and TSS) demonstrates consistent compliance with the technology based limits prescribed in 40 CFR § 440.104(a). The previous permit required quarterly sampling for TBELs at Outfall 011, and the Department is reissuing the permit with the same monitoring requirements for TBELs given a robust monitoring dataset demonstrates effluent consistency and permit limitation compliance.

Table 7 summarizes the effluent limits and monitoring requirements for Outfall 002 and provides a comparison to the limits in the previous permit.

Table 7: Effluent Limits and Monitoring Requirements for Outfall 002

Parameter[c]	Units	Effluent Limits[a, b]							
		Monthly Average		Weekly Average		Daily Maximum		Monitoring Frequency[d]	
		2011 Permit	2017 Permit	2011 Permit	2017 Permit	2011 Permit	2017 Permit	2011 Permit	2017 Permit
Outfall Flow	gpd[e]	X	X	X	X	72,000	72,000	1/day	1/day
Temperature	°C	X	—	X	—	X	—	X	1/month
BOD_5	mg/L	30	30	45	45	60	60	1/week	1/month
Influent BOD_5	mg/L	See permit. No change from the 2011 permit.						1/quarter	1/quarter
TSS	mg/L	30	30	45	45	60	60	1/week	1/month
Influent TSS	mg/L	See permit. No change from the 2011 permit.						1/quarter	1/quarter
Fecal Coliform[f,g]	#/100 mL	200	200	X	X	400	400	1/week	1/month
Nitrate/Nitrite	mg/L	80	80	X	X	160	160	1/week	1/month
Arsenic	µg/L	X	—	X	—	X	—	X	1/month
Cadmium	µg/L	X	—	X	—	X	—	X	1/month
Copper	µg/L	X	—	X	—	X	—	X	1/month
Lead	µg/L	X	—	X	—	X	—	X	1/month
Manganese	µg/L	X	—	X	—	X	—	X	1/month
Mercury[h]	µg/L	X	—	X	—	X	—	X	1/month
Zinc	µg/L	X	—	X	—	X	—	X	1/month
pH	s.u.	See permit. No change from the 2011 permit.						1/week	1/month
Dissolved Oxygen (DO)	mg/L	See permit. No change from the 2011 permit.						1/week	1/month

a. An "X" indicates that a limit or monitoring requirement is not included in the permit.
b. A "—" indicates that there is a monitoring requirement but no limit.
c. All metals shall be measured as total recoverable unless otherwise noted.
d. If there is no discharge, sampling is not required. A sample shall be taken within 24 hours of the discharge commencing.
e. Gallons per day.
f. The standard holding time for a fecal coliform bacteria sample is six hours or six hours transport time if the analysis commences within two hours of sample receipt at the laboratory. If EPA approves a variance from this holding time under 40 CFR 136.3(e), the new holding time will be applicable to samples from that date forward.
g. Averages are calculated as the geometric mean.
h. Mercury must be analyzed and reported as total.

The previous permit contained WQBELs for fecal coliform bacteria, nitrate/nitrite, and DO. The effluent limits for these parameters have been retained in the permit.

Applicants are required to collect and report water quality data on the pollutants discharged at each outfall as part of the permit application process. A reasonable potential analysis of these supplemental data showed that several metals in the effluent—arsenic, cadmium, copper, lead, manganese, and zinc—have the potential to exceed WQS at end of pipe. Consequently, monitoring requirements for these parameters have been added to the permit.

In September 2014, Pogo installed a wet scrubber on its commercial solid waste incinerator. From September 2014 to March 2015, scrubber water was discharged to the sewage treatment plant. Metals were detected in the effluent during this period. Scrubber water is no longer discharged to the sewage treatment plant, so those samples were excluded from the reasonable potential analysis (RPA). Nevertheless, metals have also been observed in the effluent before September 2014 and after March 2015. The Department is requiring monthly monitoring for arsenic, cadmium, copper, lead, manganese, mercury, and zinc. An existing mixing zone has been approved for Outfall 002 (see Section 5.3 of the Fact Sheet.) There is no potential to exceed WQS at the boundary of the mixing zone for these parameters, so no effluent limits are required.

The previous permit includes the provision that, "After consultations with ADEC, the sampling frequency may decrease to monthly if this discharge has been in full compliance with the permit limitations in Permit Part 1.3 for 6 consecutive months." The Department found that this condition has been met, so monitoring frequencies for BOD_5, TSS, fecal coliform bacteria, nitrate/nitrite, pH, and DO are reduced to monthly.

4.4 Influent and Effluent Monitoring

The permit requires monitoring of the influent and effluent to determine compliance with TBELs and WQBELs. The monitoring requirements for each outfall are summarized in Table 8.

Table 8: Influent and Effluent Monitoring

Outfall	Monitor Influent?	Monitor Effluent?	Sampled Parameters for TBEL Compliance								
			Copper	Zinc	Lead	Mercury	Cadmium	pH	TSS	BOD_5	% Removal
001	No	Yes									
011	No	Yes	✓	✓	✓	✓	✓	✓	✓		
002	Yes	Yes						✓	✓	✓	✓

At Outfalls 001 and 002, effluent samples are collected from the effluent stream after the last treatment process and prior to discharge into the Goodpaster River. At Outfall 011, samples are collected after the last treatment process prior to flowing to the ORTW.

Whole effluent toxicity (WET) tests are required at Outfall 001 to measure the aggregate toxic effect of the effluent.

Monitoring data produced will be used to evaluate the effluent for pollutants of concern and to conduct future reasonable potential analysis as needed, which will determine if the discharge of these pollutants might cause an exceedance of the water quality criteria in the receiving waterbody.

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 taken, the provisions of Appendix A, Part 3.3 of the permit shall apply.

4.5 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 an exceedance of a WQS. The Department concludes there is insufficient data collected from Outfall 001 to conduct a reasonable potential analysis for WET. Consequently, the permit does not establish WET limits.

The permit requires annual WET testing. New data gathered during the term of the permit will be added to the existing database of tests and will be used to determine whether there is a reasonable potential to exceed WET chronic water quality criterion. Based on the results of the reasonable potential analysis, WET limits may be established in future permitting actions.

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 (EPA/821-R-02-013, October 2002).

5.0 RECEIVING WATERBODY

5.1 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 required to achieve. The numeric and narrative water quality criteria are deemed necessary by the state to support the beneficial use classification of each waterbody. The antidegradation policy ensures that 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). Some waterbodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235 (June 26, 2003), such as those listed under 18 AAC 70.236(b). The receiving water for the discharge, the Goodpaster River, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, the Goodpaster River 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)

To ensure protection of receiving water quality, Table 9 contains parameters that must be monitored in the Goodpaster River above and below the area impacted by the discharge. Receiving water monitoring must be conducted a minimum of six times per year and at specific intervals that capture any seasonal variations in water quality. Receiving water monitoring is required to verify that the designated uses of the Goodpaster River have been protected from the pollutants of concern.

