ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PROPOSED FINAL

Permit Number: AK0023248 - Alyeska Pipeline Service Company, Valdez Marine Terminal

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

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Anchorage, AK 99501

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

ALYESKA PIPELINE SERVICE COMPANY

For wastewater discharges from

Valdez Marine Terminal
300 Dayville Road
Valdez, Alaska 99686

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual permit (Permit) AK0023248. The Permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the Permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This Fact Sheet explains the nature of potential discharges from the facility and the development of the Permit including:

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

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 20 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
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review. See http://dec.alaska.gov/commish/review-guidance/informal-reviews for information regarding informal reviews of Department decisions.

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

Commissioner
Alaska Department of Environmental Conservation at
P.O. Box 111800
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://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance/ for information regarding appeals of Department decisions.

Documents are Available

The Permit, Fact Sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The Permit, Fact Sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://dec.alaska.gov/water/wastewater/

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
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1.0 INTRODUCTION

On June 30, 2017, the Alaska Department of Environmental Conservation (DEC or Department) received an application from Alyeska Pipeline Service Company (APSC or permittee) for reissuance of Alaska Pollutant Discharge Elimination System (APDES) Individual Permit AK0023248 – APSC, Valdez Marine Terminal (Permit). This Fact Sheet was developed based on the application and supplemental information obtained through the application process.

1.1 Applicant

This Fact Sheet provides information on the reissuance of the Permit for the following entity:

Permittee:	Alyeska Pipeline Service Company
Name of Facility:	Valdez Marine Terminal (terminal or facility)
APDES Permit Number:	AK0023248
Facility Location:	300 Dayville Road, Valdez, Alaska 99686
Mailing Address:	P.O. Box 196660, Valdez, Alaska 99519-6660
Onsite Facility Contact:	Mr. Marc Johnson, Water Quality SME

Outfall Summary

Outfall	Description	Latitude	Longitude
001	Ballast Water Treatment Facility	61.089722	-146.386667
002	Domestic Wastewater	61.086111	-146.392500

All discharges are to the Port Valdez at the locations shown in Appendix A, Figure A-1.

1.2 Authority

The National Pollutant Discharge Elimination System (NPDES) Program regulates the discharge of wastewater to the waters of the United States (U.S.). For waters of the U.S. under jurisdiction of the State of Alaska, the NPDES Program is administered by DEC as the APDES Program. This is the first reissuance of the Permit under authority of the APDES Program.

Clean Water Act (CWA) Section 301(a) and Alaska Administrative Code (AAC) 18 AAC 83.015 provide that the discharge of pollutants to waters of the U.S. is unlawful except in accordance with an APDES permit. The Permit is being developed per 18 AAC 83.115 and 18 AAC 83.120. A violation of a condition contained in the Permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statute (AS) 46.03.760 and AS 46.03.761.

1.3 Permit History

The Permit was first issued by the Environmental Protection Agency (EPA) in December 1974. Subsequently, the Permit was reissued in 1980, 1989, 1997, 2004, 2009 and 2012 (2012 Permit). APSC successfully appealed the 2012 Permit that resulted in modifications to whole effluent toxicity (WET) testing requirements. The 2012 Permit became effective on January 1, 2013 and expired on December 31, 2017. APSC submitted a complete and timely application to DEC on June 30, 2017 and DEC issued a letter on August 1, 2017 that administratively extended the 2012 Permit per 18 AAC 83.155(c) until it can be reissued.

2.0 BACKGROUND

2.1 Facility Information

The Valdez Marine Terminal (VMT) is located at the southern terminus of the Trans-Alaskan Pipeline System (TAPS) and serves as the storage and oil tanker loading facility for the shipment of North Slope crude oil to refineries in and outside of Alaska. The terminal was constructed in the 1970s and has been in operation for over 40 years. The daily throughput of the terminal has varied significantly over the years with a peak production exceeding two million barrels per day (bpd) in the late 1980's which has declined to less than 500,000 bpd at present. This reduction in throughput has had a direct impact on reducing the volume of wastewater generated at the facility. In addition, the promulgation of the Oil Pollution Act of 1990 (OPA 90) has also helped to reduce wastewater volumes due to double-hulled vessels having essentially replaced the older single-hulled vessel fleet. However, some single-hull vessels are still in operation. Single-hulled vessels take on seawater for ballast that becomes contaminated with hydrocarbons due to direct contact with the oil being transported. The contaminated ballast water from single-hull vessels, in part, determined the necessary treatment capacity of the existing ballast water treatment facility (BWTF) at VMT. Because double-hulled vessels take on seawater within the interstitial space between hulls, the ballast water does not become contaminated and require treatment to remove hydrocarbons prior to discharge at the VMT.

Although there has been a significant reduction in the volume of wastewater managed at the VMT, recent reports of new oil discoveries on the North Slope may stabilize or result in increased throughput at the terminal during the next term of the Permit that can increase treatment and discharge requirements due to other contributions to the BWTF as described in Section 2.1.1.

2.1.1 Wastewater Sources

Terminal operations include two permitted wastewater discharges to Port Valdez: Outfall 001 – BWTF and Outfall 002 – Domestic Wastewater. The source of wastewater influent are described in the following subsections.

2.1.1.1 Outfall 001 – BWTF Influent Sources and Volumes

Wastewater influent to the BWTF primarily consists of contaminated ballast water and bilge water offloaded from arriving oil tankers, crude oil storage draws, miscellaneous site process wastewaters, and rain or snowmelt runoff from secondary containment areas (SCAs) around the terminal crude oil storage tanks. The parameters in these sources predominantly include hydrocarbons and metals. Other sources are periodically introduced to the influent to the BWTF but the volume and frequencies are not significant enough to impact the characteristics when compared to the primary sources listed above. A complete list of influent sources for the BWTF is included in the Permit.

The water balance for the BWTF estimates an average discharge of 3.27 million gallons per day (mgd) as a maximum monthly average and is presented in Appendix A, Figure A-3. For this discussion, the water balance is presented in terms of three main inputs: The industrial wastewater sewer system (IWS), tanker ballast water, and raw water.

The IWS dominants the water balance due to the volumes of rain and snowmelt runoff collected in terminal SCAs and transferred to the BWTF through the IWS. Because rain and snowmelt from SCAs are not normally contaminated, the daily average 500,000 gallons per day (gpd) flowing to the BWTF tends to dilute contaminant concentrations from other contributing sources, as well as the salinity (e.g., density measured as sigma-t) in the discharged effluent. Also diluting the BWTF to a lesser degree is ground water infiltration estimated to contribute 4,200 gpd and fire test water at approximately 130,000 gallons per event; fire testing occurs intermittently based on testing schedules and snow removal activities. In contrast, the sources in the BWTF influent from the IWS that are expected to be contaminated include tank water draws (21,000 gpd) and bilge and slop water from service vessels (1,000 gpd).

