ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET

Permit Number: AK0043206

Hecla Greens Creek Mining Company

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Technical Contact: Tim Pilon
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
610 University Avenue
Fairbanks, AK 99709-3643
(907) 451-2136
Fax: (907) 451- 2187
tim.pilon@alaska.gov

An Alaska Pollutant Discharge Elimination System (APDES) permit is reissued to

HECLA GREENS CREEK MINING COMPANY

For wastewater discharges from

Greens Creek Mine
P.O. Box 32199
Juneau, AK 99803

The Alaska Department of Environmental Conservation (Department or DEC) reissues APDES individual permit AK0043206 to Hecla Greens Creek Mining Company (HGCMC). 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 permitted discharges from Greens Creek Mine facilities to Hawk Inlet, Greens Creek, and Zinc Creek and the development of the permit including:

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

Appeals Process

The Department will transmit the permit, final fact sheet, and the Response to Comments to anyone who provided comments during the public comment period.

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, 99811-1800

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

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

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

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

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

Documents are Available

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting the Department between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm .

Alaska Department of Environmental Conservation Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99709 (907) 451-2136	Alaska Department of Environmental Conservation Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Wastewater Discharge Authorization Program 410 Willoughby Avenue, Suite 303 Juneau, AK 99811 (907) 465-5180

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 APPLICANT

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

Permittee:	Hecla Greens Creek Mining Company (HGCMC)
Facility	Greens Creek Mine
APDES Permit Number:	AK0043206
Facility Location:	18 miles southwest of Juneau, Alaska
Mailing Address:	P.O. Box 32199, Juneau, AK 99803
Facility Contact:	Mr. Christopher Wallace

The maps in Figure 1, Figure 2, and Figure 3 of the fact sheet show the mine, treatment plant, discharge, and monitoring locations.

2.0 FACILITY INFORMATION

The Greens Creek Mine is a lead, zinc, silver, and gold mine and mill located on the northwest portion of Admiralty Island approximately 18 miles southwest of Juneau, Alaska. The mine and mill are owned and operated by the HGCMC. The facility has been in operation since 1989 with a period of temporary shutdown between April 1993 and 1996. At an average production rate of 2,200 to 2,400 tons of ore per day, HGCMC predicts an additional 10 year mine life.

The mine facilities encompass approximately 273 acres in the Admiralty Island National Monument. The Admiralty Island National Monument is managed by the U.S. Forest Service and is located in the Greens Creek, Zinc Creek, Cannery Creek and Tributary Creek drainages. These creeks flow into Hawk Inlet. Major site facilities include the underground mine, waste rock storage areas, mill, dry tailings disposal site, port facilities (Hawk Inlet terminal facilities), and roads connecting these components. The location of the major facility components are shown in Figure 1.

2.1 Mining, Milling, and Tailings Disposal Processes

The ore is mined via underground methods. Waste rock removed from the mine is permanently disposed of in waste rock site 23 and dry tailings disposal site. At the mill, the ore is ground and processed by flotation to produce concentrates containing primarily lead and zinc with smaller portions of silver and gold. The following reagents are added to the flotation process: copper sulfate, alcohol-based frothers, xanthate, lime, sodium cyanide, zinc sulfate, sulfuric acid, sodium isopropyl dithiophosphate, 3418A promoter, SD200 depressant, metabisulfite, and carbon dioxide. The flotation concentrates are thickened, filter pressed, and then, trucked to the Hawk Inlet terminal for shipment off-site.

The tailings from the flotation process are thickened and filter pressed. Approximately half of the tailings are backfilled into the underground mine. The remainder are covered and transported to the dry tailings disposal site.

The dry tailings disposal site is located in the upper reaches of Tributary Creek drainage. Currently, the total area of the site is approximately 100 acres. The dry tailings disposal site consists of a dry tailings pile and runoff surge pond (tailings facility) situated adjacent to one another. In 2003, an Environmental Impact Statement (EIS) for expansion of the tailings facility was finalized by the U.S. Forest Service and followed by approval to expand the tailings facility to approximately 85 acres, and on August 30, 2013, an EIS for another expansion of the tailings facility was completed. Afterward, the US Forest Service approved plans to expand the tailings disposal facility by about 18 acres.

2.2 Description of Discharges

Previous Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permits issued to the permittee authorized the discharge of treated wastewater from outfalls 001 and 002 into Hawk Inlet and from ten storm water outfalls. Figure 1 depicts the locations of those outfalls. The sources of wastewater contributing to each outfall are described below.

<u>Outfall 001</u>: Previous permits allowed a discharge of treated domestic wastewater from outfall 001 to Hawk Inlet. In 2000, the Permittee directed the flows from outfall 001 to outfall 002 and abandoned outfall 001. Outfall 001 is no longer in use and excluded from this permit.

<u>Outfall 002</u>: Mine and mill wastewaters and storm water are treated and discharged through outfall 002 into Hawk Inlet. The specific sources of wastewater and waste streams contributing to outfall 002 are listed below.

1. Water from the underground mine - Wastewater from the underground mine is pumped to the tailings storage facility (TSF) wastewater treatment plant (WWTP) for treatment prior to discharge.
2. Process water from the mill - Most of the process water collected from the mill through tailings and concentrate thickening and filtration is recycled for reuse in the milling process. However, a portion of the process water is continually purged from the system to maintain water chemistry suitable for proper flotation performance. Prior to recycling the water is treated at the mill in either a 400 gallon per minute (gpm) or an 800 gpm treatment plant. The portion of water purged from the system is piped to the TSF WWTP for additional treatment prior to discharge. Water treatment consists of hydrogen peroxide addition to destroy cyanide, ferric iron co-precipitation, flocculation, and settling of precipitates reducing metal concentrations in the wastewater.
3. Sanitary wastes from the mine and mill area (920 Area) and Hawk Inlet terminal areas are treated to secondary standards and disinfected in a sequencing batch reactor (SBR) package plant then pumped through pipes to the TSF WWTP for additional treatment prior to discharge. The average effluent flow rate for the 920 Area and Hawk Inlet SBRs are about 7,200 and 5,800 gallons per day (gpd), respectively.

4. Storm water from the mine and mill area - Storm water drainage from the mine and mill area are collected through of a series of lined ditches, degritting basins, and ponds. These waters are piped to the TSF WWTP for treatment prior to discharge.
5. Storm water from the Hawk Inlet terminal area - Storm water from the Hawk Inlet terminal area is collected in a degrit basin and piped to the TSF WWTP for treatment prior to discharge.
6. Seepage and runoff from waste rock storage areas 23 and D, Pond C, and Pond D - Seepage and runoff from these waste rock storage areas are collected in ponds below the waste rock storage piles. These wastewaters are routed either back to the mill for use in mill processes or are pumped to the TSF WWTP for further treatment prior to discharge.
7. Tailings disposal facility seepage and runoff - Seepage and contact water from the dry tailings facility are collected in Pond 7 located below the TSF WWTP.
8. Intercepted groundwater – Groundwater, including beneath Pond 7 and the TSF, is intercepted and piped to the TSF WWTP for treatment prior to discharge.

These eight wastewater streams are combined and treated in the TSF WWTP, a 3,200 gpm wastewater treatment plant, located near the dry tailings facility. The treatment process is the same as that used for the mill wastewaters (ferric iron co-precipitation, neutralization, and filtration). The TSF WWTP effluent is discharged through outfall 002. Sludge from the treatment plant is thickened, filtered, and disposed in the dry tailings facility.

During the 2005 NPDES permit cycle, the total discharge rate from outfall 002 averaged 1.5 million gallons per day (mgd) with a maximum daily flow of 3.4 mgd. The effluent outfall line has a maximum capacity of 4.6 mgd. Pollutants of concern present in the discharge include cadmium, copper, lead, mercury, zinc, cyanide, five-day biological oxygen demand (BOD), total suspended solids (TSS), pH, and fecal coliform bacteria. Based on the maximum design capacities of the SBR package plant and the TSF WWTP, treated domestic wastewater comprises 0.13 percent of the discharge flow.

Outfall 002 extends from the dry tailings area to the Hawk Inlet discharge point at latitude 58° 06' 06" N and longitude 134° 46' 30" W. The effluent discharges through a 160 ft. long diffuser with a depth of 45 ft. at the near-shore end and 69 ft. at the far end. There are 15 discharge ports, “Tideflex” duckbill valves, spaced at 11.4 ft. intervals along the 14-inch diameter diffuser.

Storm Water: Storm water that is not discharged through outfall 002 may be discharged through the storm water outfalls listed in Table 1 and shown in Figure 1.

Table 1: Storm Water Outfalls

Outfall	Location*	Description of Discharge	Receiving Water
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Runoff from parking and storage areas not otherwise captured and routed through outfall 002	Hawk Inlet
004	Pit 7 (inactive rock quarry and topsoil storage) off of A-road at mile 1.9	Runoff and drainage from inactive rock extraction pit and topsoil storage	Wetlands
005.2	Zinc Creek (east side of bridge) off of B-road at mile 3.0	Runoff from road cut and fill in known mineralized zone	Zinc Creek
005.3	Site E (inactive waste rock storage area) off of B-road at mile 4.7	Runoff from waste rock storage area and road runoff	Greens Creek
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-road at mile 4.6	Seepage and runoff from inactive quarry site and topsoil storage area	Greens Creek
005.5	Culvert at B-road mile 7.8	Road runoff	Greens Creek
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-road at mile 8.0	Seepage and runoff from inactive waste rock storage area D	Greens Creek
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-road at mile 8.2	Seepage and runoff from inactive waste rock Site C and mill backslope	Greens Creek
008	960 laydown site (initial portal development waste rock)	Seepage and runoff from inactive waste rock placement site	Greens Creek
009	Site 1350 adit inactive waste rock storage area	Runoff and seepage from inactive development rock placement site	Greens Creek
Note: *See Figure 1 which shows storm water outfall locations.			

2.3 Permit Background

EPA issued an initial NPDES permit for Greens Creek Mine on March 31, 1987. The initial permit was reissued by EPA on October 15, 1998 and expired on November 17, 2003. Since Kennecott Greens Creek Mining Co. submitted a timely permit renewal application in a letter dated May 6, 2003, the 1998 permit was administratively extended until the effective date of a reissued permit. The current permit became effective on July 1, 2005 and expired on July 1, 2010. However, a timely application for reissuance of the permit was submitted to EPA in December 2009. Because HGCMC submitted a timely application for reissuance, the 2005 permit has been administratively extended and remains fully effective and enforceable until the effective date of a new permit per 18 AAC 83.155(c). DEC assumed primacy to administer the NPDES permit program for mining discharges in October 2010. This permit issuance marks the first APDES permit issuance for the subject discharge.

3.0 COMPLIANCE HISTORY

On April 10, 2006, approximately 4,163 gallons of mine drainage discharged into Greens Creek due to a joint failure in a steel pipeline that normally transfers mine drainage from the mine to the TSF WWTP. This event resulted in the Department issuing a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company on April 28, 2006 for discharging water with lead and zinc concentrations exceeding Alaska Water Quality Standards (WQS). This violation was addressed in an expedient manner and steps were taken to prevent recurrence of a similar problem.

On April 25, 2007, EPA issued an NOV to Kennecott Greens Creek Mining Company resulting from a July 7, 2006 inspection. The following three violations were cited in the NOV: 1) the 2005 storm water monitoring report showed numerous discharges from storm water outfalls exceeding WQS for lead and zinc; 2) on April 10, 2006, a broken pipe caused an unpermitted, 4,163 gallon, spill of mine drainage into Greens Creek; and 3) time composite sampling from outfall 002 did not satisfy the requirement for flow proportional composite sampling when flow was variable. These violations were subsequently addressed.

On December 21, 2009, EPA issued an NOV to Hecla Greens Creek Mining Company resulting from a June 8, 2009 inspection. The following four violations were cited in the NOV: 1) on August 11, 2009, Hecla Greens Creek Mining Company drillers observed an unpermitted discharge of mud entering Greens Creek; 2) plastic sheeting covering waste rock at Site E and used as a best management practice to control storm water runoff was in a state of disrepair; 3) the refrigerator for the composite sampler at outfall 002 lacked a thermometer for indicating that samples are properly preserved; and 4) the Quality Assurance Plan failed to describe the practice of composite sampling for fecal coliform bacteria from outfall 002 and needed updating to include it. These violations were subsequently addressed.