Table 9: Receiving Water Monitoring Parameters

Parameter	Units	Minimum Sample Frequency	Sample Type
Antimony[1]	µg/L	See Permit Part 1.8	Grab
Arsenic[1]	µg/L	See Permit Part 1.8	Grab
Cadmium[1]	µg/L	See Permit Part 1.8	Grab
Copper[1]	µg/L	See Permit Part 1.8	Grab
Cyanide, WAD	µg/L	See Permit Part 1.8	Grab
Iron[1]	µg/L	See Permit Part 1.8	Grab
Lead[1]	µg/L	See Permit Part 1.8	Grab
Manganese[1]	µg/L	See Permit Part 1.8	Grab
Mercury[1]	µg/L	See Permit Part 1.8	Grab
Nickel[1]	µg/L	See Permit Part 1.8	Grab
Selenium[1]	µg/L	See Permit Part 1.8	Grab
Silver[1]	µg/L	See Permit Part 1.8	Grab
Zinc[1]	µg/L	See Permit Part 1.8	Grab
Alkalinity, as $CaCO_3$	mg/L	See Permit Part 1.8	Grab
Conductivity	µS/cm[2]	See Permit Part 1.8	Grab
DO	mg/L	See Permit Part 1.8	Grab
Hardness, as $CaCO_3$	mg/L	See Permit Part 1.8	Grab
Nitrate/Nitrite, as N	mg/L	See Permit Part 1.8	Grab
pH	s.u.	See Permit Part 1.8	Grab
Sulfate	mg/L	See Permit Part 1.8	Grab
TDS	mg/L	See Permit Part 1.8	Grab
Temperature	°C	See Permit Part 1.8	Grab
Turbidity	NTU	See Permit Part 1.8	Grab

Notes:
1. Must be measured as total or total recoverable
2. Microsiemens per centimeter

The permit carries forward the biomonitoring program from previous permits. Chinook salmon will be collected and tested for whole body metals concentrations during the fall season. Tissue

from a minimum of ten salmon will be tested for antimony, arsenic, cadmium, copper, lead, mercury, nickel, selenium, and silver. This biomonitoring program will verify that metals are not accumulating in fish tissue and that the designated uses for the Goodpaster River have been protected.

5.2 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. For an impaired waterbody, Section 303(d) of the Clean Water Act (CWA) requires states to develop a Total Maximum Daily Load (TMDL) management plan for a waterbody determined to be water quality limited. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's WQS and allocates that load to known point sources and nonpoint sources.

The Goodpaster River is not included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010, as an impaired waterbody, nor is the waterbody listed as a CWA 303(d) waterbody requiring a TMDL. As such, a TMDL has not been completed for the waterbody.

5.3 Mixing Zone Analysis

Under 18 AAC 70.240, as amended through June 26, 2003, the Department may authorize a mixing zone in a permit. The Department authorized a mixing zone in the Goodpaster River in 2004 and, again, in 2011 for the subject discharge.

The Department is re-authorizing a mixing zone for treated domestic wastewater at Outfall 002 in the Goodpaster River. The mixing zone is authorized for the following parameters: fecal coliform bacteria, nitrate/nitrite, pH, dissolved oxygen, arsenic, cadmium, copper, lead, manganese, mercury, and zinc. For the chronic mixing zone, a dilution factor of 23.4 is authorized, and for the acute mixing zone a dilution factor of 15.6 is authorized. As before, fecal coliform bacteria controls the size of the authorized mixing zone. The mixing zones (both acute and chronic) for all other parameters fall inside the boundary of the mixing zone sized on the driving parameter of fecal coliform bacteria.

The chronic mixing zone is defined as a trapezoid shape with a downstream length of five feet. The upstream base of the trapezoid is five feet wide (the width of the diffuser), and the downstream base is seven feet, for a total area of 30 square feet. The mixing zone includes the vertical extent of the water column from the diffuser to the water surface. The chronic mixing zone was driven by the dilution required for fecal coliform bacteria.

The acute mixing zone is defined as a rectangular box shape with a downstream length of 1.1 feet. The base of the rectangle defining the mixing zone is five feet wide (the width of the diffuser) for a total area of 5.5 square feet. The mixing zone includes the vertical extent of the water column from the diffuser to the water surface. The acute mixing zone was driven by the dilution required for copper.

Analysis of five years of supplemental data showed that there is reasonable potential to exceed WQS for arsenic, cadmium, copper, lead, manganese, mercury, and zinc at end of pipe. This is new information that was not available during previous permit authorizations. At the request of

the applicant, DEC has added these seven parameters to the mixing zone authorization. As stated before, fecal coliform bacteria continues to require the most dilution to meet applicable WQS.

APPENDIX C outlines regulatory criteria that must be considered when the Department analyzes a Permittee's request for a mixing zone. These criteria include the size of the mixing zone, treatment technology, designated and existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met in order to authorize a mixing zone. A summary of this analysis follows.

Size – In accordance with 18 AAC 70.255, the Department determined that the size of the mixing zone is appropriate and is as small as practicable.

The original design basis for the mixing zone is described in the report, *Design of a Mixing Zone in the Goodpaster River for Discharge of Treated Domestic Wastewater from the Pogo Mine* (Basketfield, 2002). The design in this report was the basis for the mixing zone authorizations in both of the previous permits.

For the permit issuance, DEC verified the original design by modeling the mixing zone in CORMIX, a mixing zone modeling software that is approved by EPA and has been shown to provide reasonable estimates of mixing zone sizes. Updated information on the design flow in the Goodpaster River and the geometry of the river at the discharge location, provided by the applicant, were used to verify the original design.

The Department determined that, although there was a need to update some of the modeling parameters, previous modeling conclusions are still accurate. Consequently, the chronic mixing zone will continue to be defined as a trapezoid with the same dimensions that were authorized in previous permits. Fecal coliform bacteria continues to require the most dilution to meet applicable WQS. The mixing zone boundaries for all other parameters fall within the area of the chronic mixing zone for fecal coliform bacteria.

The previous permits did not authorize an acute mixing zone. Analysis of five years of supplemental data showed that there is reasonable potential to exceed acute standards for copper and zinc at end of pipe. Of these two pollutants, copper requires the most dilution to meet applicable WQS. Based on the assimilative capacity of the receiving water and after modeling the mixing zone to determine that regulatory requirements will be met, an acute mixing zone has been authorized. The acute mixing zone is defined as a rectangle with a base of five feet and a downstream length of 1.1 feet, for a total area of 5.5 square feet.

An acute mixing zone is sized to prevent lethality to passing organisms, while a chronic mixing zone is sized to protect the ecology of the waterbody as a whole. According to EPA (1991), lethality to passing organisms would not be expected if an organism passing through the plume along the path of maximum exposure is not exposed to concentrations exceeding the acute criteria when averaged over a one hour period. Furthermore, the travel time of an organism drifting through the acute mixing zone must be less than 15 minutes if a one-hour average exposure is not to exceed the acute criterion. According to CORMIX modeling, a drifting organism would pass through the acute mixing zone in less than 5 seconds.

Technology – In accordance with 18 AAC 70.240(a)(3), the most effective technologically and economically feasible methods are used to disperse, treat, remove, and reduce pollutants. Pogo provides secondary treatment of domestic wastewater with a sequencing batch reactor and disinfection via ultraviolet disinfection light, thus avoiding the introduction of chlorine into the

Goodpaster River. This proven state of the art technology goes beyond secondary treatment standards in providing tertiary treatment. After treatment, effluent is discharged to the Goodpaster River through an engineered diffuser that promotes rapid mixing and helps to minimize the size of the mixing zone.

Pogo experienced six permit limit exceedances (five daily maximum and one monthly average exceedance) for fecal coliform bacteria between the months of March through September 2011. The company took a number of corrective actions in response to these exceedances. These include increased effluent sampling, inspection and cleaning of the treatment system and replacement of wear items and sand filters, hauling decant water offsite for disposal, and the purchase and installation of a new UV system. Since these corrective actions were undertaken, Pogo has been in compliance with all permit limits at Outfall 002.