During periods of heavy rainfall and snowmelt, storm water accumulations in the SCAs can exceed the hydraulic treatment capacity of the BWTF and must be temporarily held in the SCAs until treatment capacity becomes available. This poses competing risks that the applicant suggests should be evaluated during this reissuance. If the rain event is significant enough to require storing water in the SCAs to prevent a permit violation there is a risk that tanks that are nearly empty could float and rupture pipelines and other infrastructure resulting in a release of oil and damage to the facility. On the other hand, transferring the water to the BWTF could result in permit violations.

As stated previously, the SCA water is expected to be uncontaminated under normal conditions due to adherence to stringent best management practices (BMPs) at the VMT such that it likely meets water quality criteria prior to treatment in the BWTF. In support of this assertion, APSC submitted analytical results for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) for nine water samples collected from terminal SCA (one per each SCA in the East and West Tank Farms) in 2014. Review of the analytical results shows that six of the results were below the limit of quantitation (LOQ) and the highest of the remaining three results was 6.6 μg/L, which is lower than the water quality criteria of 10 μg/L for TAH. Only one of the nine TAqH results was detectable at 0.45 μg/L, which is less than the water quality criteria of 15 μg/L. In September 2018, APSC collected seven confirmation samples from each of the same SCAs in the West Tank Farm only (the East is out-of-service) and analyzed them for TAH and TAqH. All 2018 confirmation sample results were below LOQs. The 2014 data and 2018 confirmation samples indicate that the SCA water can reasonably be classified as storm water and can be discharged without treatment when necessary to mitigate the competing risks associated with extreme storm events

As discussed in Section 2.1, contribution of contaminated ballast water has been declining over the years but is still the dominating source treated in the BWTF. Based on information from the previous permit term, the maximum monthly average contribution from the tankers is 425,000 gpd and is a source of influent hydrocarbons and metals.

The water balance for the utilities and processes accounts for wastewater from potable water treatment, boiler blowdowns and scrubbing units, and process water. Accounting for losses to domestic wastewater through Outfall 002 (See Section 2.2.2), leach fields, and evaporation the utilities and processes contribute approximately 56,000 gpd on a daily average to the BWTF.

2.1.1.2 Outfall 002 – Domestic Wastewater Influent Sources and Volumes

As this is the first reissuance of the Permit under the APDES Program, DEC points out a difference in nomenclature used by EPA in the 2012 Permit with respect to the discharge effluent from the sewage treatment plant (STP). EPA uses the term sanitary waste to describe what DEC terms domestic wastewater. Per 18 AAC 72 – Wastewater Disposal, domestic wastewater is defined as "…waterborne human wastes or graywater derived from dwellings, commercial buildings, institutions, or other structures." Wastewater influent to the STP consists of domestic wastewater from certain buildings at the VMT. Domestic wastewater flows not treated by the STP are directed to onsite leach fields approved by DEC. Currently, the daily average STP influent is approximately 2,000 gpd.

2.1.2 Wastewater Treatment Technology

2.1.2.1 Outfall 001 – Ballast Water Treatment Facility

The BWTF is the terminal's largest wastewater discharge and was originally designed to treat a maximum of 30 mgd of oily ballast water offloaded from single hull oil tankers and other terminal wastewater; the process configuration of the BWTF is shown in Figure A-2. As discussed in Section 2.1, reduced oil production and changing of the vessel fleet to double-hauled tankers have led to significant reductions in discharge flow rates. Accordingly, the 2012 Permit includes a maximum daily limit (MDL) for flow of 10.1 mgd and an average monthly limit (AML) of 5.54 mgd from BWTF Outfall 001. APSC has reconfigured the BWTF to optimize treatment performance based on reduced flow rates and changes to influent characteristics. Currently, the BWTF includes ballast water storage tanks, gravity separation tanks (identified as the 90s tanks), dissolved air flotation (DAF), shallow-tray air strippers, biological treatment tanks (BTTs), and packed-tower air strippers.

The 90s tanks are 250 feet in diameter and 53.5 feet high, and have a maximum fill height of 49.7 feet and are equipped with a vapor treatment system. The 90s tanks receive influent from the IWS and transfers of ballast water from tankers and provide gravity separation of solids and free-phase oil. The oily waste stream recovered during the treatment process is a mixture of recovered oil and entrained wastewater that is returned to the oil recovery system for further oil/water separation. The recovered oil from tank 80 is routed to the oil transfer system for loading onto tankers. Tank 80 also enables additional gravity separation of the wastewater from the recoverable oil with the separated wastewater routed back to the 90s tanks for treatment through the BWTF. Due to their capacity, the 90s tanks also provide flow equalization and the ability to contain spills. The maximum influent flow rate to the 90s tanks is 60,000 barrels (bbls) per hour, based on the capacity of the low pressure vapor control system.

After gravity separation in the 90s tanks, trace amounts of oil and other contaminants remain entrained in the water. Flocculation and DAF treatment processes are then used to further reduce free-phase separable and dissolved hydrocarbons in the waste stream. A polymer is injected into the charge stream entering the DAF, which facilitates floc formation by bonding with oils and other particulates. As the influent enters the DAF cells, it mixes with micro-bubbles of air that adhere to the suspended flocs causing them to float to the water surface. There are currently two (2) operating DAF cells, each

measuring 24 feet wide, 112 feet long and 12 feet deep. Each DAF cell consists of an inlet chamber, a flotation tank, and outlet weir channels where nutrients can be added prior to the BTTs. After the DAF cells, shallow-tray air strippers are used on a contingent basis prior to the BTTs.

The BWTF has four seven tray air stripper units which are used to remove soluble hydrocarbons in the wastewater from the DAF units on an as-needed basis. These shallow tray air strippers can be operated independently or in conjunction with biological treatment. Each air stripper unit has a normal design operating capacity of 500 – 1,100 gallons per minute (gpm), and the system of three strippers operating in parallel has a maximum design upper limit of 3,850 gpm. A fourth stripper is available as a spare during maintenance outages. The stripper off gas is collected and routed to a recuperative thermal oxidizer for destruction of volatilized hydrocarbons.