Discharge Monitoring Reports (DMRs) from December 2005 through September 2013 were reviewed to determine the Permittee’s compliance with effluent limits. Table 2 presents permit limit exceedances.

Table 2: Permit Limit Exceedance

Parameter	Date	Monitoring		
		Basis	Permit Limit (mg/L)	Reported Value (mg/L)
TSS	9/31/08	Daily Maximum	30	50
TSS	2/12/13	Daily Maximum	30	59

4.0 EFFLUENT LIMITS

4.1 Basis

The Clean Water Act (CWA) requires that the limits for a particular pollutant be the more stringent of either technology-based or water quality-based effluent limits (WQBELs). Technology-based effluent limits (TBELs) are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the WQS of a waterbody are met. WQBELs may be more stringent than TBELs. Additionally, narrative limitations designate qualitative restrictions and may also complement quantitative limits.

The permit contains both TBELs and WQBELs for outfall 002 and narrative limitations for the ten storm water outfalls. Sections 4.2 and 4.3 summarize the permit's effluent limitations. See APPENDIX - B for more details.

4.2 Outfall 002 Limits

The effluent flow limits from outfall 002 have increased. Since the 2005 permit, the mine-site storm water collection system expanded, capture of mine runoff water conveyed to the TSF WWTP increased, and the TSF WWTP discharge pipeline diffusers were upgraded to accommodate more storm water treatment and throughput. The TSF WWTP increased its throughput capacity from 2,500 gpm to 3,200 gpm in order to maximize discharge during peak rainfall events and to prevent overflow from Pond 7. As a result, limits on daily maximum and monthly average flows increased proportionally to the increase of throughput capacity from 3.6 to 4.6 mgd and 2.4 to 3.7 mgd, respectively. Otherwise, effluent limits remained the same or decreased. In the 2005 EPA-issued NPDES permit, all effluent limits were TBELs. In this permit issuance, WQBELs have replaced some TBELs, and in the case of cyanide, a new WQBEL has been developed. For a side-by-side comparison of outfall 002 effluent limits in the preceding permit and this permit see Table 3 below. For a detailed discussion of how the permit limits were developed, see APPENDIX - B. Note, some of the limits have changed from the previously public noticed March 2013 draft APDES permit.

Table 3: Outfall 002 - Effluent Limits

Parameter	Units	Effluent Limits			
		Daily Maximum		Monthly Average	
		2005 Permit	This Permit	2005 Permit	This Permit
Flow	mgd	3.6	4.6	2.4	3.7
Cadmium, total recoverable	µg/L	100	100	50	50
Copper, total recoverable	µg/L	300	99	150	39
Cyanide, weak acid dissociable	µg/L	NA	19	NA	9.2
Lead, total recoverable	µg/L	600	327	300	123
Mercury, total	µg/L	2.0	1.9	1.0	1.0
Zinc, total recoverable	µg/L	1,000	1,000	500	500
TSS	mg/L	30	30	20	20
pH	s.u.	within the range of 6.0 to 9.0			

4.3 Storm Water Outfall Limitations

Monitoring data indicated that some of the storm water discharges exceeded WQS (see, APPENDIX - B Section III. B2. for a discussion of the storm water discharges and concentrations compared to WQS). However, numeric effluent limits were not developed for the individual storm water outfalls. This is due to the difficulty in developing numeric limits for storm water discharges that are extremely variable in flow and pollutant concentrations and the uncertainty regarding the effect of the storm water discharges on the receiving waters.

Rather than developing numeric effluent limits for each storm water outfall, the permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. This limitation is imposed on a parameter-by-parameter basis for lead, zinc, TSS, pH, and oil and grease. Additionally, storm water monitoring was increased by adding a sample site just upstream of each outfall. The 2005 permit required sampling from each outfall and downstream of each outfall, and this permit requires upstream, outfall, and downstream sampling. Finally, corrective action requirements were added to address any storm water exceedance in a prescribed, approved, timely, and comprehensive manner.

The Permittee currently has an approved best management practices plan (BMP Plan) aimed at achieving the objectives and specific requirements for developing outfall-specific BMPs. APDES regulations allow for the use of BMPs where development of numeric effluent limits is infeasible (18 AAC 83.475). See Section 7.2 for more information regarding the BMP requirements.

5.0 MONITORING REQUIREMENTS

5.1 Basis

Under AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Permits require monitoring 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 to conduct the monitoring and report results on Discharge Monitoring Reports (DMRs) and on the application for permit reissuance, as appropriate.

5.2 Outfall 002 – Effluent Monitoring

The effluent monitoring requirements in the permit are summarized in Table 4. The monitoring requirements are the same as the 2005 permit with the following exceptions:

- pH monitoring frequency is increased to continuous from daily, and to accommodate the increase in frequency, the sample type has been changed from grab to recording.
- Per stipulations in DEC’s 401 Certification of the 2005 permit, the requirement for an annual video and report on the condition the outfall 002 diffuser and ports has been added.

- Cyanide monitoring frequency has a provision for reduction from weekly to monthly because the concentration of weak acid dissociable cyanide was undetectable in 93 percent of the 363 samples that were analyzed between June 2005 and July 2012.
- Fecal coliform bacteria sample type is changed from composite to grab. This was done to accommodate requirements of the test method.
- Total residual chlorine (TRC) monitoring is removed per conditions of the 2005 permit.

Table 4: Outfall 002 - Effluent Monitoring Requirements

Parameter	Units	Monitoring Requirements	
		Minimum Frequency	Sample Type
Flow	mgd	continuous	recording
Cadmium [a]	µg/L	weekly	24-hour composite
Copper [a]	µg/L	weekly	24-hour composite
Lead [a]	µg/L	weekly	24-hour composite
Mercury [b]	µg/L	weekly	24-hour composite
Zinc [a]	µg/L	weekly	24-hour composite
TSS	mg/L	weekly	24-hour composite
pH	s.u.	continuous [c]	recording
Cyanide [d]	µg/L	weekly [e]	24-hour composite
Temperature	°C	weekly	grab
BOD_5	mg/L	monthly	grab
Fecal coliform bacteria	#/100 mL	monthly	grab

Notes:

a. Metals shall be measured as total recoverable. See EPA memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

b. Mercury shall be measured as total. See EPA memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

c. Permit Part 1.2.4 imposes continuous monitoring requirements as specified in 40 CFR Part 401.17 and adopted by reference in 18 AAC 83.010(g)(1).

d. Cyanide shall be measured as weak acid dissociable (WAD).

e. Weekly sampling may be reduced to monthly after four months (16 weeks) if all samples have levels of WAD cyanide below the detection level of 5 µg/L. Otherwise, 16 consecutive weeks of WAD cyanide concentrations below 5 µg/L is necessary to reduce monitoring frequency to monthly.

5.3 Storm Water Monitoring

The 2005 permit required HGCMC to monitor storm water outfalls twice per year (once during spring runoff/snowmelt and once during the fall “monsoon” months) at the locations shown in Figure 1. Outfalls 003 through 005 are monitored for oil and grease, lead, zinc, TSS, and pH. Outfalls 006 through 009 are monitored for lead, zinc, TSS, and pH, as outlined in Table 5.

The Department reviewed the monitoring data from 2005 through 2011 and determined that twice yearly storm water monitoring of the outfalls must continue, provided there is discharge. Since some of the storm water monitoring showed that the storm water exceeded WQS, monitoring of the receiving water upstream of each outfall has been added to the permit to determine whether the storm water is impacting receiving water quality. The permit requires, for each storm water monitoring event, that HGCMC monitor the receiving water directly upstream and downstream of where the storm water enters the receiving water. The receiving water must be monitored at the same time as the storm water outfalls and for the same parameters. See Table 5.

The permit includes requirements specifying the method detection limits used for the storm water and associated receiving water monitoring. It also specifies that lead and zinc shall be measured as total recoverable.

Table 5: Storm Water Outfall Monitoring Requirements

Outfall	Location	Parameters [a]	Minimum Frequency [b]	Sample Type
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
004	Pit 7 (inactive rock quarry and topsoil storage) off of A-road at mile 1.8	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.2	Zinc Creek (east side of bridge) off of B-road at mile 3.0	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.3	Site E (inactive waste rock storage area) off of B-road at mile 4.7	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-road at mile 4.6	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.5	Culvert at B-road mile 7.8	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-road at mile 8.0	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-road at mile 8.2	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
008	960 laydown site (initial portal development waste rock)	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
009	Site 1350 adit inactive waste rock storage area	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab

Notes:

a. Flow shall be reported in gpm, lead and zinc shall be measured as total recoverable in µg/L, oil & grease and TSS shall be measured in mg/L, pH shall be measured in s.u., and hardness shall be measured as mg/L of $CaCO_3$.

b. The samples must be collected once during the spring runoff or snow-melt and once during the fall rainfall events. Sampling is only required when an outfall is discharging.

5.4 Internal Monitoring Locations 010 and 011

The effluent monitoring requirements for internal monitoring locations 010 and 011 are summarized in Table 6. Internal monitoring location 010 is a new effluent monitoring location for the Hawk Inlet SBR and internal monitoring location 011 is a new effluent monitoring location for the 920 Area SBR. Both SBRs discharge domestic wastewater that is designed to treat domestic wastewater to secondary treatment standards as well as provide disinfection. The monitoring locations will be located between the respective SBR and the TSF WWTF pond. Although the SBRs were engineered to meet secondary treatment standards for BOD_5, the 2005 permit did not require sufficient monitoring to allow verification that the domestic discharge meets secondary treatment standards for BOD_5 as required under 18 AAC 72.050. The collected BOD_5 data will be used to validate that the domestic wastewater treatment system are meeting this requirement.

Table 6: Internal Monitoring Locations 010 and 011 Requirements

Parameter	Units	Monitoring Requirements	
		Minimum Frequency	Sample Type
BOD_5	mg/L	monthly*	grab
* Samples must be taken on the same day as outfall 002 BOD_5 sampling.			

5.5 Hawk Inlet Monitoring

This permit requires HGCMC to monitor seawater, sediments, and toxicity in Hawk Inlet. Based on recommendations from Alaska Department of Fish and Game (ADF&G), including a memo dated April 22, 2014, permit monitoring requirements have been updated since the 2005 permit. The goal of the monitoring program is to demonstrate that WQS are not exceeded outside the boundary of the mixing zone and to assess whether sediments or aquatic organisms may be affected by the facility's discharges. The sampling locations are shown in Figure 2. The changes from the 2005 permit relating to Hawk Inlet monitoring are contained in Permit Parts 1.6.1.2, 1.6.1.2.2, 1.6.1.3, and 1.6.1.3.2, where monitoring frequency has been adjusted and the number of samples specified, 1.6.3.2 requiring site 108 sampling on days when effluent is sampled and 1.6.1.5 adding statistical evaluation to annual reporting requirements. A summary of the Hawk Inlet Monitoring Program follows.

<u>Water Column Monitoring</u>: The permit requires quarterly receiving water monitoring in Hawk Inlet at three pre-existing sample locations (sites 106, 107, and 108). Sites 106, 107, and 108 are part of the Hawk Inlet ambient water quality monitoring program: 106 is nearest the mouth of the inlet, 107 is nearest the head of the inlet and adjacent to the mine's port facility, and 108 is nearest to the outfall.

The samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, zinc, TSS, pH, cyanide, temperature, conductivity, and turbidity. Metals, with the exception of mercury that is measured as total, must be measured as dissolved. Hawk Inlet water quality monitoring data is used to evaluate water quality impacts of outfall 002 and 003 discharges. To perform this evaluation, it is necessary that the ambient monitoring use analytical methods that have method detection limits below the water quality criteria. Therefore, Table 7 specifies method detection limits (MDLs) for metals and cyanide required for marine water monitoring.

Receiving water monitoring requirements are the same as required in the 2005 permit. As approved by EPA, the permit requires that the metals be monitored as dissolved.