Existing Use – In accordance with 18 AAC 70.245, as amended through June 26, 2003, the mixing zone has been appropriately sized to fully protect the existing and designated uses of the Goodpaster River. The Goodpaster River is protected for all fresh water uses under 18 AAC 70.020(a)(1). Outside the boundaries of the small mixing zone, these designated uses are maintained.

Human Consumption – In accordance with 18 AAC 70.250(b)(2) and (b)(3), there is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Additionally, the discharge will not preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. The permit requires that a sign be maintained near the outfall line informing the public that users of the area should exercise caution.

Spawning Areas – In accordance with 18 AAC 70.255(h), as amended through June 26, 2003, the mixing zone is not authorized in a spawning area for anadromous fish or resident fish spawning redds. The Alaska Department of Fish and Game (ADF&G) anadromous waters interactive catalog indicates that fish are known to spawn in the Goodpaster River. However, by design, Outfall 002 is located in an area that has been identified by ADF&G as not conducive to spawning due to steep talus slopes and a slab rock river bed. According to the application, spawning areas are located a distance of 50 meters from the diffuser, far outside the boundary of the mixing zone.

Human Health – In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit is protective of human health. An analysis of the effluent testing data that was included with the wastewater discharge application and the results of the reasonable potential analysis conducted on pollutants of concern indicate that the level of treatment at Pogo is protective of human health.

Aquatic Life and Wildlife – In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit is protective of aquatic life and wildlife. Based on a review of the effluent data and mixing zone modeling, the Department concludes that the discharge will meet all water quality criteria at the boundary of the small mixing zone.

Endangered Species – In accordance with 18 AAC 70.250(a)(2)(D), as amended through June 26, 2003, the authorized mixing zone will not cause an adverse effect on threatened or endangered species, as no listed species are present in the vicinity of the discharge.

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 changed 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 or where new information is available that justifies the relaxation. Since the last permit was issued, there have been material and substantial alterations to the permitted facility and new information has been collected to characterize the effluent and determine limits for the outfalls.

CWA 402(o)(B)(i) exempts 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 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 exemption 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 water does not have a TMDL, further evaluation under this 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 water meets WQS to support designated uses, further evaluation under this provision is not required.

Like the previously issued permits, the permit establishes effluent limits and monitoring for three outfalls (one being an internal outfall). Outfall 001 discharges treated mine drainage and contact water from the mine site. The underground workings at Pogo have increased in size since the last permit was issued. As more surface area is exposed underground, the flow of water into the underground workings has increased. An increase in flow at Outfall 001 was required to allow for the continued operation of the mine.

The increase in the flow limit at Outfall 001 is based on a material and substantial alteration to the permitted facility and is permissible per 18 AAC 83.135(b)(1). The permissible alteration is the increased size of the underground workings. As the workings increase, a greater volume of mine drainage must be treated and discharged to keep the mine from flooding.

Since the last permit was issued, new information has been collected to characterize the effluent from Outfall 001. An analysis of five years of the most recent effluent and receiving water data resulted in changes to effluent limits. The Department determined that some parameters required more stringent limits. Limits that are more stringent in the permit, in comparison to the previous permit, include the

average monthly limits for cyanide and lead. Analysis of the effluent data also showed that the limits for other parameters could be relaxed. Both the maximum daily and monthly average limits for copper and zinc and the maximum daily limits for lead and cyanide are less stringent than in the previous permit.

These changes in the effluent limitations for Outfall 001 are based on the collection and statistical analysis of new information and, where the limitations increased or showed no reasonable potential and are no longer necessary, these changes are permissible per 18 AAC 83.135(b)(2).

Outfall 011 is not a point source discharge to waters of the United States. Outfall 011 is an internal monitoring point used to characterize the waste stream and verify that the TBELs for copper, zinc, lead, mercury, cadmium, pH, and TSS have been achieved. With the exception of monitoring frequencies, there are no limitations, standards, or conditions for these seven TBELs that are less stringent than in the previous permit. Consequently, further antibacksliding analysis is not warranted.

Outfall 002 discharges treated domestic wastewater. With the exception of monitoring frequencies, there are no effluent limitations, standards, or conditions for Outfall 002 that are less stringent than in the previous permit. Consequently, further antibacksliding analysis is not warranted.

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 waterbody'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 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 procedures and policy, 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. The Goodpaster River is not listed as impaired on DEC's most recent *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*; therefore, a Tier 1 designation is not warranted. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 waterbody.

The State's Antidegradation Policy in 18 AAC 70.015(a)(2) says 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 70.0015(a)(2)(D) below, the Department has determined that the most reasonable and effective pollution prevention, control, and treatment methods are being used and that the localized lowering of water quality is necessary.

Pogo contributes substantial economic benefit to local and state economies by providing employment opportunities, annual payments to the state, and business to supporting industries. In 2014, Pogo had 320 full-time employees and paid $57 million in wages and benefits. Average annual wages are among the highest in the City of Delta Junction and the Fairbanks North Star Borough.

Annual payments to the state include corporate taxes, the mining license tax, and royalty payments for mining on state land. Capital spending at Pogo was in excess of $21.2 million in 2016, and exploration spending was budgeted for $9.8 million in 2016.

The Department concludes that the operation of Pogo Mine and the authorization of the discharge accommodates important economic development in Alaska and interior Alaska and the anticipated lowering of water quality is necessary for these purposes and that the finding 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 whole effluent toxicity limit in 18 AAC 70.030.

   Section 1.2.3 of the permit requires that the discharge shall not cause a violation of the WQS at 18 AAC 70 except if excursions are authorized in accordance with provisions in 18 AAC 70.200 – 70.270 (i.e., mixing zone, variance, etc.). As a result of Pogo Mine's reasonable potential to exceed water quality criteria for fecal coliform bacteria, nitrate/nitrite, pH, dissolved oxygen, arsenic, cadmium, copper, lead, manganese, mercury, and zinc at Outfall 002, and available assimilative capacity in the receiving water, a mixing zone is authorized in the Pogo Mine wastewater discharge permit in accordance with 18 AAC 70.240 (See Fact Sheet Section 5.3). The resulting effluent end-of-pipe limits and monitoring requirements in the permit protect water quality criteria, and therefore, will not violate water quality criteria found at 18 AAC 70.020.

   There are no site-specific criteria associated with 18 AAC 70.235 for the discharge and associated waterbody.

   WET testing is required annually for Outfall 001. WET tests reveal if the discharge has toxicity, and the Permittee is required to submit these results to DEC during the month in which the results are received. Section 1.7.5 of the permit sets a trigger for chronic toxicity. If this trigger value is exceeded, the Permittee is required to conduct accelerated testing (Permit Part 1.7.6). If accelerated testing shows exceedances of the toxicity trigger, the Permittee is required to conduct a Toxicity Reduction Evaluation as required in Permit Part 1.7.7. WET results will be used when the Permittee applies for reissuance of the permit to ensure the applicable criteria of 18 AAC 70.030 are met.

   DEC determined that the reduction in water quality will not violate the criteria of 18 AAC 70.020, 18 AAC 70.235, or 18 AAC 70.030, 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.