The BTTs biologically degrade dissolved hydrocarbons and other organic wastes in the waste stream. Nutrient enriched water from the DAF cells and air strippers enters the BTTs through a splitter box and influent channels that release the water evenly across the head of the tank. As the water flows through the tanks it is mixed and aerated to promote microbial degradation of remaining hydrocarbons prior to discharge to Port Valdez through Outfall 001. Each BTT has a hydraulic capacity of 5.5 million gallons. The existing BTTs may be subject to episodic performance variations due to starvation (i.e., low organic loading relative to the hydraulic loading) and/or low temperatures that affect biological performance. The BTTs have also been experiencing algae blooms during summer that have made meeting the existing limits for total suspended solids (TSS) and pH difficult. APSC is conducting research and exploring alternatives to reduce or eliminate the growth of algae in the BTTs. During these biological upsets, an auxiliary air stripping tower can be used to treat the final effluent to meet limits for TAH but does not provide for additional removal of TSS or adjustment to pH.

The auxiliary packed-tower air strippers are used to further reduce benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations in the BTTs effluent prior to discharge through Outfall 001. Forced air is released upward through the cells as the water falls over specially designed plastic media. The media breaks up the water mass into small droplets creating more water- air interface, which facilitates removal of BTEX from the wastewater.

Per the application, Outfall 001 consists of a high-density polyethylene pipe extending approximately 356 meters (m) horizontally from the shoreline into the waters of Port Valdez. The seaward end of the pipe is an approximately 61 m long diffuser structure (distance between first and last diffuser) having 20 discharge ports on either side and submerged at an average elevation of 72 m below mean lower low water (MLLW). The ten sets of ports located at the onshore end of the diffuser are 10-centimeters (cm) in diameter and those located at the offshore end are 13-cm in diameter. All ports are oriented 45-degrees upward from the horizontal axis and discharge in the direction of the prevailing ebb and flood tides.

2.1.2.2 **Outfall 002 – Domestic Wastewater STP**

The STP is a small activated sludge sequencing batch reactor (SBR) designed to treat 10,000 gpd of domestic wastewater to secondary treatment standards per 18 AAC 72 –

Domestic Wastewater Disposal. The SBR is a fill-and-draw activated sludge system which uses a single "batch" bioreactor to process each batch of wastewater by applying aeration and clarification steps prior to discharge. Per the compliance schedule in the 2012 Permit, APSC installed an ultraviolet (UV) disinfection system to meet bacteria limits prior to discharging to Port Valdez through a single-port diffuser located in 12 m of water.

Sewage enters the partially filled bioreactor containing biomass left from the previous batch treatment. Once the bioreactor is full, the fresh influent and acclimated biomass is aerated continuously like an activated sludge system but without a continuous influent or effluent flow. Once the biological treatment is complete, aeration is stopped to allow settling of the biomass and decanting the treated supernatant. After decanting, excess biomass is wasted to control the food to microorganism ratio of the biological treatment.

Recently, the SBR has experienced unwanted infestations of water fleas that have negatively affected the system biology. The permittee has made multiple attempts to remove the water fleas by disinfecting and repopulating the system with a new biological culture but they have continued to occur. At present, the permittee is closely monitoring the system and conducting research and outreach aimed at identifying improved methods to remove water fleas and improve the overall operability and performance of the system.

2.1.3 Wastewater Characterization

Effluent characterization is necessary to derive maximum probable parameter concentrations that are used to evaluate and size mixing zones as well as maximum expected concentrations (MECs) used in the reasonable potential analysis (RPA). The objective of characterization is to categorize parameters based on their likelihood of exceeding water quality criteria or existing limits. Only those parameters that warrant consideration as being a driving parameter for mixing zones or have reasonable potential to exceed, or contribute to an exceedance, of water quality criteria require a water quality-based effluent limit (WQBEL). The following subsections provide characterization for these objectives.

2.1.3.1 Outfall 001 – Ballast Water Treatment Facility

The characteristics of the treated ballast water include parameters associated with portioning between water and crude oil and include free-phase and dissolved hydrocarbons and certain metals. The influent hydrocarbons consist of alkanes (saturated linear or branched hydrocarbons), cycloalkanes (one or more carbon ring), and various aromatic hydrocarbons (one or more planar six-carbon rings). Aromatic hydrocarbons include BTEX and are the most water soluble and volatile aromatic compounds. BTEX is synonymous with TAH for which state water quality criteria has been established as 10 micrograms per liter (μg/L). The influent hydrocarbons also include aromatic hydrocarbons containing multiple rings, commonly referred to as polynuclear or polycyclic aromatic hydrocarbons (PAHs). PAHs are less water soluble and volatile in comparison to BTEX and tend to be present in much lower concentrations in the BWTF influent. PAHs are regulated using the water quality criteria for TAqH of 15 μg/L, which is the summation of the concentrations for BTEX compounds plus the PAHs. The BWTF influent also includes various metals that solubilize in water due to prolonged contact with crude oil or metallic infrastructure (e.g., tanks, piping, etc.).

In addition, characteristics also include TSS that has been observed to be impacted by algae growth during the summer that can threaten compliance with the applicable MDL of 40 milligrams per liter (mg/L) and AML of 25 mg/L. Discharge monitoring report (DMR) data for the months from January 2008 through November 2017 were reviewed and compared to applicable water quality criteria and the existing MDLs and AMLs from the 2012 Permit to characterize effluent quality. In addition, the effluent is characterized based on oceanographic parameters, density measured as sigma-t, for use in mixing zone modeling in Section 3.0. The characterization of Outfall 001 is shown in Table 1.

Table 1: Outfall 001 Characterization (January 2008 through October 2017)

Parameter (Units)	Data Set	Criteria		Existing Limits		Observed Range (Low – High, Avg)[1]
		Acute	Chronic	MDL	AML	
Flow (mgd)	118	--	--	10.1	5.54	0.44 – 8.76, 1.72
pH [2] (standard units (SU))	118	6.5 to 8.5		6.0 to 8.5		**5.4** – **8.8**, 7.2
TSS (mg/L)	118	--	--	40	25	5.6 – ***51.6***, 21.7
TSS (mg/L) [3]	4			170		15.2 – 38, 20.4
TAH (µg/L)	118	10	--	730	210	3 – **180**, 6
TAqH (µg/L)	58	15	--	Report		3 – **40**, 6
Oil and Grease (mg/L)	114	--	--	Report		5.0-20.0, 5.9
Density (sigma-t)	118	--	--	Report		0.1 – 24.0, 14.9
Dissolved Phosphorus (mg/L) [4]	42	--	.0001	Report		0.002 – 9.0, 0.395
Ammonia as nitrogen (mg /L) [5]	43	12.4	1.8	Report		0 – **9.1**, 1.32
Zinc (µg/L) [6]	22	95	86	Report		53 – **1,450, 267**

Notes:
1. Values that exceed applicable water quality criteria are presented in bold. Values that exceed any limit is italicized.
2. The median of pH is presented in lieu of average.
3. The MDL of 170 mg/L has been retained multiple times in permit reissuances to account for high TSS concentrations due to maintenance of the air strippers at the time of sample collection.
4. The aquatic life chronic criteria for phosphorus is based on elemental phosphorus and is not directly comparable to data reported as dissolved inorganic phosphorus (See Section 2.1.3.1.4).
5. Ammonia criteria are based on values for pH (8 SU), salinity (30 parts per thousand), and temperature (10° C).
6. The water quality criteria for zinc have been converted from dissolved to total recoverable.