Table 7: Receiving Water Monitoring Parameters and MDLs

Parameter	Units	Minimum Frequency	MDL
Cadmium, dissolved	µg/L	quarterly	0.1
Copper, dissolved	µg/L	quarterly	0.03
Lead, dissolved	µg/L	quarterly	0.05
Mercury, total	µg/L	quarterly	0.002
Zinc, dissolved	µg/L	quarterly	0.2
TSS	mg/L	quarterly	-
pH	s.u.	quarterly	-
Cyanide, WAD	µg/L	quarterly	5
Temperature	°C	quarterly	-
Turbidity	NTU	quarterly	-
Conductivity	µS/cm	quarterly	-

Permit Part 1.6.3 – Site 108 Monitoring is a new section. It introduces the requirement to conduct effluent sampling on days when mixing zone sampling occurs. This requirement was added to track the relationship between effluent and receiving water quality. For more than 12 years, monitoring for water quality near the mixing zone has been performed at DEC-approved, monitoring site 108, and the permit maintains monitoring site 108 as the site for sampling water quality adjacent to the mixing zone.

Sediment Monitoring: The permit requires sediment monitoring in Hawk Inlet at least once per year at three pre-existing sample locations (locations S-1, S-2, and S-4) and at least once every five years at pre-existing sample locations S-5N and S-5S. Location S-1 is in an area affected by the discharges from outfall 002, location S-2 represents background conditions, location S-4 is in the area of the ore loading dock, and locations S-5N and S-5S are in an area affected by the loading of concentrates onto ships that is listed as impaired. See Section 6.2 for more details about the impairment. Samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc. The permit specifies method detection limits for these parameters. See Table 8. With the exception of frequency and number of samples, the sediment monitoring requirements are the same as required in the 2005 permit. Changes to the sediment monitoring requirements include reducing the frequency from twice annual sampling events at S-1, S-2, and S-4 to once annually and adding a requirement to collect six samples at each site annually. Section 8.0 *Anti-backsliding* provides the bases for these changes.

Table 8: Sediment Monitoring Parameters and Methods

Parameter	Preparation Method	Analysis Method	MDL [a] (mg/Kg)
Cadmium	PSEP [b]	GFAA [c]	0.3
Copper	PSEP [b]	ICP [d]	15.0
Lead	PSEP [b]	ICP [d]	0.5
Mercury	7471 [e]	7471 [e]	0.02
Zinc	PSEP [b]	ICP [d]	15.0

Notes:

a. Dry weight basis.
b. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Puget Sound Estuary Program (PSEP), EPA 910/9-86-157, as updated by Washington Department of Ecology. Subsection: Metals in Puget Sound Water, Sediment, and Tissue Samples, PSEP.
c. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.
d. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.
e. Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry - Method 7471, SW846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.

<u>In-situ Bioassays:</u> The permit requires analysis of tissues from organisms collected in Hawk Inlet at least once per year at seven pre-existing sample locations. Polychaete sediment dwellers (marine worms), Nephthys procera and Nereis sp., must be collected from three pre-existing sample locations (locations S-1, S-2, and S-4). These locations are the same as required for the sediment sampling, except bioassays are not required at location S-5 since the polychaete test organisms do not occur at location S-5. The filter feeder, Mytilus edulis (blue mussel) must be collected from four pre-existing sample locations (location Stn 1, Stn 2, Stn 3, and ESL). Sites Stn 2 and Stn 3 represent background conditions. Locations ESL and Stn 1 are in the area influenced by outfall 002. Tissue samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc. The methods used for sample collection and analysis are in Table 9. With the exception of the number of samples required and reducing the minimum frequency from twice annually to once per year, in-situ bioassay monitoring requirements are the same as required in the 2005 permit. Changes to the in-situ bioassay monitoring requirements include addition of a requirement to collect six samples at each site annually and reducing the minimum monitoring frequency from twice annually to once per year. Section 8.0 *Anti-backsliding* provides the bases for these changes.

Table 9: In-situ Bioassay Monitoring Organisms and Parameters

Sample Location	In-situ Test Organism [a]	Parameters (total in mg/kg)
S-1 S-2 S-4	*Nephthys procera* (polychaete) and *Nereis sp.* (polychaete) [b]	Cadmium, Copper, Lead, Mercury, Zinc
Stn 1 Stn 2 Stn 3 ESL	*Mytilus edulis* (blue mussel)	

Notes:

a. The organisms must be collected from each of the locations identified.
b. *Nereis sp*. may be replaced with other local species if *Nereis sp.* is not available.

5.6 Non-Routine Discharge Monitoring

The permit requires representative sampling per 18 AAC 83.405(k). This provision specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. This provision is included in the permit because routine monitoring could miss permit violations or WQS exceedances resulting from bypasses, spills, or non-routine discharges. This requirement directs HGCMC to conduct additional, targeted monitoring to quantify the effects of these occurrences on the final effluent discharge.

5.7 Whole Effluent Toxicity (WET) 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.

During development of the 2005 permit, EPA reviewed the WET data. The data showed that the effluent from outfall 002 had no reasonable potential to contribute to an exceedance of the WQS for toxicity. Adequate data determined that WET limits were not needed, and there was no reason to believe that the characteristics of the discharge would change over the term of the next permit; therefore, regular monitoring for WET was removed from the 2005 permit. Since the characteristics of the effluent remain unchanged, this permit does not require WET monitoring.

6.0 RECEIVING WATERS

6.1 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/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody.

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). Alaskan waterbodies may also have a site-specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The area of Hawk Inlet affected by permitted discharges has not been reclassified nor has a site-specific criterion been approved.

The Greens Creek facility wastewaters are discharged to Hawk Inlet. Storm water may be discharged to Hawk Inlet, Greens Creek, Zinc Creek, and wetlands.

Hawk Inlet is located adjacent to Chatham Strait. Hawk Inlet and Chatham Strait are classified for protection of all marine water uses: water supply (for aquaculture, seafood processing, and industrial uses); contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life and wildlife; and, harvesting for consumption of raw mollusks or other raw aquatic life (18 AAC 70.020).

Greens Creek and Zinc Creek are classified for protection of all fresh water uses: water supply (for drinking, agriculture, aquaculture, and industrial uses); contact and secondary recreation; and, growth and propagation of fish, shellfish, other aquatic life, and wildlife (18 AAC 70.020).

6.2 Water Quality Status of Receiving Waterbody

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. Zinc Creek and Greens Creek are not included on the list of Alaska’s CWA 303(d) impaired waters as published in Alaska’s Final 2012 Integrated Water Quality Monitoring and Assessment Report, December 23, 2013. However, the 2012 Integrated Water Quality Monitoring and Assessment Report lists a small portion of Hawk Inlet (150’ by 350’) for listing as impaired due to cadmium, copper, lead, mercury, and zinc in sediments where a spill occurred 1989, even though all samples indicate that the water column meets Alaska Water Quality Standards. The marine sediments, which are confined to a less than one acre area, do not negatively impact water quality in the locations affected by permitted discharges.

6.3 Mixing Zone Analysis

Under 18 AAC 70.240, as amended through June 26, 2003, the Department has authority to authorize a mixing zone in a permit. In Hawk Inlet at outfall 002, the Department authorizes a mixing zone with dilution of 20.3 parts receiving flow to 1 part effluent flow, equaling a dilution multiplier of 21.3. This dilution was determined by calculating the maximum expected effluent concentration from five years of effluent water quality data. Then using the maximum expected effluent concentrations, the 85^{th} percentile of the receiving water concentrations, WQS, and other relevant site-specific discharge and ambient data, mixing zones were modeled and dilution factors calculated using Department and EPA-approved CORMIX modeling software. See Table 3 for the metals that are authorized chronic (monthly average limit) and acute (daily maximum limit) mixing zones.

The mixing zone is a rectangular box shape extending from the inlet floor to the water surface. It has a maximum width of 165 feet centered along the 160 feet long diffuser, and it extends 40 feet perpendicular to either side of the diffuser for a total length of 80 feet. These results were modeled using single port option in CORMIX because the 15 diffusers are spaced so discharge plumes do not intersect, i.e. there are no cumulative effects from overlapping plumes.

Under 18 AAC 70.255(d), there is a smaller, initial, acute, mixing zone surrounding outfall 002 and contained within the larger 165 feet by 80 feet chronic mixing zone. At and beyond the boundary of the acute mixing zone, which is 160.5 feet wide and 63.4 feet long, all acute aquatic life WQS apply. Based on the maximum expected effluent concentrations and acute WQS, cyanide required the most dilution with a dilution factor equal to 18.53, and cyanide determined the acute mixing zone size. All other parameters needing an acute mixing zone to meet their respective water quality criteria fit into the acute mixing zone sized for cyanide.

To comply with 18 AAC 70.240, as amended June 26, 2003, and the prior provisions of 18 AAC 20.255(b) and consistent with EPA's *Technical Support Document for Water Quality-based Toxics Control* regarding the maximum size of an acute mixing zone (which are generally referenced in 18 AAC 70.255(d)), a drifting organism may not be within an acute mixing zone for longer than 15 minutes. At the 10th percentile receiving water current, 0.1 meter per second (meter/second), a drifting organism passes through the acute mixing zone in 4 minutes and at the 90th percentile current, 1.4 meters/second, in 17 seconds. The Department confirmed that there will be no lethality to organisms passing through the mixing zone.

In 2005, the Department authorized a mixing zone that had a length of 50 feet to either side of the diffuser and 300 feet wide that was modeled with the PLUMES software. Even though the limit on maximum discharge flow has increased in this permit compared to the 2005 NPDES permit, the mixing zone in the 2013 APDES permit is smaller, shorter and narrower, than that in the 2005 NPDES permit. In spite of an increased flow limit, the mixing zone is reduced for two main reasons. First, the mixing zone was modeled using CORMIX rather than PLUMES which has different numerical modeling approaches and outputs. Second as a modeling input, actual wastewater treatment plant performance replaced technology-based performance standards in predicting effluent quality. Under 18 AAC 70.245(b)(5), it requires the Department to consider the characteristics of the effluent after treatment of the wastewater. As a result, five years of effluent quality data from July 2007 through June 2012 were used sizing the mixing zone.

Appendix C - Mixing Zone Analysis Checklist 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.

Ambient Data – To determine the width and length of the mixing zone under critical receiving water conditions, calculations use the 10^{th} percentile and 90^{th} percentile current velocities. The 10th percentile current velocity used in the modeling was 0.1 meter per second and the 90^{th} percentile current velocity used was 1.4 meters per second. Water density inputs were 1018.63 kilograms per cubic meter (kg/m^3) for the surface and 1020.79 kg/m^3 for the bottom of the water column.

Effluent Data – The mixing zone plume was modeled using the maximum permitted flow limit equal to 3,200 gallons per minute and an effluent temperature of 16º C.

The effluent parameter requiring the greatest dilution to meet WQS at outfall 002 is lead, with a maximum expected effluent concentration of 176.75 micrograms per liter (µg/L); therefore, lead determined the chronic mixing zone size. All other parameters needing a chronic mixing zone to meet their respective water quality criteria fit within the chronic mixing zone sized for lead. Consequently, this parameter determined the smallest practicable the mixing zone. See Table 10 for a summary of water quality input variables and calculated dilution factors.

Table 10: Modeling Data and Dilution Factors

Parameter [a]	Maximum Expected Effluent Concentration	Background Parameter Concentration	Acute Marine WQS	Dilution Required to Meet Acute Marine WQS	Chronic Marine WQS	Dilution Required to Meet Chronic WQS
Cadmium	1.83	0.0769	40.28	<1[b]	8.846	<1[b]
Copper	26.40	0.4819	5.8	4.87	3.7	8.1
Cyanide, WAD	18.53	0	1	18.53	1	18.53
Lead	176.75	0.159	217.16	<1[b]	8.468	21.3
Mercury	0.38	0.000617	2.062	<1[b]	0.051[c]	7.6
Zinc	237.36	2.16	95.1	2.53	86.14	2.8

Notes:

a. All concentration units are µg/L, and parameters are measured as total recoverable or total with the exception of cyanide which is measured as weak acid dissociable.

b. Values less than one indicate that no dilution is required to meet WQS.

c. Human health standard for consumption of aquatic organisms

Discharge Data – Depth of water at the diffuser equals 15 meters.