   The WQS serve the specific purpose of protecting the existing uses of the receiving waterbody. The Goodpaster River is protected for all designated uses (see Fact Sheet Section 5.2); therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (DEC 2008) were selected for use in the RPA for the wastewater discharge effluent. This will

ensure that the resulting water quality at and beyond the boundary of the authorized mixing zone will fully protect all designated uses of the receiving waterbody.

Analysis of effluent monitoring data from the past five years shows that discharges are controlled to protect existing waterbody uses. The effluent limits required by the permit will ensure that all uses are fully protected. A mixing zone is authorized, in accordance with 18 AAC 70.245; the mixing zone has been appropriately sized to fully protect the existing uses of the Goodpaster River.

DEC determined that wastewater treatment will result in adequate water quality to fully protect existing uses of the waterbody 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.

   The Department finds the most effective methods of prevention, control, and treatment are the practices and requirements set out in the permit and currently in use for both outfalls at this mine. 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.

   MWTP#3 was commissioned in January 2016 and replaced the previous water treatment plant. The new plant operates under a more robust microfiltration membrane system and a fifth reactor that will allow hydrogen peroxide to be added if WAD cyanide levels require more treatment. MTWP#3 utilizes four processes to remove contaminants from the water before discharge. These processes are:

   - High Density Sludge process to achieve enhanced co-precipitation of metals, including arsenic;
   - As necessary, lime softening and recarbonation to remove calcium and magnesium via precipitation and thereby reduce TDS;
   - Sulfide precipitation if additional treatment is necessary to achieve the expected metals concentrations; and,
   - A microfiltration membrane system to polish the treated water for removal of residual suspended solids prior to release to the ORTW.

   This is a proven treatment technology and water quality data from the water treatment plant effluent indicates that it performs effectively.

   Pogo treats domestic sewage with a membrane bioreactor including nutrient removal and disinfection with ultraviolet light before discharging via Outfall 002. This proven state of the art technology goes beyond secondary treatment standards in providing tertiary treatment.

   The Department finds that this criterion to address pollution prevention, control, and treatment 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. 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 Outfall 001.

The federal technology-based ELGs for secondary treatment of domestic wastewater are found in 40 CFR Part 133. These ELGs apply to POTWs and are not directly applicable to the treatment of domestic wastewater at Pogo. However, the Department exercised its best professional judgement and applied the federal ELGs for secondary treatment and the state requirements for secondary treatment, found in 18 AAC 72.990, to Outfall 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. The authorized domestic wastewater discharge is in compliance with the minimum treatment standards found in 18 AAC 72.050 as reflected by the permit limits specifying secondary treatment standards.

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 concludes that all wastes and other substances discharged will be treated and controlled to achieve the highest statutory and regulatory requirements and finds that 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 60 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. The permit requires the Permittee to implement a 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 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.

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 August 2, 2016, DEC solicited USFWS and NMFS for feedback about ESA impacts associated with the permit. That same day, NMFS indicated lack of concern about the permit because there are no threatened or endangered or species in the area of impact (Jon Kurland, Assistant Regional Administrator, Juneau, personal communication). On August 9,

2016, USFWS replied that there are no endangered species or critical habitat located near the area of impact (Kaithryn Ott, Fish and Wildlife Biologist, Fairbanks, personal communication).

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 proposed 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 August 2, 2016, DEC solicited NMFS for feedback on EFH impacts associated with the permit. To date, NMFS has not responded to an email inquiry.

Pogo was issued a permit from ADF&G in 2003 (Fish Habitat Permit FH03-III-0339) for the operation of the ORTW. The permit imposes conditions to prevent adverse effects to anadromous fish or their habitat in the Goodpaster River.

9.3 Permit Expiration

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

10.0 REFERENCES

Basketfield, S.S. 2002. *Design of a Mixing Zone in the Goodpaster River for Discharge of Treated Domestic Wastewater from the Pogo Mine*. Design Science & Engineering, Inc. December 2002. 18 pp.

DEC (Alaska Department of Environmental Conservation). 1999. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation, May 27, 1999.

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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.

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

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DEC. 2016. 18 AAC 72, Wastewater Disposal. State of Alaska, Department of Environmental Conservation, October 22, 2016.

EPA (U.S. Environmental Protection Agency). 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. 1996. 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-R-02-013.

EPA. 2010. NPDES Permit Writers' 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: Pogo Mine Project Location Map