Parameters for which monitoring results exceeded one or more applicable water quality criteria and/or permit limit was evaluated as a potential parameters of concern (POCs) for further analysis as described below along with other parameters that require additional explanations.

2.1.3.1.1 pH

The 2012 Permit authorizes numeric limits for pH ranging from 6.5 to 8.5 SU and includes the following language per 40 CFR 401.17:

> "… when pH is continuously monitored, excursions between 5.0 and 6.0, or between 8.5 and 9.5, shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 26 minutes per month."

Based on the review of the characterization data, and the compliance history report discussed in Section 2.3, there have not been any violations of pH limits during the review period. Therefore pH is not expected to result in reasonable potential and was not subjected to further analysis. However, because pH is observed to exceed water quality criteria, pH is parameter under consideration for inclusion in the mixing zone.

2.1.3.1.2 TSS

The characterization of TSS revealed two exceedances with current permit limits. The 2012 Permit includes technology-based effluent limits (TBELs) for TSS based on normal operation of the treatment system and a conditional TSS limit based on past observations that maintenance of the air strippers can cause increased TSS within the day of the maintenance activity. However, this conditional limit was not exceeded during the period of review nor did any of the results of TSS coincident with stripper maintenance exceed the limits for normal operation. This observations suggests the conditional limit may no longer be necessary for the facility to stay in compliance.

For the exceedances of the normal limits, DEC considered the possibility that algae growth during summer and late fall in the BTTs may be the factor causing elevated concentrations of TSS. In order to evaluate this assertion, DEC conducted a seasonal evaluation of TSS data by month to ascertain if summer increases in TSS are evident and if so, if these increases render the limits unattainable. On two occasions, September 2012 and September 2017, TSS results (each 51.6 mg/L) exceeded the MDL of 40 mg/L. Given the violation reports for these exceedance indicated storm events were the cause, and the discharge complies with the TSS MDL greater than 98 percent (%) of the time, DEC does not consider the algae issue currently threatening compliance. However, DEC plans to monitor the algae issue during the next term of the Permit. Because TSS does not have water quality criteria under 18 AAC 70, TSS is not applicable to mixing zones, RPA, or WQBELs. See Appendix B for more information on TSS TBELs.

2.1.3.1.3 TAH and TAqH

During the period of review, TAH did not exceed the 2012 Permit limits. However, TAH and TAqH exceeded their respective water quality criteria. Accordingly, both TAH and TAqH are POCs to be included in the chronic mixing zone. However, only TAH had concentrations that could result in being the driving parameter in the mixing zone and has been evaluated in the RPA in Appendix A.

2.1.3.1.4 Nutrients Phosphorus and Ammonia

The aquatic toxicity of phosphorus in the effluent in Outfall 001 is based on criteria for elemental phosphorus, which is not discernable given the data is reported as total dissolved inorganic phosphorus (e.g., accumulative estimate of phosphates in various forms) and DEC has not implemented nutrient criteria based on phosphate.

Based on the characterization data, the effluent from Outfall 001 is not expected have ammonia concentrations that would result in reasonable potential. However, because the highest observed value exceeds the chronic water quality criteria, ammonia is a POC to be included in the mixing zone.

2.1.3.1.5 Zinc

During development of the 2012 Permit, zinc had been monitored on a quarterly basis and did not trigger reasonable potential to require a WQBEL. However, current characterization of zinc reveals multiple exceedances above applicable water quality criteria and the degree to which the results exceeded criteria indicate zinc is a strong candidate as a potential driving parameter for the chronic and acute mixing zones. Accordingly, zinc is a POC for the RPA and mixing zone analysis.

2.1.3.2 **Chronic Whole Effluent Toxicity (WET)**

The chronic WET monitoring required by the 2012 Permit included the species *Strongylocentrotus purpuratus* (purple sea urchin) for invertebrate fertilization and the species *Atherinops affinis* (topsmelt) for vertebrate growth and survival. The chronic toxicity water quality criteria is 1.0 chronic toxicity unit (TU_c) and the 2012 Permit specified a chronic toxicity trigger of 56 TU_c for all tests based on the authorized dilution factor of the chronic mixing zone.

The testing frequency in the permit began with monthly testing and allowed the frequency to be reduced to quarterly after the effluent exhibited 12 consecutive months of test results that did not exceed the TU_c trigger. The first 12 tests did not exceed the trigger and APSC successfully reduced the frequency to quarterly monitoring for the remaining term of the Permit. Furthermore, all tests for topsmelt survival did not result in observation of acute toxicity endpoints in the 100 % effluent concentrations. Hence, the effluent does not appear to have acute toxicity.

A total of 72 chronic WET tests were conducted during the review period. Results of 31 tests were based on observation of chronic endpoints but observations of endpoints did not occur in the remaining tests. Review of the results identifies the purple sea urchin as the most sensitive test species for the ballast water effluent with 11 test results based on observed endpoints with a maximum of 16 TU_c reported. Based on multiple samples exceeding the water quality criteria of 1.0 TU_c, chronic WET is a POC to be evaluated in the RPA and mixing zone analysis.

2.1.3.3 **Outfall 002 – Sewage Treatment Plant**

The 2012 Permit includes a compliance schedule that required installation of a disinfection process and compliance with fecal coliform (FC) and enterococci (EC) bacteria limits within 36 months after the effective date of the Permit. Accordingly, only the results of FC and EC bacteria data collected after completion of the compliance period are used in characterizing the effluent for bacteria. The water quality criteria for which the limits for EC bacteria were based in in the 2012 Permit were revised in 2016. Accordingly, the new criteria of 130 colony forming units per 100 milliliters (cfu/100 ml) as a statistical threshold value and a geometric mean of 35 cfu/100 ml, based on the marine water criteria for water recreation/contact recreation, are included in Table 2.

Limits for total residual chlorine (TRC) were also included in the 2012 Permit to ensure that concentrations of this potential disinfection chemical did not exceed water quality criteria in the discharged effluent. Because APSC ultimately selected UV disinfection rather than chlorination, TRC limits and monitoring was unnecessary and not conducted.

Although the 2012 Permit includes weekly average and mass-based limits for five-day biochemical oxygen demand (BOD_5) and TSS, these limits are not included in Table 2 because weekly averages and mass-based limits are superfluous to the characterization discussions as discussed in Section 2.1.3.3.1. The characterization of Outfall 002 is shown in Table 2.