Facility Upgrades – In addition to mill treatment plant effluent, contact storm water is treated and discharged through outfall 002. In 2007, back-to-back high rainfall events produced storm water flows that stressed the facility's storage and discharge capabilities. Since then, the facility has been upgraded and increased its maximum discharge rate from 2,500 gpm (3.6 million gpd) to 3,200 gpm (4.6 million gpd).

Results – Model simulations showed September to be the month when critical conditions are present. For the month of September, modeling provided an acute mixing zone of 160.13 feet wide by 63.4 feet long and a chronic mixing zone of 164.0 feet wide by 73.8 feet long. See Table 11.

Table 11: Modeling Results

Current		Mixing Zone Dimensions			
		Acute		Chronic	
Percentile	Velocity (meter/sec)	Width (feet)	Length* (feet)	Width (feet)	Length* (feet)
10th	0.1	160.07	19.3	161.4	21.2
90th	1.4	160.13	63.4	164.0	73.8

Note: The length of the mixing zone accounts for reversal of tidal currents across the length of the diffuser.

Size – For practical reasons, both the acute and chronic mixing zones are included in an approved mixing zone size of 165 feet wide by 80 feet long. CORMIX model simulations based on critical receiving water and effluent conditions along with the Department's knowledge of the water body's existing uses were used to determine the appropriate size of the mixing zone. This evaluation is consistent with the provisions of 18 AAC 70.245 and the small as practicable provision found 18 AAC 70.240(a)(2).

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. Ferric iron co-precipitation, neutralization, filtration, and secondary treatment with an SBR are used to treat wastewater influent and produce an effluent with a much higher quality than specified by technology-based effluent limitation guidelines (ELGs) for the subcategory of mines that produce copper, lead, zinc, silver, gold, or molybdenum mines as found in 40 CFR Part 440, Subpart J (adopted by reference at 18 AAC 83.010(g)(3)). Additionally, state-of-the-art diffusers were installed in 2010 to help disperse the high quality effluent upon mixing with the receiving water.

Existing Use – In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of Hawk Inlet. The existing uses have been maintained and protected under the terms of the previous permit. The permit reissuance application does not propose any changes that would result in the discharge of lower quality effluent.

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 has not precluded or limited established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

Human Health – According to 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit must protect human health. An analysis of the effluent testing data that was included with the HGCMC wastewater discharge application and the results of the reasonable potential analysis conducted on pollutants of concern indicate that the level of treatment at Greens Creek Mine is protective of human health. The quality of the effluent has met permit limits and maintained water quality criteria at, and beyond the mixing zone boundary. Further, the effluent quality is not expected to change and compliance with WQS is expected to continue.

Aquatic Life and Wildlife – According to 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit must protect aquatic life and wildlife. Whole effluent toxicity (WET) testing indicated that there are no observed toxic effects associated with effluent. The Hawk Inlet Monitoring Program, which evaluates if WQS are exceeded beyond the boundary of the mixing zone and assesses whether sediments or aquatic organisms are impacted by the facility's effluent discharges, has not demonstrated any negative impacts associated with the mixing zone.

Endangered Species – Under 18 AAC 70.250(a)(2)(D), the authorized mixing zone must not cause an adverse effect on threatened or endangered species. The United States Fish and Wildlife Service (USFWS) indicated that there are no concerns regarding harm to endangered species. The Humpback Whale and Eastern Stellar Sea Lion are endangered species potentially affected by Greens Creek Mine discharges. However, EPA conducted a Biological Evaluation (BE) in 1998, which determined that negative impacts on endangered species from the permit's discharges is unlikely. Currently, there is no information to refute the findings of the BE.

7.0 OTHER PERMIT CONDITIONS

7.1 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) and submit written notification to the Department within 120 days of the effective date of the final permit stating that the plan has been updated and is being implemented. 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.

7.2 Best Management Practices Plan

Under AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. This permit requires the Permittee to develop a BMP Plan to prevent or minimize the potential for the release of pollutants to waters and lands of the United States through plant-site runoff, spillage or leaks, or erosion. The permit contains conditions that must be included in the BMP Plan. The permit requires the Permittee to develop or update and implement a BMP Plan within 60 days of the effective date of the final permit. The BMP Plan must be kept on site and made available to the Department upon request.

Under 18 AAC 83.475, it authorizes the Department to require best management practices (BMPs) in APDES permits. BMPs are measures that are intended to prevent or minimize the generation and the potential for release of pollutants from industrial facilities to waters of the U.S. These measures are important tools for waste minimization and pollution prevention. HGCMC's 2005 permit required preparation of a BMP Plan. This permit contains general BMP Plan requirements, similar to what is required for most major industrial facilities in Alaska. The permit requires that the BMP Plan be updated as discussed below.

Where BMPs are used in lieu of numeric effluent limits for storm water discharges, the BMPs must demonstrate adequate water quality protection. It is not apparent from the past storm water monitoring that the BMPs currently utilized by HGCMC are protecting the receiving water quality. See APPENDIX – B Section III.C., which shows that the storm water discharges have exceeded WQS. Therefore, the permit includes a requirement that HGCMC develop BMPs for each storm water outfall to protect the receiving water quality. The permit includes BMP Plan requirements that are based on the storm water pollution prevention plan (SWPPP) requirements for metal mining facilities (Sector G) in DEC's APDES Storm Water Multi-Sector General Permit (AKR050000). The monitoring required in this permit (Section 5.3), along with periodic inspections, are required to evaluate the effectiveness of BMPs and to provide sufficient information to determine if the storm water discharges cause or contribute to degradation of water quality.

The permit requires that the BMP Plan be maintained and that any modifications to the facility are made with consideration to the effect the modification could have on the generation or potential release of pollutants. The BMP Plan must be revised if the facility is modified or as new pollution prevention practices are developed.

7.3 Standard Conditions

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

8.0 ANTI-BACKSLIDING

Anti-backsliding requirements found in 18 AAC 83.480(a) prohibit relaxation of certain permit conditions, except under prescribed circumstances. This permit reissuance relaxes five such permit conditions: 1) an increase in the outfall 002 discharge rate from 2,500 gpm to 3,200 gpm. This increase in flow resulted in increases in pollutant mass-loading rate limits for cadmium, mercury, and zinc. These increases are consistent with the state's antidegradation policy; 2) a provision reducing cyanide monitoring frequency in outfall 002 effluent from weekly to monthly after 16 consecutive weeks of undetectable measurements; 3) a provision reducing sediment monitoring frequency at sites S-1, S-2, and S-4 from twice per year to annually; 4) a provision reducing sediment monitoring frequency at sites S-5N and S-5S from twice annually to once every five years; and 5) a provision reducing in-situ bioassay monitoring frequency in Hawk Inlet from twice per year to annually. The Department relaxed these conditions as allowed under 18 AAC 83.480(a) because for (1) the relaxation of a WQS effluent limit is consistent with the state's antidegradation policy and for (2)–(5) the changes are allowed under 18 AAC 83.135(a) due to findings of cause for modifications of a permit listed under 18 AAC 83.135(b). The following details expand on each of the numbered items in this paragraph.

1) Extreme storm events in 2007 produced increased mine contact storm water flows, and in response, the mine upgraded and expanded its mine-site storm water collection, treatment, and

discharge system. Substantial facility changes included installing a system to capture runoff from the back slope at the mill and the mill road, improving Ponds C and D, increasing the pumping capacity to the TSF WWTP, and modifying the TSF WWTP diffuser, which relieved a bottleneck in the system allowing the discharge rate to match the TSF WWTP's throughput capacity. These are material and substantial alterations to the facility that occurred after issuance of the prior permit. Changes to the permit's flow limits reflect these facility upgrades necessary for managing water during large storms like those experienced in 2007. These increases comply with all effluent guidelines and WQS including antidegradation (See subpoint (C) of the antidegradation analysis in Section 9.3).

2) During development of the 2005 permit, cyanide data showed no reasonable potential to exceed water quality standards. Consequently, the permit imposed no limits for cyanide. However, the 2005 permit required weekly monitoring as a precaution. Since the 2005 permit was issued, the concentration of cyanide in the effluent from outfall 002 has been consistent with 93 percent of 363 samples resulting in undetectable levels of cyanide. A provision for reducing cyanide monitoring frequency from weekly to monthly after 16 consecutive weeks of undetectable levels of cyanide was added due to the consistency of undetectable measurements. Since new information indicates cyanide is consistently undetectable, reducing the cyanide monitoring frequency is merited according to 18 AAC 83.135(b)(2).
3) The Hawk Inlet Monitoring Program has been updated to incorporate comments and recommendations in a memo to the Department from ADF&G (ADF&G 2014). Because 1) a successful monitoring program must be site specific, simple and cost effective, adaptive, and long term, 2) historically the Hawk Inlet Monitoring Program has benefited from ADF&G's familiarity, expertise, and recommendations, and 3) the *Environmental Audit of the Greens Creek Mine* (SRK 2009) recommended reviewing the Hawk Inlet Monitoring Program data, ADF&G evaluated sediment and tissue sample data from 1989 through 2012 within and among sites. Sediment data include three samples from each site (S-1, S-2, S-4, S-5N, and S-5S) twice a year in the spring and again in the fall. However, these data indicate no seasonal variation or pattern between spring and fall. Based on ADF&G's recommendation, a provision was added to the permit reducing the sediment monitoring frequency from twice annually to once annually. Since new information or data indicates no seasonal variation, reducing the sediment monitoring frequency is merited according to 18 AAC 83.135(b)(2).
4) Sediments at sites S-5N and S-5S are contaminated from a 1989 concentrate spill and remnant cannery waste. In 2012, the Department listed 0.96 acres of Hawk Inlet between and including these sites as a Category 5 impaired waterbody under Section 303(d) of the Clean Water Act. Sediment data indicate a chronic impairment and suggests that metals will continue to persist for the long-term. For these reasons and based on a recommendation from ADF&G, sediment sampling frequency at sites S-5N and S-5S was further reduced from once annually to once every five-year permit cycle to track longer-term changes. New information on data and impairment, indicate that sediment contamination at sites S-5N and S-5S is chronic problem

dating back to 1989 and reducing the sediment monitoring frequency is merited according to 18 AAC 83.135(b)(2).

5) Polychaete and mussel tissue data include three samples from each site (S-1, S-2, and S-4 for polychaetes and ESL, Stn 1, Stn 2, and Stn 3 for mussels) in the spring and again in the fall. However, these data indicate no seasonal variation or pattern between spring and fall. Based on a recommendation from ADF&G, a provision was added to the permit reducing the tissue monitoring frequency from twice annually to once annually. Since new information or data indicate no seasonal variation, reducing the tissue monitoring frequency is merited according to 18 AAC 83.135(b)(2).

9.0 ANTIDEGRADATION

9.1 Receiving Waters

As described in Section 2.2 , outfall 002 discharges treated mine water, treated storm water, and treated domestic wastewater into Hawk Inlet. Ten storm water outfalls discharge to the following receiving waters: one into Hawk Inlet, one to wetlands, one to Zinc Creek, and seven to Greens Creek.

9.2 Tier Determination

The Department's approach to implementing the antidegradation policy found in 18 AAC 70.015 is based on the requirements in 18 AAC 70 and *Interim Antidegradation Implementation Methods* dated July 14, 2010. Using these requirements and policies, the Department determines whether a waterbody or portion of a waterbody is classified as Tier 1, Tier 2, or Tier 3, where a larger number indicates a greater level of water quality protection. To qualify as a Tier 3, or "outstanding national resource" water, one of two criteria must be met. The water must either be 1) in a national or state park or wildlife refuge or 2) a waterbody with exceptional recreational or ecological significance. Greens Creek Mine is in Admiralty Island National Monument, which is managed by the U.S. Forest Service as part of the Tongass National Forest. Eight storm water outfalls are located in the federal monument: seven discharge into Greens Creek, and one discharges into Zinc Creek. All other treated wastewater and storm water discharges are outside the monument.