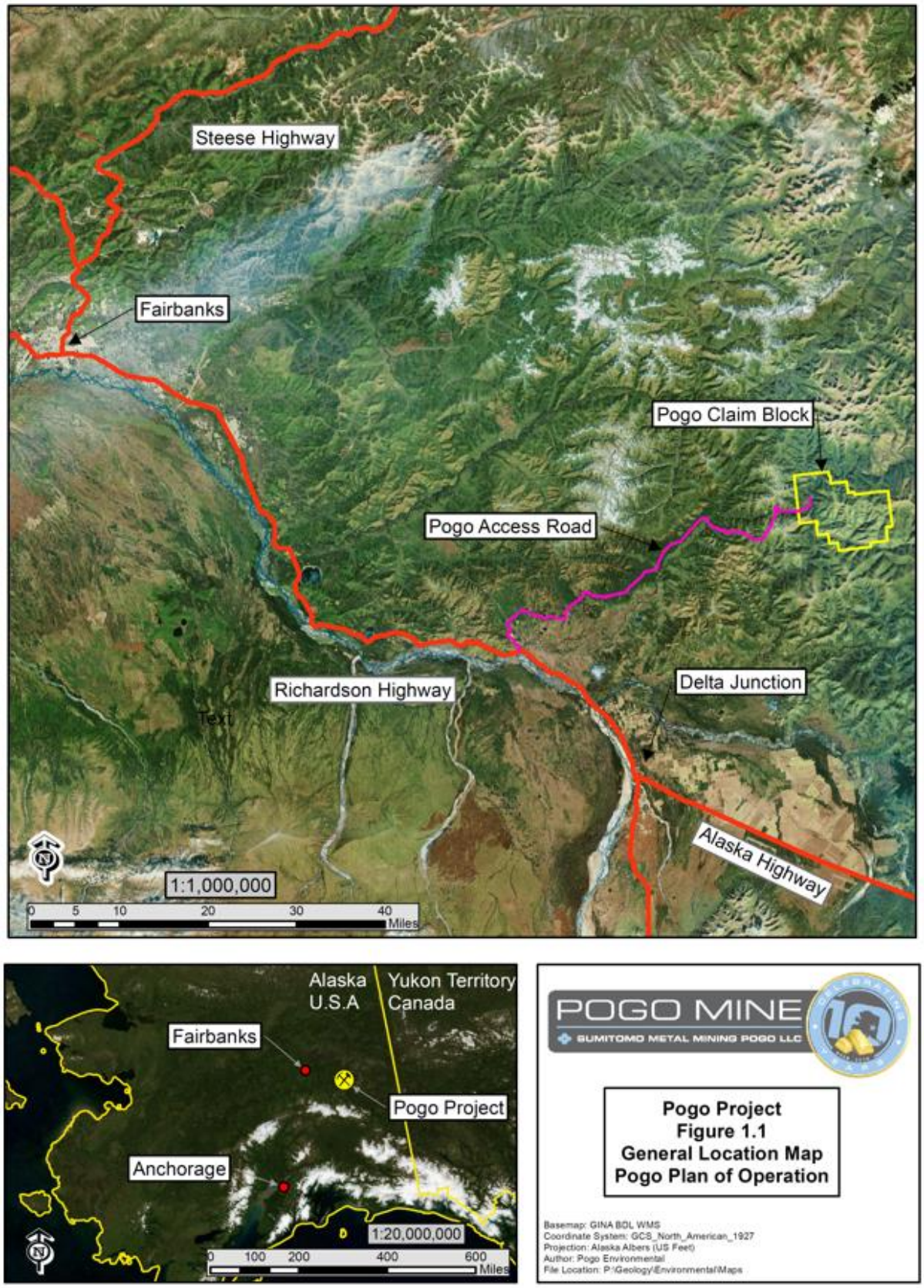


Figure 2: Site Map

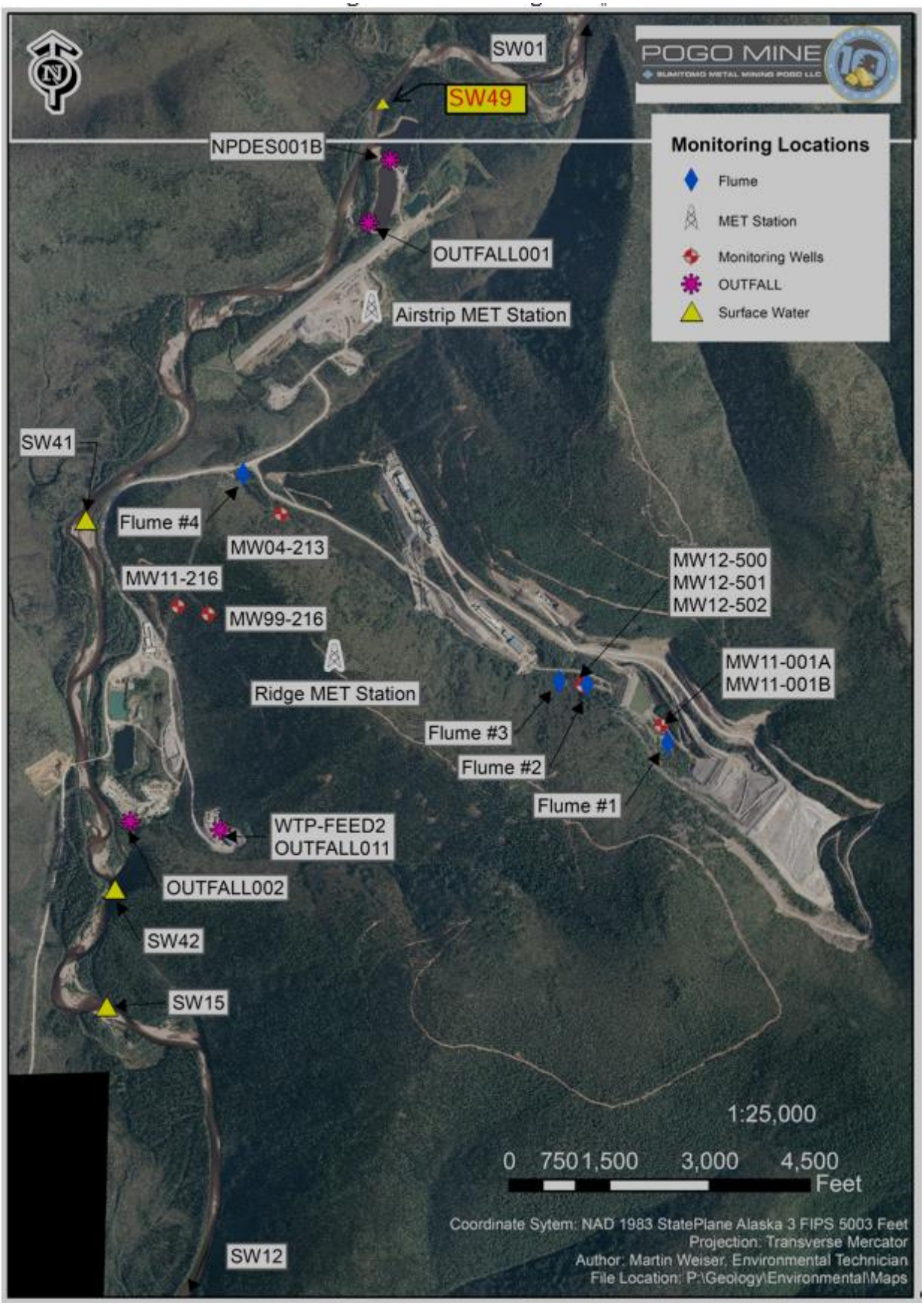
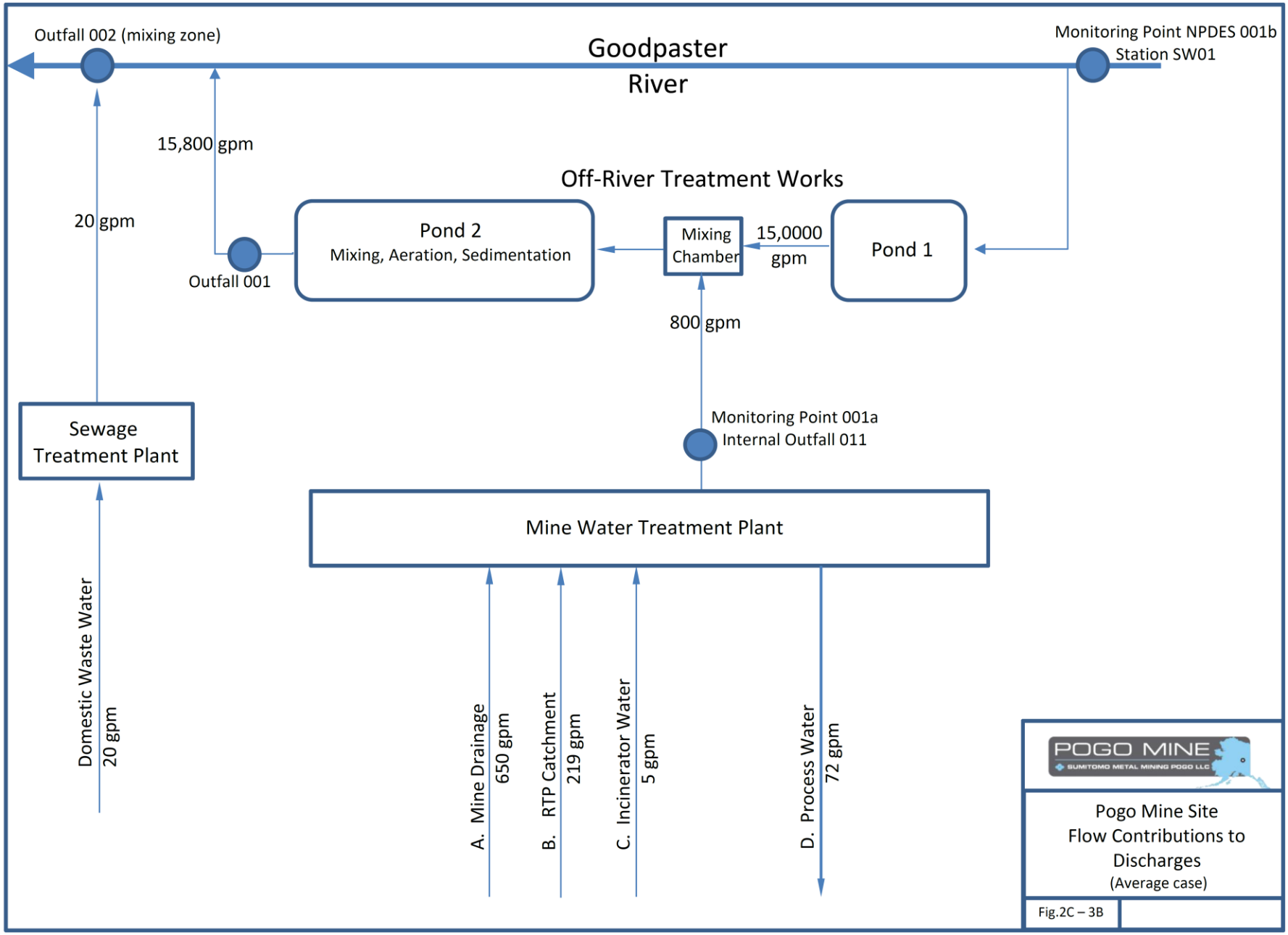


Figure 3: Line Drawing



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.