Table 2: Outfall 002 Characterization (January 2008 through October 2017)

Parameter (Units)	Data Set	Criteria		Existing Limits		Observed Range (Low – High, Avg) [1]
		Acute	Chronic	MDL	AML	
Flow (gpd)	111	--		10,000	Report	995 – 4,261, 2,004
pH [2] (SU)	111	6.5 to 8.5		6.0 to 9.0		6.0 – 8.5, 7.0
TSS (mg/L)	110	--	--	60	30	2.0 – *38.7*, 7.6
BOD_5 (mg/L)	108	--	--	60	30	2 – *68*, 13
FC Bacteria (FC/100mL) [3]	7	40	20	396	129	5 – ***260***, **38.2** [4]
EC Bacteria (cfu/100mL) [3]	7	130	35	2,540	322	5 – ***980***, **56.4** [4]

Notes:
1. Values that exceed applicable water quality criteria are presented in bold. Values that exceed applicable limits are italicized.
2. The median of pH is presented in lieu of average.
3. FC and EC bacteria are based on protection of human health rather than aquatic life. The criteria shown in the acute column represent maximum criteria that may not be exceeded more than 10 % of the time. The criteria shown in the chronic column is based on a 30-day geometric mean.
4. Averages for FC and EC bacteria are presented as a geometric mean.

2.1.3.3.1 TSS and BOD_5

Review of the above monitoring results shows that three BOD_5 concentrations exceeded permit limits during the monitoring period. However, BOD_5 is not a water quality parameter that warrants consideration in the mixing zone or the RPA. See Section 2.3.1 for more information on the reported exceedances. During the period of review, there was one result that exceeded the TSS AML. Neither the BOD_5 or TSS mass-based results exceeded the respective mass-based limits.

During the period of review, both TSS and BOD_5 were also assigned mass-based limits; the MDLs were 5 pounds per day (lbs/d) for both TSS and BOD_5. Only concentrations are shown in Table 2 because the reported maximum mass-based result for TSS and BOD_5 were significantly less than limits. For the 40 data points for BOD_5, the maximum was 0.81 lbs/d and the average was 0.15 lbs/d. The maximum reported TSS was 0.32 lbs/d and the average was 0.08 lbs/d. The maximum reported results for mass-based limits represent 16 % and 6 % of the MDLs for BOD_5 and TSS respectively. On average, the BOD_5 mass discharge was 13 ounces per day (oz/d) and for TSS it was 5 oz/d. Continuation of the existing mass-based limits for BOD_5 and TSS does not appear necessary for controlling these pollutants when compared to concentration-based limits imposed under 18 AAC 72 – Wastewater Disposal.

2.1.3.3.2 FC and EC Bacteria

Both FC and EC bacteria exceeded criteria and the AMLs in the 2012 Permit and are POCs requiring additional evaluation in the RPA (See Appendix B). In addition, both require a mixing zone and one, or the other, will be the driving parameter in the chronic mixing zone for Outfall 002 (See Sections 3.3.1.2 and APPENDIX C).

2.2 Environmental Monitoring

Studies of the Port Valdez marine environment have been conducted since 1969 and have included measurements of hydrocarbon concentrations in sediments. As previously discussed in Section 2.1.2.1, over time the treatment efficiency of the BWTF has increased while the annual volume of the discharge has significantly decreased. The benefits of the overall mass reduction of hydrocarbons is exemplified in sediment monitoring results required by the Permit to evaluate the long-term effects of treated ballast water discharges. During the period 2000 to 2007, the ongoing studies indicated PAH concentrations associated with the discharge of treated ballast water were determined to be negligible to, at most, minor effects on benthic infauna. Hydrocarbon concentrations were not measured at levels that are recognized as harmful to benthic organisms or pose a significant risk to human health. Although widespread persistence of PAH in sediments is not observed, some minor faunal responses were still detected at a sampling station nearest to the discharge.

2.3 Compliance History

2.3.1 Limits Exceedances

Facility compliance was evaluated for the time interval beginning January 2013 through October 2017. The data for Outfall 001 shows a single effluent violation in September 2017 when the discharge concentration of TSS was measured at 51.6 mg/L, 29 % greater than the permitted MDL of 40 mg/L. This exceedance was attributed to a prolonged rain event that resulted in excessive amounts of sediment in storm water from SCAs entering the BWTF through the IWS. The BWTF is not able to treat excessive sediment during high hydraulic loading rates.

During the period of review, data for Outfall 002 shows seven violations as summarized below:

- TSS: One reported concentration of 38.7 mg/L in August 2017, exceeding the 30 mg/L MDL by 29 %.
- BOD_5: Three reported concentrations, ranging from 48.9 mg/L to 68.4 mg/L, which occurred in March and October 2014. These resulted in one MDL, two weekly average, and one AML exceedances.
- FC Bacteria: One reported value of 168 FC/100 ml in October 2017, exceeding the 129 FC/100 ml AML by 46 %. The MDL was not exceeded.
- EC Bacteria: One reported value of 348 cfu/100 ml in October 2017, exceeding the 129 cfu/100 ml AML by 8 %. The MDL was not exceeded.

During a November 2017 site visit at the VMT by DEC, the permittee described ongoing evaluation of the operation of the STP targeting maintaining effective microbiology in the system and other considerations aimed at preventing future exceedances of permit limits.

2.3.2 Reporting Violations

There have been no non-reporting violations during the period of review.

3.0 RECEIVING WATERBODY

3.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with 18 AAC 70 – Alaska Water Quality Standards (WQS). The WQS are composed of waterbody 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. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The Department has determined that there has been no reclassification nor has site-specific water quality criteria been established for Port Valdez at the location of the permitted discharge. Accordingly, site-specific criteria is not applicable.

3.2 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not, or is not expected to, intrinsically meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a Total Maximum Daily Load (TMDL) management plan for the waterbody. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating WQS and allocates that load to known point sources and nonpoint sources.

Port Valdez is not included as an impaired waterbody in the *Alaska's Final 2014/2016 Integrated Water Quality Monitoring and Assessment Report*, November 2, 2018 (*2014/2016 Integrated Report*) nor is it listed as a CWA 303(d) waterbody requiring a TMDL. Accordingly, a TMDL has not been established for Port Valdez.

3.3 Mixing Zone Analysis

Per 18 AAC 70.240, excluding 18 AAC 240(g)(1), (2), and (4) as amended through March 23, 2006 the Department may authorize mixing zone(s) in an APDES permit. Determination of mixing zones requires an evaluation of critical characteristics of the receiving water, effluent discharges and other pertinent factors, combined with use of an approved mixing zone modeling program such as the Cornell Mixing Zone Model (CORMIX) or Visual Plumes.