In 1980, the U.S. Congress established Admiralty Island National Monument and reserved the rights to mine the claims at the Greens Creek site. Section 503 of the Alaska Native Interest Land Conservation Act specifically allows mining at the Greens Creek claims unless otherwise revoked by the Secretary of Agriculture. At this time, the Department has not designated any Tier 3 waters in Alaska. Based on the intent of Congress to allow the facility to be developed on the Admiralty Island National Monument, the Department determined that the affected waters are not Tier 3 waters and conducted an antidegradation analysis assuming that the affected waters are Tier 2.

9.3 Analysis

Under 18 AAC 70.015(a)(2), an antidegradation analysis was applied on a parameter-by-parameter basis to permit limits associated with reduction of water quality. The Antidegradation Policy of the Alaska WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing and designated uses must be maintained and protected. The Department may allow 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.

(A) Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

Rationale:

Per finding four, the Department has determined that the methods of pollution prevention, control, and treatment are the most effective and reasonable and that lowering water quality in the vicinity of the discharge is necessary.

Greens Creek Mine contributions to the socioeconomics of Southeast Alaska are important and highly significant. The mine is the largest private sector employer in Juneau, Alaska directly providing employment for approximately 400 fulltime equivalent positions and indirectly employing an additional 375 fulltime equivalent jobs. About 55% of the mine's employees live in Juneau, while an additional 7.5% live in Southeast Alaska. The mine provides over $61 million in pay and benefits annually. Greens Creek Mine pays more than $1.67 million annually in local property taxes and more than $6.7 million (2013) in State licensing taxes.

In 2013, Greens Creek Mine provided $81,000 in charitable contributions and the Hecla charitable foundation provided another $54,000. The mine has also instituted workforce development partnerships with the University of Alaska and Alaska Department of Labor, has started a successful new miner training program geared toward training local people for employment at mine sites and started (2011) the pathways to mining career program for high school students. The operation of the Greens Creek Mine is important to the economy of Southeast Alaska.

The operation of the Greens Creek Mine is important to the economy of Southeast Alaska. The Department finds that authorization of the mine's discharge accommodates important economic activity in the area and that this requirement is met.

(B) The reduced water quality will not violate applicable water quality criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

Rationale: Except within the mixing zone at outfall 002, the permit prohibits violation of the water quality criteria in 18 AAC 70.020. Reduction of water quality in the mixing zone is specifically authorized according to 18 AAC 70.240 through 18 AAC 70.270 (as amended June 26, 2003) and as allowed in 18 AAC 70.015(a)(2). The mixing zone has been sized to ensure that all applicable water quality criteria are met at all points outside the boundary of the mixing zone; therefore, reduction of water quality in the mixing zone is allowed under the antidegradation policy at 18 AAC 70.015(a)(2), and outside the mixing zone all applicable water quality criteria are protected.

The permit requires the permittee to establish best management practices at each outfall. The permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality for the same criterion. This is imposed on a parameter-by-parameter basis for lead, zinc, total suspended solids, pH, and oil and grease. These permit requirements are as restrictive as the 2005 NPDES permit.

Discharges authorized under this permit will not violate applicable water quality criteria, as allowed under 18 AAC 70.235. Under this regulation the Department may establish a site-specific water quality criteria that modifies a water quality criterion set for a waterbody. Since there are no site-specific criteria established for any receiving waters applicable to this permit, further evaluation is not required.

Discharges authorized under this permit will not violate applicable water quality criteria, as allowed under 18 AAC 70.020. In previous permits, WET monitoring data indicated no reasonable potential to exceed water quality criteria and consequently, the 2005 permit did not require WET monitoring. Since it was previously demonstrated that discharges does not violate applicable water quality criteria for WET and the nature of the discharge is not expected to change, further evaluation is not required.

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

(C) Resulting water quality will be adequate to fully protect existing uses of the water.

Rationale: Data from, and the ongoing high performance of the TSF WWTP, indicate that the discharges from HGCMC have been controlled to fully protect existing water body uses. Regardless of the changes to the permit, HGCMC is required and expected to continue operating in a fashion that protects all existing uses present in the water bodies that their discharges enter. Additionally, the Hawk Inlet Monitoring Program, as required by the permit, ensures that all limits remain protective by analyzing the relationships between the chemical composition of local water, sediment, and aquatic organisms.

At outfall 002, the permit restricts flow and imposes limits for cadmium, copper, cyanide, lead, mercury, pH, TSS, and zinc. However, the permit increases flow rate limits, which results in increased mass loading rate limits for cadmium, mercury, and zinc. Otherwise, the permit imposes as stringent or more stringent effluent limits for outfall 002 when compared to the 2005 permit. All mass loading rates in the permit, whether increased or decreased from the 2005 permit, comply with all WQS and protect all designated and existing uses for the water. Further, the mixing zone size has decreased by 56%, further ensuring protection of Hawk Inlet.

Upgrades to the contact storm water collection and treatment systems produced a 700 gpm increase in discharge capacity from 2,500 to 3,200 gpm. This change increases the mine's ability to treat and discharge water that may have been discharged without treatment. The design and impact of this change is to reduce the discharge of metals from untreated, contact water and to benefit the local aquatic environment. With only one exception (May 2, 2009) during the past five years of weekly sampling and analysis, all effluent limits have been met.

The Fresh Water Monitoring Program began in 1978 as a part of the mine's Exploratory Project Plan of Operations, which requires the U.S. Forest Service (USFS), land manager, approval.. When the mine received its first Waste Management Permit in 2001, the Department adopted the program as a permit requirement. Therefore, it's required primarily by the General Plan of Operations, secondarily by the USFS, and thirdly by the Waste Management Permit.

The Fresh Water Monitoring Program and the Hawk Inlet Monitoring Program have been in effect for over a decade. They are designed to detect impacts of the mine's discharges on local fresh and marine water ecosystems. To date, no negative impacts from the mine's discharges on the local aquatic ecosystems have been documented. During the past seven years, receiving water from Hawk Inlet sites 106, 107, and 108 have been sampled and analyzed four times per year for an array of constituents including those for which there is a mixing zone. Those receiving water quality data indicate that WQS have been met and all existing uses.

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

(D) The most effective and reasonable methods of pollution prevention control and treatment will be applied to all wastes and other substances to be discharged.

Rationale: See the technology section of 6.3 for a description of the high quality effluent generated by the treatment processes utilized at Greens Creek. Wastewater is treated to a much higher level than required by the promulgated ELG applicable to this facility found at 40 CFR Part 440, Subpart J.

In addition, as required in the 2005 NPDES permit, the Permittee must continue to implement an approved BMP Plan. The BMP Plan includes pollution prevention measures and controls appropriate for each facility and discharge. The Permittee is required to prepare a BMP Plan Annual Report (Permit Part 2.2.6.1) summarizing the site evaluations and inspections performed during the year. Any modifications to the BMP Plan must also be noted in the Annual Report. The BMP Plan and Annual Report must be provided to the

Department upon request. The design, construction, and operation of the TSF WWTP has also been reviewed and approved by the Department.

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

(E) Wastes and other substances discharged will be treated and controlled to achieve the highest statutory and regulatory requirements.

Rationale: The "highest statutory and regulatory requirements" defined in 18 AAC 70.990(30) (as amended June 26, 2003) have been applied to outfall 002 and storm water outfalls 003 through 009. Accordingly, there are three parts to the definition.

The first part of the definition includes all federal technology-based ELGs. For outfall 002, the permit imposes, at a minimum, technology-based ELGs for the subcategory of mines that produce copper, lead, zinc, silver, gold, or molybdenum mines as found in 40 CFR Part 440, Subpart J (adopted by reference at 18 AAC 83.010(g)(3)).

For the ten storm water outfalls, the permit requires developing and implementing an approved BMP Plan including requirements of a storm water pollution prevention plan. Further, the permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality.

The second part of the definition appears to be in error as 18 AAC 72.040 considers discharge of sewage to sewers and not minimum treatment. The correct reference appears to be the minimum treatment standards found in 18 AAC 72.050, which refers to domestic wastewater discharges only. All domestic wastewater flows from one of two SBR package plants where it undergoes primary and secondary treatment and disinfection. Effluent from the SBRs undergoes further treatment through the TSF WWTP. At outfall 002, monitoring demonstrates that minimum secondary treatment standards, as defined in 18 AAC 72.990(5) are achieved at outfall 002 for TSS, and pH but above the standard for BOD_5. The elevated level of BOD_5 is believed to be attributed to the non-domestic effluent and the overall effluent concentration of BOD_5 masks the treatment performance of the domestic treatment systems making it impossible to determine if secondary treatment standards are met for the treatment of domestic wastewater. Internal monitoring locations 010 and 011 are established in this permit as new monitoring locations to collect BOD_5 data to evaluate treated effluent from the SBRs and will provide data to rule out the domestic effluent as the source. This collected data will be used to validate if the domestic wastewater treatment system meets the minimum treatment requirements of 18 AAC 72.050. All effluent, including domestic and non-domestic, is ultimately routed through the TSF WWTP which provides additional treatment for domestic effluent and is discharged into Hawk Inlet.

The third part of the definition considers any more stringent treatment required by state law including 18 AAC 70 and 18 AAC 72. The permit requires the Permittee to develop and implement pollution prevention plans and a BMP Plan, which will control the discharges to satisfy all applicable state and federal limitations.

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

10.0 OTHER LEGAL REQUIREMENTS

10.1 Endangered Species Act

The Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the USFWS (collectively referred to as the Services) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, the Department is not required to consult with NMFS or USFWS regarding permitting actions. However, the Department values input from the Services and solicited comments from them on reissuance of this permit. On May 2, 2011 USFWS and on May 3, 2011 NMFS commented on a draft of this permit. Comments received from the Services were considered in this permit.

In an email dated August 6, 2010, USFWS reported there are no endangered or threatened terrestrial species in the area of Greens Creek Mine. The NMFS identified the humpback whale and eastern Steller sea lion as threatened and endangered species in the vicinity of Greens Creek Mine discharges in a letter dated August 14, 2003. During permit development, the Department sent an email to NMFS requesting updates to the threatened and endangered species list on October 8, 2010.

In 1998, EPA prepared a Biological Evaluation (BE) to evaluate the potential impacts of the NPDES discharges authorized in the 1998 permit on the listed species. The BE concluded that issuance of the NPDES permit was not likely to adversely affect any of the threatened and endangered species. Because the effluent limits and most of the other permit conditions are as stringent as or more stringent than in the 2005 NPDES permit, the Department determined that reissuance of the permit is not likely to adversely affect any of the species.

10.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NMFS when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, the Department is not required to consult with NMFS regarding permitting actions. However, the Department values NMFS input and on October 8, 2010 solicited NMFS comments regarding EFH and reissuance of this permit. The Department provided NMFS with copies of the draft permit and fact sheet during the public notice period. On May 3, 2011, NMFS commented on the draft permit, and the Department provided due consideration of the agencies concerns in the response to comments document dated September 30, 2012.

ADF&G has statutory authority at AS 16.05.841 and AS 16.05.871 to protect resident and anadromous fishes from development proposals that will occur below the ordinary high water line in fish-bearing waters. The Department provided ADF&G with copies of the draft permit and fact sheet during the public notice period. On November 11, 2010 and April 28, 2011, ADF&G commented on the draft permit, and those comments are incorporated.

In the 1998 BE prepared by EPA, EPA determined that issuance of the current permit was not likely to adversely affect the threatened and endangered species. The Department believes that this same determination is appropriate for EFH for the reasons laid out in the BE. Therefore, the Department has determined that reissuance of the Greens Creek Mine permit is not likely to adversely affect EFH in the vicinity of the discharge.

10.3 Permit Expiration

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

11.0 References

ADF&G (Alaska Department of Fish and Game). 2010a. Greens Creek Mine APDES Recommendations. State of Alaska, Department of Fish and Game, November 17, 2010.

ADF&G. 2010b. Aquatic Biomonitoring at Greens Creek Mine, 2009. State of Alaska, Department of Fish and Game, May 2010, Technical Report No. 10-03.