This section discusses the basis for and the development of effluent limits in the permit. This section includes: an overall discussion of the statutory and regulatory basis for development of effluent limitations (Section B-I); discussions of the development of technology-based effluent limits (Section B-II) and water quality-based effluent limits (Section B-III); and a summary of the effluent limits developed for the permit (Section B-IV).

B-I Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the 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 the minimum for 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. The final selected permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent.

B-II Outfalls 001, 011, and 002 - Technology-Based Evaluation

<u>Outfalls 001 and 011</u>

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 wastewater from Outfall 001 at Pogo.

At Pogo mine drainage, contact water, and wastewater from the incinerator scrubber is collected, treated, and delivered to the ORTW located near the Goodpaster River. At the ORTW, fresh water from Pond 1 is mixed with treated effluent in a mixing tank and is subsequently discharged to the Goodpaster River

at Outfall 001. No credit is given for dilution in the application of the technology-based standards. Consequently, an internal monitoring point is needed to verify that the NSPS have been met before the treated effluent is sent to the ORTW. This internal monitoring point is Outfall 011, and this is the location where the NSPS are applied.

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 Pogo are shown in Table B-1.

Table B-1: Technology-Based Effluent Limits for Outfall 001

Parameter	Units	Maximum for any 1 day	Average of daily values for 30 consecutive days	Range
Cadmium	mg/L	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.	-	-	6.0-9.0
Total Suspended Solids (TSS)	mg/L	30.0	20.0	-

Outfall 002

The CWA requires a Publicly Owned Treatment Works (POTW) to meet effluent limits based on available wastewater treatment technology; specifically, secondary treatment standards found in 40 CFR Part 133, adopted by reference in 18 AAC 83.010(e). Section 301 of the CWA established a required performance level, referred to as secondary treatment, which all POTWs were required to meet by July 1, 1977. The Department has adopted the secondary treatment effluent limits, 18 AAC 83.010(e), which are found in 40 CFR § 133.102. The secondary treatment TBELs apply to all municipal wastewater treatment facilities and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133, the State of Alaska requires maximum daily limits of 60 mg/L for BOD_5 and TSS in the definition of secondary treatment found in its waste disposal regulations (18 AAC 72.990); however, the waste disposal regulations do not specify the percent removal requirements that are required by 40 CFR 133, so the more stringent 40 CFR 133 requirements as adopted by reference are applied.

Since Pogo's wastewater treatment plant is not a POTW, the ELGs in 40 CFR Part 133 do not specifically apply. However, the Department exercised its best professional judgement in establishing TBELs based on the secondary treatment standards in 40 CFR Part 133. Given the domestic nature of the discharge and that the mine employs a domestic treatment facility similar in performance to a municipal plant, the Department determined that secondary treatment standards provide the most relevant requirements to control the discharge. Table B-2 identifies the parameters and TBELs required as a minimum for Outfall 002 found in 40 CFR Part 133 and 18 AAC 72.990.

Table B-2: Technology-Based Effluent Limits for Outfall 002

Parameter	Units	Maximum Daily Limit	7-day Average	30-day Average	Range
BOD_5	mg/L	60	45	30	-
TSS	mg/L	60	45	30	-
pH	mg/L	-	-	-	6.0-9.0
Minimum removal rates for BOD_5 and TSS	%	-	-	85	-

B-III Water Quality-Based Evaluation

In addition to the TBELs discussed above, the Department evaluated the Pogo 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 Section B-III.B);
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 B-III.C).

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 the Goodpaster River, the receiving water of Outfalls 001 and 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 the Goodpaster River, the most stringent applicable criteria are summarized in Table B-3.

Table B-3: Most Stringent of the Water Quality Criteria Applicable to Pogo Discharges Into the Goodpaster River (Outfalls 001 and 002)

Parameter[a] (µg/L unless otherwise noted)	Acute	Chronic	
	Aquatic Life Criterion	Aquatic Life Criterion	Human Health Criterion
Antimony	N/A	N/A	6
Arsenic	340	150	10
Cadmium[b]	0.93	0.15	5
Copper[b]	6.5	4.6	200
Cyanide	22	5.2	200
Fecal Coliform (#/100 mL)	N/A	N/A	20
Iron	N/A	1,000	5,000
Lead[b]	28.71	1.12	50
Manganese	N/A	N/A	50
Mercury[c]	2.4	0.012	0.05
Nickel[b]	234.3	26.0	200
Nitrate	N/A	N/A	10,000
Zinc[b]	59.8	59.8	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 44 mg/L $CaCO_3$, the 15th percentile of background data.
c. Criteria for mercury are expressed as total. The federally approved freshwater aquatic life criteria for mercury are from the Alaska Water Quality Standards (1999).

B-III.B Reasonable Potential Analysis

This section discusses how reasonable potential was evaluated for Outfalls 001 and 002. For each parameter, the Department compared the maximum projected concentration to the criterion 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.

Reasonable potential is evaluated at the end of pipe in the absence of a mixing zone. However, if a mixing zone has been authorized reasonable potential is evaluated at the boundary of the mixing zone using the dilution factor authorized in the permit. The Department used the recommendations in the *RPA Guidance* to conduct the reasonable potential analysis.

Outfall 001

Since no mixing zone has been authorized 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

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

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

$\text{CV} =$ 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)

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

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)

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

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 B-4 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 B-4: RPM Calculation for Outfall 001

Parameter	Statistical Distribution	Equation	RPM
Arsenic	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.21
Cadmium	Log-ROS	2.4.2.2	1.01
Copper	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.01
Cyanide	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.00
Lead	Log-ROS	2.4.2.2	1.07
Manganese	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.00
Mercury	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.20
Zinc	Log-ROS	2.4.2.2	2.28
Sulfate	Lognormal	2.4.2.2	1.16
TDS	Normal	2.4.2.1	1.08

Reasonable Potential Summary: Results of the reasonable potential analysis for Outfall 001 are provided in Table B-5. Since no mixing zone has been authorized for Outfall 001, the reasonable potential determination was made at the end of pipe.