The Mixing Zone Analysis Checklist (Appendix D) outlines the criteria that must be considered and met per mixing zone regulations for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody,

human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's regulatory mixing zone analyses.

3.3.1 Modeling Process

3.3.1.1 Outfall 001

The effluent characterization for Outfall 001 identified zinc, TAH, chronic WET, and pH as parameters potentially requiring mixing zones. The RPA identified zinc as the driving parameter (parameter requiring the greatest dilution to meet water quality at the boundary of a mixing zone) for sizing both the acute and chronic mixing zones.

The Outfall 001 mixing zones were analyzed by both the applicant and DEC with the applicant using Visual Plumes and DEC CORMIX. Both analyses considered an instantaneous discharge rate of 0.442 cubic meters per second (7,000 gpm) based on the maximum capacity of the BTT discharge pumps and 10th and 90th percentile current speeds of 0.02 and 0.06 meters per second (m/s) based on available current studies. Both analyses modeled 20 ports having an average diameter of 0.1143 m and discharging from the side of the diffuser pipe oriented in the direction of current flow.

The characterization by the applicant used zinc data collected quarterly during the term of the 2012 Permit. The analyses by DEC used a larger zinc data set from January 2008 through October 2017 to more comprehensively model the discharge. DEC calculations resulted in a probable maximum effluent concentration of 4,172 μg/L zinc which requires acute and chronic dilution factors of 50.5 and 56.5 to meet zinc water quality criteria at their respective mixing zone boundaries.

The relationship between discharge and receiving water velocities and densities are important considerations in mixing zone modeling. Under ideal conditions the discharge and receiving water velocities are sufficient to facilitate rapid mixing and, for near bottom discharges, the discharge is sufficiently buoyant to avoid vertical entrapment. These are important factors in the analyses of the Outfall 001 discharge because the diffuser system has low discharge velocities in current discharge conditions.

The 2012 and previous permits required effluent density monitoring, reported as sigma-t, to provide data to assess discharge buoyancy. Sigma-t is defined as the density of the effluent in units of kilograms per cubic meter (kg/m^3) minus 1,000 (the density of freshwater). For example a water sample with a density of 1,027 kg/m^3 has a sigma-t value of 27. The sigma-t data allows evaluation of the potential for buoyant mixing which is particularly important for the analysis of mixing under simultaneously low current and discharge velocities when there is greater potential for the discharge to become trapped in a layer and lead to upstream intrusion. Essentially, entrainment and trapping is exacerbated when the current and/or effluent discharge velocities are insufficient to overcome the effects of density. As discussed in the facility description, the BWTF effluent is becoming less dense. DEC evaluated sigma-t data collected from 2002 to present to assess long-term trends in effluent density and provide data for CORMIX modeling aimed at determining at what density and how frequently the discharge may result in trapping or intrusion under the current conditions.

The resulting CORMIX models indicate that under the 10th percentile current conditions, sigma-t densities of 21.7 and above result in significant ambient spreading and upstream intrusion begins to have a significant effect on the mixing zone width. Based on density observations during the last 10 years, a sigma-t value of 21.5 represents the 85th percentile of the data, which is DEC standard of practice. Hence, this value would be expected to be exceeded approximately 15 % of the time and would have to be coincident with slack tide conditions that typically last approximately 10 % of each tide cycle in order for ambient spreading to occur. When considering the likelihood of these mutually exclusive events occurring at the same time, high density effluent discharged during slack tide, ambient spreading and upstream intrusion is possible approximately 1.5 % of the time. Furthermore, if these conditions do occur simultaneously, slack tide conditions typically last approximately 36 minutes so the frequency and duration of poor ambient mixing conditions do not warrant significant concern. Based on the sensitivity analysis, DEC used a density of 1021.5 kg/m^3 as the critical effluent density for its modeling of the Outfall 001 mixing zone.

3.3.1.2 Outfall 002

The effluent characterization for Outfall 002 evaluated EC bacteria and FC bacteria as parameters potentially requiring a chronic mixing zone, based on applicable water quality criteria. The characterization identified EC bacteria as the driving parameter for chronic mixing zone.

The applicant modeled the Outfall 002 in previous permit applications using CORMIX and referenced these results in their application. DEC evaluated the previous model and concluded that there have been no substantive changes in critical conditions that would preclude using it for this reissuance. However, although the critical conditions have not changed, the size of the mixing zone must account for the current characterization of the effluent in determining the driving parameter and the probable maximum concentration of that parameter. As noted above, DEC identified EC bacteria as the driving parameter for the Outfall 002 mixing zone in the reissued Permit whereas FC bacteria was the driving parameter in the 2012 Permit.

3.3.2 Mixing Zone Sizes

3.3.2.1 Outfall 001

For Outfall 001, DEC authorizes a chronic mixing zone for zinc, TAH, TAqH, pH, chronic WET, and ammonia with a dilution factor of 56.5. The chronic mixing zone is rectangular measuring 72 m long (36 m in each prevailing current direction) by 69 m wide extending from the seafloor (excluding sediments) to the receiving water surface. In addition, DEC authorizes an acute mixing zone for zinc with a dilution factor of 50.5. The acute mixing zone is a rectangle measuring 58 m long (29 m in each prevailing current direction) by 68 m wide and extending from the seafloor (excluding sediments) to the receiving water surface.

3.3.2.2 Outfall 002

For Outfall 002, DEC authorizes a chronic mixing zone for EC bacteria, FC bacteria, and zinc with a dilution factor of 73.5. The mixing zone is cylindrically-shaped with a radius

of 0.72 m centered on the outfall and extending from the seafloor to the receiving water surface.

3.3.3 Regulatory Size Constraints

Per 18 AAC 70.240(k), mixing zones must be as small as practicable and the Department will ensure that existing uses of the waterbody outside the mixing zones are maintained and fully protected.

Per 18 AAC 70.240(k)(1)(A), for estuarine and marine waters, measured at MLLW the cumulative linear length for all mixing zones intersected on any given cross section of an estuary, inlet, cove, channel, or other marine water may not exceed 10 % of the total length of that cross section. Additionally, per 18 AAC 70.240(k)(1)(B), the total horizontal area allocated to all mixing zones at any depth may not exceed 10 % of the surface area. DEC estimates the width of Port Valdez in the vicinity of the discharge to be approximately 4,000 m. Given the dimension the chronic mixing zone for Outfall 001 (the largest of the mixing zones to be authorized under the Permit) oriented perpendicular to the shoreline is 69 m, the chronic mixing zone is approximately 1.7 % of the average cross channel width. Comparison of the chronic mixing zone size to the overall area of Port Valdez indicates the area of this mixing zone is less than 0.01 % of the overall surface area of the waterbody making it significantly smaller than the size allowed by 18 AAC 70.255(k)(1)(B).