ADF&G. 2011. Aquatic Biomonitoring at Greens Creek Mine, 2010. State of Alaska, Department of Fish and Game, May 2011, Technical Report No. 11-02.

ADF&G. 2012. Aquatic Biomonitoring at Greens Creek Mine, 2011. State of Alaska, Department of Fish and Game, April 2012, Technical Report No. 12-03.

ADF&G. 2014. Memo on the Hawk Inlet Monitoring Program from J. Timothy to T. Pilon dated April 22, 2014.

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

DEC. 2003b. Waste Management Permit 0211-BA001. State of Alaska, Department of Environmental Conservation, November 7, 2003.

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

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

DEC. 2012a. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation, April 8, 2012.

DEC. 2012b. 18 AAC 72, Wastewater Disposal. State of Alaska, Department of Environmental Conservation, April 8, 2012.

DEC. 2012c. 18 AAC 83, Alaska Pollutant Discharge Elimination System. State of Alaska, Department of Environmental Conservation, April 8, 2012.

EPA (U.S. Environmental Protection Agency). 1991. Technical Support Document for Water Quality-based Toxics Control. Office of Water Enforcement and Permits, Office of Water Regulations and Standards, Washington, DC, March 1991, 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. 1996a. NPDES Permit Writer's Manual. EPA, Office of Water, Office of Wastewater Management, Permits Division. Washington, DC. December 1996. EPA-833-B-96-003.

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

EPA. 1998. Memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

EPA. 2005. Permit No. AK-004320-6, fact sheet, and response to comments. Seattle, WA, May 20, 2005.

HGCMC (Hecla Greens Creek Mining Company). 2009. Re-application package, Dated December 29, 2009, and Supplemental information.

HGCMC. 2008. Hawk Inlet Monitoring Program 2007 Annual Report. January 2008.

HGCMC. 2009. Hawk Inlet Monitoring Program 2008 Annual Report. January 2009.

HGCMC. 2010. Hawk Inlet Monitoring Program 2009 Annual Report. January 2010.

HGCMC. 2011. Hawk Inlet Monitoring Program 2010 Annual Report. January 2011.

HGCMC. 2012. Hawk Inlet Monitoring Program 2011 Annual Report. January 2012

SRK Consulting. 2009. Environmental Audit of the Greens Creek Mine. March 2009.

Figure 1: Facility Map

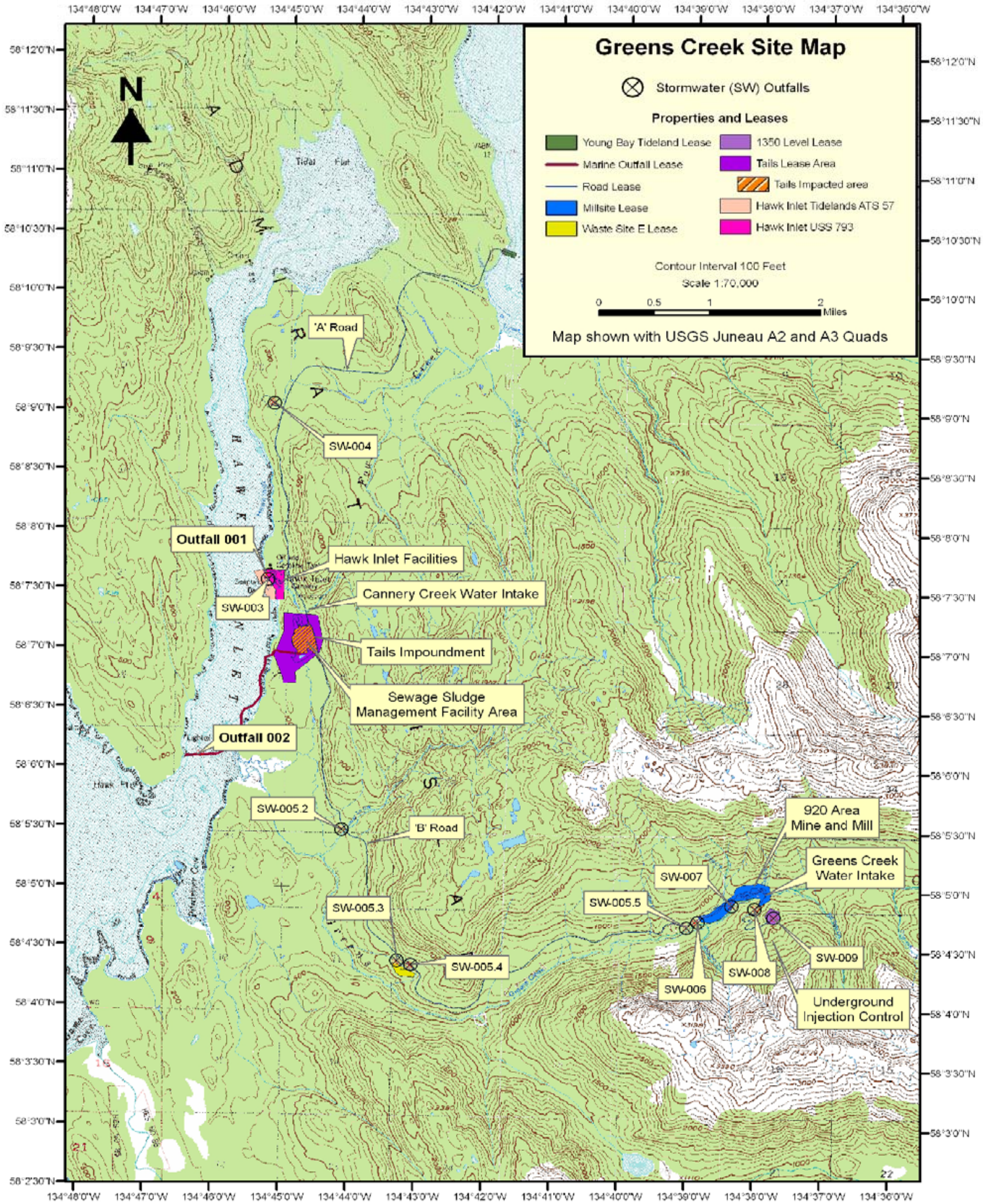


Figure 2: Hawk Inlet Monitoring Sites

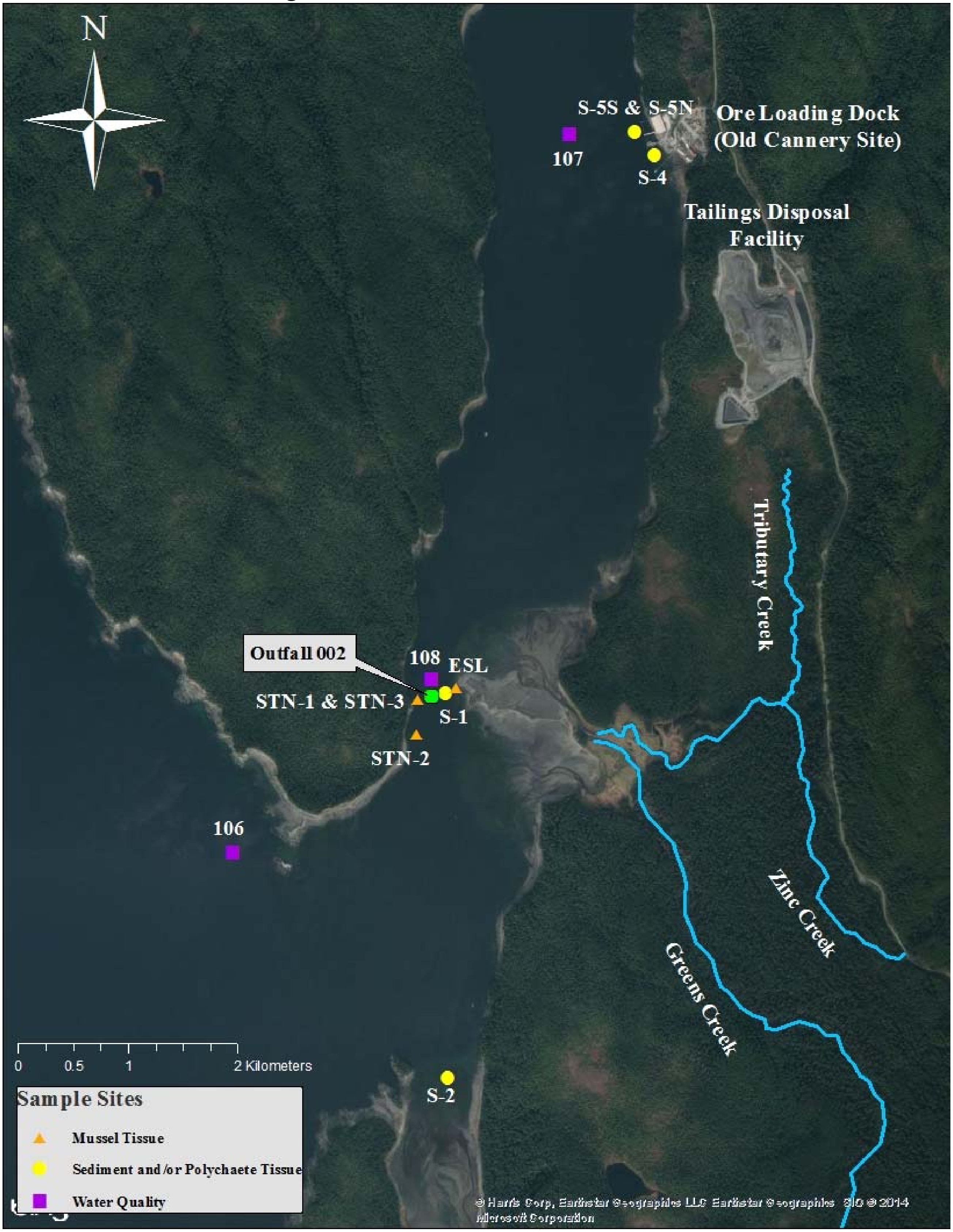
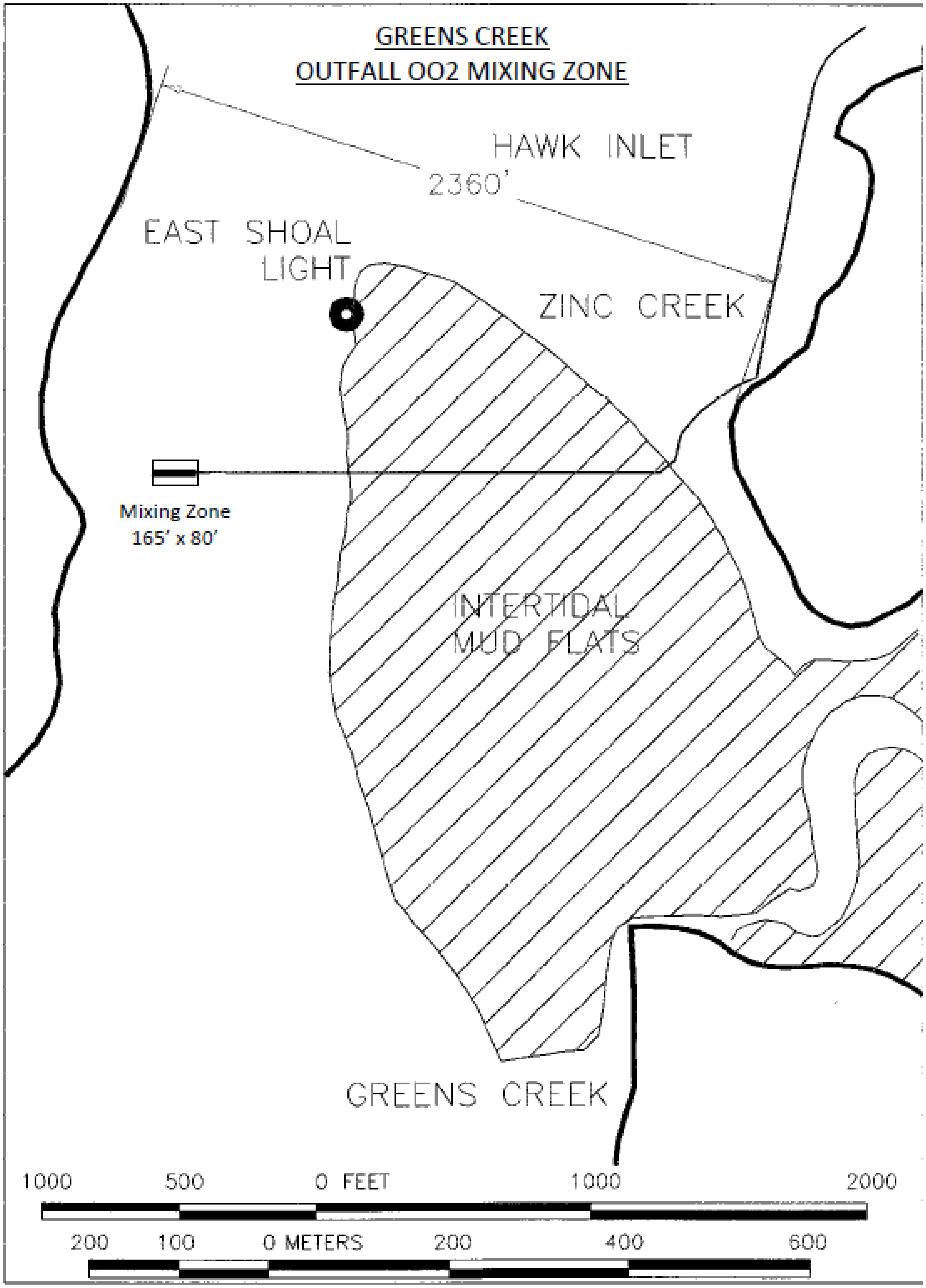