Table B-5: 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]		
Arsenic	7.1	1.03	75	1.21	8.6	10	no
Cadmium[c]	0.05	0.240	272	1.01	0.05	0.1	no
Copper[c]	9.7	0.798	273	1.01	9.8	4.6	yes
Cyanide	15	0.735	306	1.00	15.0	5.2	yes
Lead[c]	2.33	7.32	273	1.07	2.49	1.1	yes
Manganese	58.5	0.719	285	1.00	58.8	50	yes
Mercury	0.007	1.00	75	1.20	0.008	0.012	no
Zinc	2.5	2.73	75	2.28	5.7	59.8	no
Sulfate (mg/L)	62	0.270	77	1.16	72	250	no
TDS (mg/L)	186	0.162	69	1.08	200	500	no

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 44 mg/L $CaCO_3$, the 15th percentile of background data.

Outfall 002

A mixing zone has been authorized for fecal coliform bacteria, nitrate/nitrite, pH, dissolved oxygen, arsenic, cadmium, copper, lead, manganese, mercury, and zinc at Outfall 002. When a mixing zone has been authorized, reasonable potential is evaluated at the boundary of the mixing zone. Using the dilution factor authorized in the permit, the maximum projected receiving water concentration is determined and compared to the most stringent water quality criterion to determine if there is reasonable potential to exceed the water quality standard at the boundary of the mixing zone.

The maximum projected receiving water concentration was determined using the following mass balance equation, for discharge to the mixing zone in the Goodpaster River:

$$C_d = C_u + \frac{C_e - C_u}{D}$$

Where,

C_d = maximum projected receiving water concentration at the edge of the mixing zone

C_e = maximum expected effluent concentration

C_u = background concentration of pollutant

D = dilution in mixing zone

D (dilution): A mixing zone is defined as a limited area or volume of water where the discharge plume is progressively diluted by the receiving water. WQS may be exceeded in the mixing zone as long as acutely toxic effects are prevented from occurring and the applicable existing designated uses of the waterbody are not impaired as a result of the mixing zone. A mixing zone is authorized at the discretion of the Department based on the WQS regulations.

The WQS allow for the use of mixing zones. Under 18 AAC 70.250, it provides general conditions for mixing zones, and in 18 AAC 70.255, it provides quality and size specifications for mixing zones. The standards allow water quality within a mixing zone to exceed chronic water quality criteria so long as chronic water quality criteria are met at the boundary of the mixing zone. Acute water quality criteria may be exceeded within the acute mixing zone, which is located within the chronic mixing zone.

The Department authorized a chronic mixing zone for Outfall 002 with a dilution factor (D) of 23.4. The dilution factor was calculated by rearranging the equation for maximum projected receiving water concentration (C_d) to determine the dilution required to meet the Alaska WQS for fecal coliform bacteria at the boundary of the mixing zone.

$$D = \frac{C_e - C_u}{C_d - C_u}$$

Where,

C_e = 400/mL (maximum expected concentration of fecal coliform bacteria in effluent)

C_u = 3/mL (background concentration of fecal coliform bacteria = 15% of Alaska WQS)

C_d = 20/mL (Alaska WQS for fecal coliform bacteria)

$$D = \frac{400 - 3}{20 - 3} = \frac{397}{17} = 23.4$$

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 B-6 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 B-6: RPM Calculation for Outfall 002

Parameter	Statistical Distribution	Equation	RPM
Antimony	Normal	2.4.2.1	1.25
Arsenic	Gamma	2.4.2.1	1.12
Cadmium	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.23
Copper	Lognormal	2.4.2.2	1.31
Iron	Gamma	2.4.2.1	1.22
Lead	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.27
Manganese	Gamma	2.4.2.1	1.35
Mercury	Insufficient data set of sample detects (CV = 0.6)	2.4.1.1	1.45
Nickel	Non-Parametric (Kaplan-Meier)	2.4.2.1	1.13
Nitrate/Nitrite	Lognormal	2.4.2.2	1.03
Zinc	Lognormal	2.4.2.2	1.23
Sulfate	Normal	2.4.2.1	1.06

Reasonable Potential Summary: Twelve parameters that are known to be present in the effluent were analyzed to see if there is a reasonable potential to exceed WQS at Outfall 002. Four of these parameters showed no reasonable potential to exceed WQS at the end of pipe. The results of the reasonable potential analysis for these four parameters is shown in Table B-7.

Table B-7: Reasonable Potential Determination for Outfall 002 (No Authorized Mixing Zone)

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]		
Antimony	3.4	0.215	15	1.25	4.3	6	no
Iron	376	0.280	28	1.22	458	1,000	no
Nickel[c]	6.7	0.255	52	1.13	7.6	26.0	no
Sulfate	45	0.109	57	1.06	48	250	no

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 44 mg/L $CaCO_3$, the 15th percentile of background data.

Eleven parameters were shown to have a reasonable potential to exceed WQS at the end of pipe, and the Department authorized a mixing zone for these parameters. The results of the reasonable potential analysis for these parameters (with the exception of fecal coliform bacteria, dissolved oxygen, and pH) are shown in Table B-8.

Table B-8: Reasonable Potential Determination for Outfall 002 (Authorized Mixing Zone)

Parameter[a] (µg/L unless otherwise noted)	Effluent Data					Background Receiving Water Conc. (C_u)[c]	Max Projected Receiving Water Conc. (C_d)	Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)[d]
	Max Observed Effluent Conc.	Coefficient of Variation (CV)	Number of Samples	Reasonable Potential Multiplier (RPM)[c]	Max Expected Effluent Conc. (MEC)[b]				
Arsenic	140	0.213	52	1.12	156	1.5	8.1	10	no
Cadmium[e]	0.7	0.833	61	1.23	0.9	0.02	0.06	0.1	no
Copper[e]	69	0.380	52	1.31	90	0.7	4.5	4.6	no
Lead[e]	4.9	1.258	61	1.27	6.2	0.2	0.4	1.1	no
Manganese	114	0.698	33	1.35	153	7.5	14	50	no
Mercury	0.02	0.6[f]	60	1.45	0.03	0.002	0.003	0.012	no
Nitrate/Nitrite	51,500	0.883	265	1.03	53,200	1,500	3,700	10,000	no
Zinc[e]	400	0.292	52	1.23	494	9.0	30	59.8	no

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. Based on the 15th percentile of the most stringent water quality criterion.
d. Evaluated at the boundary of the authorized mixing zone.
e. Hardness-based limits using a hardness of 44 mg/L $CaCO_3$, the 15th percentile of background data.
f. The recommended CV of 0.6 was used for mercury due to the small number of detected samples.

B-III.C Water Quality–Based Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed WQS or a parameter has a technology-based limit that exceeds WQS, a water quality-based effluent limit for the pollutant is developed. Outfall 001 was shown to have reasonable potential to exceed WQS at the end of pipe, so WQBELs for Outfall 001 were developed. This section explains the procedure used to develop WQBELs for Outfall 001.

Outfall 002 was shown to have no reasonable potential to exceed WQS at the boundary of the mixing zone. Consequently, no WQBELs for Outfall 002 were developed; however, all existing WQBELs from the previous permit have been retained.

The effluent limits for pH at Outfall 002 have been retained from the previous permit. These limits are the same as the TBELs for pH at 40 CFR § 133.102. From the permit application, the measured pH at Outfall 002 has ranged from a minimum of 6.1 s.u. to a maximum of 8.3 s.u. The lowest reported value is slightly below the WQS of 6.5 s.u., and the highest reported value complies with the Alaska WQS.