Per 18 AAC 70.240(d)(7), acute mixing zones must be sized so there will be no reasonable expectation of lethality to passing organisms in the mixing zone. DEC begins the evaluation of potential lethality to passing organisms by calculating the exposure time required for drifting organisms to pass through the mixing zone during 10-percentile current conditions. DEC views results showing that organisms spend less than 15 minutes in the mixing zone as indicating no reasonable expectation of lethality while results of greater than 15 minutes exposure undergo additional evaluation before making a determination.

For the Outfall 001, the exposure time is calculated by dividing the length of the mixing zone (29 m in the down-current direction) by the 10th percentile current (0.02 m/s). The calculation indicates an organism would spend approximately 24 minutes in the mixing zone during low current conditions, prompting more evaluation. DEC considered acute WET results collected under the 2012 Permit (See Section 2.1.3.2). There were no acute WET results during the period of review that resulted in observed endpoints in the highest concentrations tested. Given the effluent has no lethal effects based on acute WET testing, DEC determined there is no reasonable expectation that a 24 minute exposure time will pose a risk of lethality to passing organisms in the mixing zone. As discussed in section 3.3.2.2, only a small chronic mixing zone is authorized for Outfall 002. Therefore, per 18 AAC 70.240(k), the Department finds that available evidence reasonably demonstrates the mixing zones have been sized to be as small as practicable.

3.3.4 Technology

18 AAC 70.240(c)(1) requires the Department to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible,

consistent with the highest statutory and regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are described in 18 AAC 70.240(c)(A), (B), and (C) as follows:

- Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as revised as of July 1, 2005 and adopted by reference;
- Minimum treatment standards in 18 AAC 72.050; and
- Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

The first part of the definition includes all TBELs applicable to federal Effluent Limitation Guidelines (ELGs) that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case best professional judgement (BPJ). Although the VMT could be considered an industrial type "shore-reception facility", EPA has not established national ELGs for discharges from ballast water from treatment facilities in this industrial category. Where EPA has not yet developed ELGs for a particular industry, permitting authorities can establish TBELs using case-by-case BPJ. For Outfall 001, DEC is retaining TBELs established previously using case-by-case BPJ for TSS and pH.

The second part of the definition per 18 AAC 72.050 refers to the minimum treatment requirements for domestic wastewater. Since the discharge from Outfall 002 consists of domestic wastewater, the minimum treatment standards of 18 AAC 72.050 are applicable and the TBELs established in the Permit reflect these same requirements. Accordingly, the second part of the definition has been met.

The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 83, 18 AAC 72 and 18 AAC 15. The Permit is consistent with 18 AAC 83, the minimum treatment requirements of 18 AAC 72 and neither the regulations in 18 AAC 15 nor another state legal requirement that the Department is aware of impose more stringent treatment requirements than 18 AAC 70. Therefore, the third and final part of the definition has also been met.

3.3.5 Existing Use

Per 18 AAC 70.240(c)(2), the mixing zones have been appropriately sized to fully protect the existing uses of Port Valdez. Water quality criteria are developed to ensure protection of existing uses such that if the water quality is met in the receiving water the uses are protected. The mixing zones have been appropriately sized to meet applicable acute, chronic, and human health criteria at and beyond the boundary of each mixing zone. Therefore, the mixing zones results in the protection of the existing uses of the waterbody as a whole.

3.3.6 Human Consumption

Per 18 AAC 70.240(c)(4)(B) the mixing zone must not preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Per 18 AAC 70.240(d)(3), the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge.

The mixing zones are not authorized in a location where aquatic resources are harvested or that could result in precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. The closest resource structures are hatchery net pens located approximately three kilometers away. In addition, the VMT is required to have a marine terminal safety zone that precludes significant harvesting activities in the area. The conclusions in the final report of the 2017 studies notes that the likelihood of adverse effects associated with PAH, such as taste and odor in aquatic resources, in Port Valdez remains low. Therefore there is no indication that the pollutants discharged would produce objectionable color, taste or odor in aquatic resources harvested for human consumption if such activity occurred near the outfall.

3.3.7 Spawning Areas

Per 18 AAC 70.240(e)(1) and (2), a mixing zone will not be authorized in an lakes, streams, rivers, or other flowing freshwaters in spawning area of any of the five species of Pacific salmon found in the state or be allowed to adversely affect the present and future capability of an area to support spawning of these species. Per 18 AAC 70.240(f), a mixing zone will not be authorized in a spawning area for the following resident fish: Arctic Grayling; northern pike; lake trout; brook trout; sheefish; burbot; landlocked coho salmon, chinook salmon, or sockeye salmon; anadromous or resident rainbow trout, Arctic char, Dolly Varden, whitefish, or cutthroat trout. Because the permit does not authorize the discharge of effluent to open waters of a freshwater lake, river, or other flowing freshwater, there are not associated discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

3.3.8 Human Health

Per 18 AAC 70.240(d)(1), a mixing zone may be approved if the Department finds that available evidence reasonably demonstrates that within the mixing zone pollutants will not bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels based on consideration of bioaccumulation and bioconcentration factors, toxicity, and exposure. In addition, per 18 AAC 70.240(d)(2) pollutants discharged must not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using a risk assessment method approved by the Department and consistent with 18 AAC 70.25, which indicates the lifetime incremental cancer risk level is 1 in 100,000 for exposed individuals.

A conservative risk assessment was performed for potential bioaccumulative, bioconcentrating, and carcinogenic parameters in discharge of Outfall 001 in 2001. Even using conservative approaches, the conclusion was there is reasonable demonstration that the discharge will not result in bioaccumulation/bioconcentration or unacceptable carcinogenic risks. An analysis of the effluent data submitted with application for reissuance indicates a reduction in concentrations since the assessment and that human health criteria are met either at the point of discharge or at the boundary of the chronic mixing zones. The quality of the effluent is expected to continue to meet human health criteria within a short distance from the point of discharge such that authorization of the mixing zones are protective of human health.

3.3.9 Aquatic Life and Wildlife

Per 18 AAC 70.240(c), the Department will approve a mixing zone if there is available evidence that reasonably demonstrates (3) the overall biological integrity of the waterbody will not be impaired and (4) the mixing zone will not (A) result in acute or chronic toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone(s), (C) preclude or limit established processing activities ore established commercial, sport, personal-use, or subsistence fish and shellfish harvesting, (D) result in a reduction in fish or shellfish population levels, (E) result in permanent or irreparable displacement of indigenous organisms, or (G) form a barrier to migratory species or fish passage.