Figure 3: Mixing Zone Diagram



APPENDIX - A FACILITY INFORMATION

Facility Name and Location		
Name:	Hecla Greens Creek Mine	
APDES ID Number:	AK0043206	
Location: Mailing Address:	18 miles southwest of Juneau on Admiralty Island P.O. Box 32199 Juneau, AK 99803	
Facility Background:	The facility's previous permit was effective July 1, 2005. The current permit application was received December 29, 2009.	
Non-Domestic System Information		
Treatment Train:	Degrit basins, settling pond, chemical precipitation, and pressure filtration	
Design Flow:	4.6 million gallons per day	
Existing Flow:	3.7 million gallons per day	
Months when Discharge Occurs:	Year round	
Outfall 002 Location:	Latitude: 58° 06' 06" North	Longitude: 134° 46' 30" West
Receiving Waterbody Information		
Receiving Waterbody:	Hawk Inlet	

APPENDIX - B BASIS FOR EFFLUENT LIMITS

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 I); discussions of the development of technology-based effluent limits (Section II) and water quality-based effluent limits (Section III); and a summary of the effluent limits developed for this permit (Section IV).

I. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the 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 technology-based effluent limits have been developed that must be considered as the base or floor 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 water quality standards (WQS) in the receiving water. If reasonable potential exists that exceedances could occur, the Department must include water quality-based effluent limits in the permit. The permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent. For outfall 002, a mixing zone was requested. In authorizing a mixing zone for outfall 002, the Department considered "the characteristics of the effluent, including volume, flow rate, dispersion, and quality after treatment," as required by 18 AAC 70.245(b)(5). Water quality-based and technology-based analyses were performed to determine the most stringent limits. In conducting the water quality-based analysis, the tailings storage facility's wastewater treatment plant performance in conjunction with CORMIX modeling were used to determine dilution necessary and available to meet all WQS at and beyond the mixing zone's boundary.

II. Outfall 002 - Technology-Based Evaluation

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

At 40 CFR Part 440, EPA has established ELGs for the Ore Mining and Dressing Point Source Category. Subpart J of these guidelines, titled *Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory*, became effective on December 3, 1982. ELGs are applicable to mines that produce gold bearing ores from open-pit or underground operations and to mills that use the froth-flotation process, alone or in conjunction with other processes, for the beneficiation of gold. At 40 CFR §440.104 NSPS are used to provide the technology-based effluent limitations for cadmium, copper, lead, mercury, zinc, total suspended solids (TSS) and pH. The BAT (40 CFR 440.103) and BPT (40 CFR 440.102) ELGs that apply to the Greens Creek Mine discharges are shown in the Table B-1.

Table B-1: Outfall 002 - Technology Based Effluent Limits

Parameter	Daily Maximum	Monthly Average
Cadmium, µg/L	100	50
Copper, µg/L	300	150
Lead, µg/L	600	300
Mercury, µg/L	2	1
Zinc, µg/L	1,000	500
TSS, mg/L	30	20
pH, s.u.	within the range 6.0 - 9.0	

III. Water Quality-Based Evaluation

In addition to the technology-based limits discussed above, the Department evaluated the Greens Creek Mine discharges to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires permit limits necessary to meet WQS by July 1, 1977.

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 water quality standard, 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 water quality-based limits are needed and develop those limits when necessary, the Department follows guidance in the *Technical Support Document for Water Quality-based Toxics Control* (TSD, EPA 1991). The water quality-based analysis consists of the following four step sequence:

1. Identify the applicable water quality criteria (see Section III.A);
2. Determine if there is "reasonable potential" for the discharge to exceed a water quality criterion in the receiving water (see Section 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 waste load allocation (WLA) (see Section III.C).

The following sections provide a detailed discussion of each step.

A. Water Quality Criteria

The first step in determining if water quality-based limits 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 Hawk Inlet, the receiving waters of outfall 002 and storm water outfall 003, and the regulatory citation of the water quality criteria applicable to the uses are as follows:

- aquaculture water supply - 18 AAC 70.020(b)(2)(A)(i)
- seafood processing - 18 AAC 70.020(b)(2)(A)(ii)
- industrial uses - 18 AAC 70.020(b)(2)(A)(iii)
- contact recreation - 18 AAC 70.020(b)(2)(B)(i)
- secondary recreation - 18 AAC 70.020(b)(2)(B)(ii)
- growth and propagation of fish, shellfish, other aquatic life and wildlife - 18 AAC 70.020(b)(2)(C)
- harvesting for consumption of raw mollusks or other raw aquatic life - 18 AAC 70.020(b)(2)(D)

The beneficial uses for wetlands, Zinc Creek and Greens Creek, the receiving waters of storm water outfalls 004 through 009, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

- domestic water supply - 18 AAC 70.020(b)(1)(A)(i)
- agriculture water supply - 18 AAC 70.020(b)(1)(A)(ii)
- aquaculture water supply - 18 AAC 70.020(b)(1)(A)(iii)
- industrial uses - 18 AAC 70.020(b)(1)(A)(iv)
- contact recreation - 18 AAC 70.020(b)(1)(B)(i)
- secondary recreation - 18 AAC 70.020(b)(1)(B)(ii)
- 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 Hawk Inlet, the most stringent applicable WQS are summarized in Table B-2. The most stringent applicable WQS for wetlands, Greens Creek, and Zinc Creek are summarized in Table B-3.

Table B-2: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into Hawk Inlet (outfalls 002 and 003)

Parameter (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Human Health Criterion [c]
Cadmium (TR) [a, b]	40.28	8.85	na
Copper (TR) [a, b]	5.8	3.7	na
Lead (TR) [a, b]	217.16	8.47	na
Mercury (total) [b]	2.062	1.106	0.051
Zinc (TR) [a, b]	95.1	86.14	69,000
WAD cyanide	1.0	1.0	220,000
pH (s.u.)	within the range of 6.5 - 8.5		
Fecal coliform bacteria (FC)	the FC median Most Probably Number (MPN) may not exceed 14 FC/100 mL and not more than 10% of the samples may exceed a MPN of 43 FC/100 mL		

Notes:

a. TR = total recoverable

b. Standards for metals have been converted from dissolved to total recoverable by dividing the dissolved criterion by the conversion factor identified in regulation.

c. Human health criterion for consumption of aquatic organisms

Table B-3: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into wetlands, Greens Creek, and Zinc Creek (outfall 004 through 009)

Parameter [a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion [b]	Chronic Aquatic Life Criterion [b]
Lead [c] (TR)	26	1.0
Zinc [c] (TR)	56	56
pH (s.u.)	within the range of 6.5 - 8.5	

Notes:

a. TR = total recoverable. Lead, zinc, and pH were included in this table since these are the only parameters for which there are storm water monitoring data.

b. The standards for metals have been converted from dissolved to total recoverable by dividing the dissolved criteria by the conversion factor identified in regulation.

c. The lead and zinc criteria depend upon hardness, measured as mg/L $CaCO_3$. The 15th percentile hardness of the receiving water is used to calculate the criteria since it is a reasonably conservative value protective under most conditions. The 15th percentile hardness at Greens Creek background Site 48 is 41 mg/L $CaCO_3$ based on data collected from October 2006 through September 2011. Hardness data was not available for Zinc Creek.

B. Reasonable Potential Analysis

1. Outfall 002

The Department compared the maximum projected receiving water concentration to the criteria for that pollutant to determine if there is "reasonable potential" to cause or contribute to an exceedance of water quality criteria for each pollutant present in the discharge. If the projected receiving water concentration exceeds the criterion, there is "reasonable potential", and a limit must be included in the permit. The Department used the recommendations in Chapter 3 of the TSD to conduct the reasonable potential analysis.

This section discusses how reasonable potential was evaluated for outfall 002. Because of the extreme variability of the data from the storm water outfalls, the need for effluent limits for storm water was determined separately. The storm water analysis is provided in Section III.C.

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

$$C_d = C_u + ((C_e - C_u)/D)$$

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

Where no mixing zone is allowed: $C_d = C_e$

After C_d is determined, it is compared to the applicable water quality criterion. If it is greater than the criterion, a water quality-based effluent limit is developed for that parameter. The following discusses each of the factors used in the mass balance equation to calculate C_d.

<u>C_e (maximum expected effluent concentration or MEC)</u>: Per the TSD, the maximum expected effluent concentration in the mass balance equation was represented by the 99th percentile of the effluent data. The 99th percentile was calculated using the statistical approach recommended in the TSD, i.e., by multiplying the maximum observed effluent concentration by a reasonable potential multiplier (RPM):

$$C_e = (\text{maximum observed effluent concentration}) \times \text{RPM}$$

The RPM accounts for uncertainty in the effluent data. The RPM depends upon the amount of effluent data and variability of the data as measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. Once the CV of the data was determined, the RPM was determined using the statistical methodology discussed in section 3.3 of the TSD. In this procedure, RPMs with a 95% confidence level and a 99% probability were calculated. See Table B-4 for a summary of the maximum reported effluent concentrations, CVs, and RPMs used in the reasonable potential analysis.

C_u (background concentration of pollutant): The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the background pollutant concentration. Where sufficient data exists, the 85th percentile of the ambient data is generally used as an estimate of worst-case. The C_u used for each parameter is provided in Table B-4.

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 a zone of initial dilution inside the chronic mixing zone.

Outfall 002: The Department authorized a mixing zone for outfall 002 representing 1 part effluent to 20.3 parts receiving water for a dilution factor of 21.3.

Reasonable Potential Summary: Results of the reasonable potential analysis for outfall 002 are provided in Table B-4. Water quality-based limits were not needed for mercury (monthly average), cadmium, cyanide, or fecal coliform bacteria in outfall 002.