At the 7-day, 10-year, low flow the discharge from Outfall 002 is diluted by a ratio of 111:1 (river water to maximum effluent discharge). The large amount of available dilution is sufficient to ensure that the background water quality in the Goodpaster River will remain unchanged, and the receiving water monitoring program supports this assertion.

The first step in calculating a permit limit is development of a 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.

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 for the acute and chronic criteria, and manganese is used as an example for the human health criteria.

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 and chronic water quality criteria for copper are 6.5 and 4.6 µg/L, respectively. The human health water quality criterion for manganese is 50 µg/L. Accordingly, the respective WLAs are:

$$WLA_{acute} = 6.5 \text{ µg/L}$$

$$WLA_{chronic} = 4.6 \text{ µg/L}$$

$$WLA_{hhealth} = 50 \text{ µg/L}$$

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,

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

$\sigma^2 = \ln(0.798^2 + 1)$

$\sigma^2 = 0.493$

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

$\boldsymbol{LTA_{acute} = 1.6\ \mu g/L}$

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

Where,

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

$${\sigma_4}^2 = \ln\left(\frac{0.798^2}{4} + 1\right)$$

${\sigma_4}^2 = 0.148$

$\boldsymbol{LTA_{chronic} = 2.0\ \mu g/L}$

Step 3 - Most Limiting LTA

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.

Step 4 - Calculate the Permit Limits

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,

$\sigma^2 = 0.493$ (as previously calculated)

$\boldsymbol{MDL_{aquatic} = 6.5\ \mu g/L}$

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

Where,

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

$${\sigma_n}^2 = \ln\left(\frac{0.798^2}{4} + 1\right)$$

${\sigma_n}^2 = 0.148$

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

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

$\boldsymbol{AML_{aquatic}} = \mathbf{2.8\ \mu g/L}$

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 manganese,

$$\mathrm{AML}_{hhealth} = WLA_{hhealth} = \mathbf{50\ \mu g/L}$$

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

Where,

z_{99} = 2.326 (as before)

z_{95} = 1.645 (as before)

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

$\sigma^2 = \ln(0.719^2 + 1)$

$\sigma^2 = 0.417$

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

$${\sigma_n}^2 = \ln\left(\frac{0.719^2}{4} + 1\right)$$

${\sigma_n}^2 = 0.122$

$\mathbf{MDL_{hhealth}} = \mathbf{109\ \mu g/L}$

Table B-9 summarizes the water quality-based effluent limit calculations for Outfall 001.

Table B-9: 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
Cadmium[a]	0.15	0.240	0.9	0.15	5	0.11	0.2	0.1
Copper	4.6	0.798	6.5	4.6	200	1.6	6.5	2.8
Cyanide	5.2	0.735	22.0	5.2	200	2.4	9.0	4.1
Lead	1.12	7.32	28.7	1.12	50	0.10	1.4	0.4
Manganese	50	0.719	N/A	N/A	50	N/A	109	50
Mercury[a]	0.012	1.00	2.4	0.012	0.05	0.004	0.02	0.01
Zinc[a]	59.8	2.73	59.8	59.8	2,000	5.8	60	19

a. There is no reasonable potential for these parameters to exceed WQS. However, limits are required because there are TBELs for each parameter.

B-IV Summary of Permit Effluent Limitations

As discussed in Section B-I of this appendix, 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, 011, and 002.

Table B-10: Outfall 001 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Cadmium[a]	µg/L	0.2	Chronic WQS	0.1	Chronic WQS
Copper	µg/L	6.5	Acute WQS	2.8	Acute WQS
Cyanide	µg/L	9.0	Chronic WQS	4.1	Chronic WQS
Lead	µg/L	1.4	Chronic WQS	0.4	Chronic WQS
Manganese	µg/L	109	Human Health WQS	50	Human Health WQS
Mercury[a]	µg/L	0.02	Chronic WQS	0.01	Chronic WQS
Zinc[a]	µg/L	60	Acute WQS	19	Acute WQS
Turbidity, effluent	µg/L	See Permit	Human Health WQS	See Permit	Human Health WQS
pH	mg/L	See Permit	WQS	See Permit	WQS
Outfall Flow	ml/L	15,800	Fish Passage	-	-

a. There is no reasonable potential for these parameters to exceed WQS. However, limits are required because there are TBELs for each parameter.

Table B-11: Outfall 011 Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Cadmium	µg/L	100	ELG	50	ELG
Copper	µg/L	300	ELG	150	ELG
Iron	µg/L	1,639	BPJ	817	BPJ
Lead	µg/L	600	ELG	300	ELG
Mercury	µg/L	2	ELG	1	ELG
Zinc	µg/L	1,500	ELG	750	ELG
TSS	mg/L	30	ELG	20	ELG
pH	s.u.	6 to 9	ELG	6 to 9	ELG
Outfall Flow	gpm	800	Design Capacity	-	-

Table B-12: Outfall 002 Effluent Limits

Parameter	Units	Monthly Average		Weekly Average		Daily Maximum	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Outfall Flow	gpd	-	-	-	-	72,000	Design Capacity
BOD_5	mg/L	30	BPJ TBEL	45	BPJ TBEL	60	BPJ TBEL
BOD_5 % Removal (Minimum)	%	85	BPJ TBEL	85	BPJ TBEL	85	BPJ TBEL
TSS	mg/L	30	BPJ TBEL	45	BPJ TBEL	60	BPJ TBEL
TSS % Removal (Minimum)	%	85	BPJ TBEL	85	BPJ TBEL	85	BPJ TBEL
Fecal Coliform Bacteria	#/100 mL	200	Human Health WQS	-	-	400	Human Health WQS
Nitrate/Nitrite	mg/L	80	Human Health WQS	-	-	160	Human Health WQS
pH	s.u.	6 to 9	BPJ TBEL	6 to 9	BPJ TBEL	6 to 9	BPJ TBEL
Dissolved Oxygen (DO)	mg/L	>2	Acute WQS	>2	Acute WQS	>2	Acute WQS

APPENDIX C. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an APDES permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet; however, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates) - Permit writer performs modeling exercise and documents analysis in Fact Sheet at: ►Section 5.3 Mixing Zone Analysis - describe what was done to reduce size.	•Technical Support Document for Water Quality Based Toxics Control •Fact Sheet, Appendix C • DEC's RPA Guidance • EPA Permit Writers' Manual	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	**Y**
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet at Section 5.3 Mixing Zone Analysis. Attach additional documents if necessary.		18 AAC 70.240 (a)(3)	**Y**

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	• Fact Sheet Section 5.3	18 AAC 70.255(f)	**Y**
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(1)	**Y**
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(2)	**Y**
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**		18 AAC 70.250(a)(3)	**Y**
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**		18 AAC 70.250(a)(4)	**Y**
	Does the mixing zone…			

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Human consumption	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(2)	**Y**
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(3)	**Y**
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**		18 AAC 70.255 (h)	**Y**
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**		18 AAC 70.250 (a)(1)	**Y**

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**			**Y**
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(1)(C)	**Y**
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**		18 AAC 70.255 (b),(c)	**Y**
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**		18 AAC 70.255(e)(3)(B)	**Y**
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(2)(A-C)	**Y**
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**			**Y**
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**			**Y**

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**		18 AAC 70.250(b)(1)	**Y**
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(1)	**Y**
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(2)	**Y**
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(1)	**Y**
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(2)	**Y**
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Applicant or permit writer requests list of T/E spp from USFWS prior to drafting permit conditions.	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	**Y**