Table B-4: Reasonable Potential Determination for Outfall 002

Parameter [a] (µg/L unless otherwise noted)	Effluent Data					Background Receiving Water Conc. (C_u) [g]	Max Projected Receiving Water Conc. (C_d)	Reasonable Potential [h] (yes or no)
	Max Observed Effluent Conc. [b]	Coefficient of Variation (CV) [c]	Number of Samples [d]	Reasonable Potential Multiplier (RPM) [e]	Max Expected Effluent Conc. (MEC) [f]			
Cadmium	1.80	0.844	261	1.01	1.83	0.0769	0.16	no
Copper	26.0	1.04	261	1.02	26.40	0.482	1.70	no
Lead	174	1.15	261	1.02	176.75	0.159	8.45	no
Mercury	0.38	0.440	261	1.01	0.384	0.000617	0.020	no
Zinc	234	0.850	261	1.01	237.36	2.16	13.21	no
Cyanide	18	0.6	259	1.03	18.53	0	0.87	no
Fecal Coliform, #/100 mL	5	0.6	61	2.15	7.21	0	0.34	no

Notes:

a. Parameters where there are applicable water quality criteria and effluent monitoring data available.

b. The maximum observed effluent concentrations are based on effluent samples collected by HGCMC from July 2007 through June 2012.

c. The CV is calculated as the standard deviation of the data divided by the mean. The CVs for cadmium, copper, lead, mercury, and zinc were calculated based on outfall 002 effluent samples collected by HGCMC from July 2007 through June 2012. The vast majority of the effluent data available for cyanide and fecal coliform during the same period was reported at less than method detection limits; therefore effluent-specific variability cannot be determined, so a default CV of 0.6 was used.

d. The number of samples is used to develop the RPM.

e. The RPM is based on the CV and the number of data points.

f. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance for determining if there is a reasonable potential to exceed WQS in the receiving water outside the mixing zone.

g. The receiving water concentrations are based on samples collected from Hawk Inlet monitoring site 106 representing background data of outfall 002 from 2007 through 2011. The concentrations are the 85th percentile of the data, except for cyanide and fecal coliform. The background fecal coliform was assumed to be zero, and cyanide data at site 106 was reported at less than the method detection limit, or it was suspect due to huge discrepancies between labs, therefore zero was used as background.

h. Reasonable potential is evaluated at the mixing boundary, and it exists if C_d exceeds the most stringent applicable water quality criterion in Table B-2.

2. Water Quality Analysis for Storm Water Outfalls

HGCMC monitors the storm water twice per year during storm events. The results of storm water monitoring are summarized in Table B-5.

Table B-5: Summary of Storm Water Monitoring Data

Outfall	Receiving Water	Range of Data from Storm Water Monitoring							
		Flow (gpm)		Lead (µg/L)		Zinc (µg/L)		pH (s.u.)	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
003	Hawk Inlet	10	150	<1.6	12	1	31	6.2	7.6
004	Wetlands	0.033	60	<1.5	<5.4	<4	320	6.2	7.6
005.2	Zinc Creek	0.25	48	<1.5	<5.3	<4	162	3.8	4.9
005.3	Greens Creek	3	3,141	<1.5	<5.3	1	471	6.8	7.6
005.4	Greens Creek	0.5	60	<2	<5.4	1	178	6.7	7.7
005.5	Greens Creek	0.5	2.6	<5	<5.3	348	13,900	7.6	8.9
006	Greens Creek	na	na	<5	<5.3	<4	386	6.8	7.0
007	Greens Creek	2	100	<5.1	<5.1	43	456	6.6	7.5
008	Greens Creek	6	75	<5.1	<5.3	<1	100	6.8	7.7
009	Greens Creek	3	27	na	na	<1	18	6.9	8.0
Storm water monitoring data is based on samples collected by the Permittee twice per year during storm events from March 2005 through September 2011.									

Comparing the lead and zinc data in Table B-5 with the water quality criteria in Tables B-2 and B-3 shows that the discharges from outfalls 003 through 009 have exceeded the water quality criteria at some time. However, numeric effluent limits were not developed for the individual storm water outfalls. This is due to the difficulty in developing numeric limits for storm water discharges that are intermittent and extremely variable in flow and variable in pollutant concentrations as well as the uncertainty regarding the effect of the storm water outfalls on the receiving waters.

Rather than develop numeric effluent limits for each storm water outfall, the permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. Also, the permit requires development of outfall-specific best management practices (BMPs). APDES regulations, 18 AAC 83.475, require the use of BMPs where development of numeric effluent limits is infeasible.

C. Water Quality–Based Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed WQS at the end-of-pipe (comparing the MEC in Table B-4 to the WQS in Table B-2) or a parameter has a technology-based limit that exceeds WQS, a water quality-based effluent limit for the pollutant is developed. The first step in calculating a permit limit is development of a WLA for the pollutant.

Mixing Zone Based WLA

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the WQS.

Acute and chronic aquatic life standards apply over different time frames and may have different mixing zones; 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 and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

<u>End-of-Pipe WLAs</u>

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the 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. As with the mixing-zone based WLA, the acute and chronic criteria must be converted to LTAs and compared to determine which one is more stringent. The more stringent LTA is then used to develop permit limits.

<u>Permit Limit Derivation</u>

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the *TSD* to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability [using the Coefficient 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 *TSD*, 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. Lead is used as an example.

<u>Step 1- Determine the WLA</u>

The acute and chronic aquatic life criteria are converted to acute and chronic WLAs (WLA_{acute} or $WLA_{chronic}$) using the following equation:

1. $$Q_d C_d = Q_e C_e + Q_u C_u$$

Q_d = total flow = $Q_u + Q_e$
C_d = most stringent WQS that cannot be exceeded outside the mixing zone
Q_e = effluent flow
C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = background flow
C_u = background concentration of pollutant

Rearranging the above equation to determine the effluent concentration (C_e) or WLA results in the following:

2. $$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e} = \frac{C_d(Q_u + Q_e) - Q_u C_u}{Q_e}$$

With a 20.3: 1 chronic dilution ratio and C_u equal to 0.159, this equation becomes:

3. $$C_e = WLA = \frac{C_d(20.3 + 1) - (20.3 * 0.159)}{1}$$

4. WLA = (C_d * 21.3) – 3.23

For example, the lead chronic WLA, the calculation is:

C_e = $WLA_{chronic}$ = (8.47 * 21.3) – 3.23 = 177

For lead, the acute WLA with an acute dilution ratio equal to 17.53: 1, the calculation is:

C_e = WLA_{acute} = (217.16 * (17.53 + 1)) – (17.53 * 0.159) = 4,021

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

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

where,

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

$$\sigma^2 = \ln(1.155^2 + 1)$$

$$\sigma^2 = 0.847$$

$$z = 2.326 \; for \; 99^{th} \; percentile \; probability \; basis$$

LTA_{acute} = 722

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

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

$$\sigma^2 = \ln\left(\frac{1.155^2}{4} + 1\right)$$

$$\sigma^2 = 0.288$$

$$z = 2.326 \; for \; 99^{th} \; percentile \; probability \; basis$$

$$LTA_{chronic} = 58.7$$

Step 3 - Most Limiting LTA

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

Step 4 - Calculate the Permit Limits

The *TSD* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The maximum daily limit (MDL) and the average monthly limit (AML) are calculated as follows:

$$MDL = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

$$\sigma^2 = \ln(1.15^2 + 1)$$

$$\sigma^2 = 0.847$$

$$z = 2.326 \; for \; 99^{th} \; percentile \; probability \; basis$$

CV = coefficient of variation

MDL = 327 mg/L

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

$$\sigma^2 = \ln\left(\frac{1.15^2}{4} + 1\right)$$

$$\sigma^2 = 0.288$$

$$z = 1.645 \; for \; 95^{th} \; percentile \; probability \; basis$$

$$CV = coefficient \; of \; variation = \frac{standard \; deviation}{mean}$$

n = number of sampling events required per month for lead = 4 (based on weekly sampling as required in the previous permit)

AML = 123 mg/L

IV. Summary of Permit Effluent Limitations

As discussed in Section I of this appendix, technology-based limits were applied to each discharge and evaluated to determine whether these limits may result in any exceedances of WQS in the receiving water. If exceedances could occur, then water quality-based effluent limits were developed. The following summarizes the effluent limits developed for each outfall.

Outfall 002: The reasonable potential analysis in Section III.B. demonstrates that discharge at the water quality-based effluent limits for metals will not cause or contribute to an exceedance of WQS at or beyond the boundary of the mixing zone in Hawk Inlet. However, effluent discharge at the technology-based effluent limits will in most cases result in an exceedance of WQS at the boundary of the authorized mixing zone. Consequently, water quality-based effluent limits are implemented to ensure protection of WQS. In a few cases, the total suspended solids (TSS), chronic mercury, and cadmium limits, technology-based effluent limits, which are more stringent than water quality-based effluent limits, have been imposed by the permit. Additionally, the reasonable potential analysis showed that the discharge of cyanide and fecal coliform bacteria would not cause or contribute to an exceedance of their applicable water quality criterion. Therefore, water quality-based effluents limits were not needed for these parameters, and in addition, there are no technology-based limits associated with these parameters.

The permit also includes flow limits to ensure that the volume discharged does not exceed the flow assumptions used to develop the allowable dilution (mixing zone). Since flow and concentration limits are included in the permit, mass limits are not needed. Controlling flow and concentration is the same as controlling mass. See Table B-6 for a summary of outfall 002 effluent limits.

Table B-6: Outfall 002 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Flow	mgd	4.6	design capacity	3.7	catchment area and precipitation
Cadmium [a]	µg/L	100	ELG	50	ELG
Copper [a]	µg/L	99	Acute Aquatic WQS	39	Acute Aquatic WQS
Cyanide [b]	µg/L	19	Acute Aquatic WQS	9.2	Acute Aquatic WQS
Lead [a]	µg/L	327	Chronic Aquatic WQS	123	Chronic Aquatic WQS
Mercury [c]	µg/L	1.9	Human Health WQS [d]	1.0	ELG
Zinc [a]	µg/L	1,000	ELG	500	ELG
TSS	mg/L	30	ELG	20	ELG
pH [e]	s.u.	6 to 9	ELG	6 to 9	ELG

Notes:

a. Metals shall be measured as total recoverable.
b. Cyanide shall be measured as weak acid dissociable
c. Mercury shall be measured as total.
d. First, the average monthly limit (AML) was set equal to the wasteload allocation of 1.11 µg/L. Then, the daily maximum limit was calculated as a ratio of the AML as prescribed section 5.4.4 of the *Technical Support Document For Water Quality-based Toxics Control*.
e. The limit reflects that there is a pH mixing zone, covers a range, and does not offer specific daily and monthly limits.

Storm Water Outfalls: Based on the discussion in Section III.C., numeric effluent limits were not developed for the storm water outfalls. Rather, requirements to sample the receiving waters upstream and downstream of each outfall when the outfall discharge is sampled support the permit requiring the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. The permit also includes the requirement to develop outfall-specific BMPs.

APPENDIX - C MIXING ZONE ANALYSIS CHECKLIST - APPLIED AT OUTFALL 002

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. See Section 6.3 of the fact sheet for facility specific mixing zone analysis details.

Criterion	**Description**	**Resources**	**Regulation**	**MZ Approved Y/N**
Size	Is the mixing zone as small as practicable? Yes - 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: ►Appendix B, Table B-4: Reasonable Potential ►Section 6.3 Mixing Zone Analysis	•*Technical Support Document for Water Quality-based Toxics Control* •fact sheet, Appendix B •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) 18 AAC 70.255 (d)	Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? Yes		18 AAC 70.240 (a)(3)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** NA - Determine low flow calculations or documentation for the applicable parameters. Justify in fact sheet	• fact sheet Section 6.3	18 AAC 70.255(f)	NA
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? No		18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? No		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? Yes		18 AAC 70.250(a)(3)	Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	(4) cause an environmental effect or damage to the ecosystem that the Department considers being so adverse that a mixing zone is not appropriate? No		18 AAC 70.250(a)(4)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? No		18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? No		18 AAC 70.250(b)(3)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? No		18 AAC 70.250 (a)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, teratogenic, or otherwise harmful effects to human health? No			Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	(3) create a public health hazard through encroachment on water supply or through contact recreation? No		18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? Yes		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? No		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? No		18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? No			Y
	(3) fail to provide a zone of passage? No			Y
	(4) result in undesirable or nuisance aquatic life? No		18 AAC 70.250(b)(1)	Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	(5) result in permanent or irreparable displacement of indigenous organisms? No		18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? No		18 AAC 70.255(g)(2)	Y
	(7) cause or create a reasonable expectation of lethality to organisms passing through it? No		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? No		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? Yes, Eastern Stellar Sea Lions and Humpback Whales. Are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. No		Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y