As a permit condition, APSC has conducted environmental studies in Port Valdez for over 25 years to ascertain impacts from the discharge of treated ballast water on aquatic resources in sediment. During this lengthy period of studying water and sediment chemistry and effects on biology, there has been an observed decline in sediment concentrations of PAH that are approaching background levels. The PAH concentrations are less than 1/10th of the Effect Range Low (ERL) sediment criteria (Long 1998) suggesting impacts to aquatic wildlife are negligible. Accordingly, the discharge is not expected to cause a reduction in the Port Valdez fish or shellfish populations, resulted in undesirable or nuisance aquatic life, caused permanent or irreparable displacement of indigenous organisms, or formed a barrier to migration or prevented a zone of passage in the receiving water. Nor has the discharge resulted in adverse effects on threatened or endangered species or anadromous fish (See Sections 3.3.7, 3.3.10, and 8.1). The continuing reductions in the discharge of pollutants in Outfall 001 provide assurance this condition will be maintained in the future.

3.3.10 Endangered Species

Per 18 AAC 70.240(c)(4)(F), the Department will approve a mixing zone if there is available evidence that reasonably demonstrates the mixing zone will not cause an adverse effect on threatened or endangered species except as authorized under the Endangered Species Act (ESA). DEC reviewed the potential presence of endangered species using mapping and data bases (See Sections 8.1 and 8.2) and considered the mixing zone sizes and local tidal conditions and concludes that the mixing zones are not likely to cause an adverse effect on threatened or endangered species.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the applicant has first obtained an APDES permit that meets the purposes of AS 46.03 and is in accordance with CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to meet standards reflecting levels of technological capability, comply with WQS, and comply with other state requirements that may be more stringent. The CWA requires that the limits for a particular pollutant be the more stringent of either TBELs or WQBELs.

The development of limits and monitoring requirements for the Permit is summarized in Appendix B. The limits for Outfall 001 include TBELs for the parameters pH, and TSS and WQBELs for zinc. The limits for Outfall 002 include TBELs for the parameters pH, BOD_5, and TSS and WQBELs for EC bacteria.

4.2 Effluent Limits and Monitoring Requirements

In accordance with AS 46.03.110(d), the Department may specify the terms and conditions for discharging wastewater in a permit. The Permit includes monitoring requirements so that compliance with effluent limits can be determined, but may also be required to characterize the effluent and to assess impacts to the receiving water. Sufficiently sensitive methods as required in 40 CFR 136 are required for analyzing collected samples. The permittee must report all violations of MDLs per Appendix A, Standard Conditions, Section 3.4 – 24-Hour Reporting. Violations of all other effluent limits are to be reported per Appendix A, Standard Conditions, Section 3.5 – Other Noncompliance Reporting.

4.2.1 Effluent Limits and Monitoring Requirements for Outfall 001 - BWTF

Effluent limits and monitoring requirements for Outfall 001 – BWTF are summarized in Table 3.

Table 3: Effluent Limits and Monitoring Requirements for BWTF (Outfall 001)

Parameter (Units)	Effluent Limits		Monitoring Requirements	
	MDL	AML	Frequency	Sample Type
Flow (mgd)	10.1	5.54	Continuous	Meter
pH[1] (SU)	6.0 < pH < 9.0		Continuous	Meter
TSS (mg/L)	40	25	1/week	Composite
TSS During Stripper Activation [2] (mg/L)	170	---	2/event	Composite
Total Recoverable Zinc (µg/L)	4,163	1,592	1/month	Grab
TAH [2] (µg/L)	Report		1/month	Grab
TAqH (µg/L)	Report		1/month	Grab
Total Recoverable Oil and Grease (mg/L)	Report		1/month	Grab
Density (kg/m^3)	Report		1/month	Grab
Dissolved Inorganic Phosphorus as P (mg/L)	Report		1/quarter	Grab
Ammonia as Nitrogen (mg/L)	Report		1/quarter	Grab
Chronic WET [3] (TU_c)	Report		See Section 4.3.2	Grab

Notes:

1. Report instantaneous maximum and minimum pH monthly. Per 40 CFR 401.17, when pH is continuously monitored excursions between 5.0 and 6.0, or between 9.0 and 9.5, shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 26 minutes per month. Any excursions below 5.0 and above 9.5 are violations.
2. TSS measured on the day of and the day after BTT air stripper activation shall not be included in the calculation of monthly average or maximum daily. The permittee shall submit as an attachment to the eDMR a monthly BTT air stripper activity report identifying the dates and times of BTT stripper activation and deactivation.
3. The initial chronic WET samples must be collected simultaneously with other water quality parameters in this table. For Chronic WET requirements see Section 4.3.

The permittee must develop and implement specific BMPs that help ensure compliance with permit limits and conditions. The following 10 specific BMPs are required for Outfall 001:

1. Storm Water: The permittee must develop and implement BMPs to prevent contamination of storm water to the extent practicable per Section 7.3.1.1.
2. SCA Water Diversions: To prevent damage to terminal infrastructure or noncompliance due to hydraulically overloading the BWTF, the permittee must develop and implement BMPs that enable diverting storm water (i.e., uncontaminated SCA water) to facility drainage rather than the IWS during extreme rainfall events per Section 7.3.1.2.
3. BTT Monitoring and Algae Control: The permittee must continue monitoring of dissolved oxygen and temperature in the BTT. In addition, the permittee must establish specific BMPs to monitor and control algae growth in the BTTs that could impact compliance with TSS and/or pH during the summer per Section 7.3.1.3.
4. Methanol Detection, Control, and Treatment: During the term of the Permit, operation of TAPS during the winter may require addition of methanol to prevent freezing. The permittee must develop specific BMPs to address the maintaining of compliance with the Permit given the potential for methanol to be introduced into the BWTF per Section 7.3.1.4.
5. Incoming Ballast Water Reviews: The permittee must maintain BMPs for monitoring incoming ballast water for inappropriate pollutants that may not be authorized in the discharge per Section 7.3.1.5.
6. Coagulant and Other Treatment Chemicals: The permittee must maintain BMPs for the efficient and effective use of coagulants and other treatment chemicals as inputs to the BWTF per Section 7.3.1.6.
7. Air Stripper Media Maintenance: The permittee must maintain BMPs to maintain compliance during maintenance activities and prevent the discharge of stripper media per Section 7.3.1.7.
8. Scraper Pig Cleaning and Wash Water Treatment: The permittee must maintain BMPs to address removal of crude oil and residues on scraper pigs prior to reduce pollutants in wash down water from entering the IWS and being treated in the BWTF per Section 7.3.1.8.
9. Terminal Fire Water System Tests: The permittee must maintain BMPs to limit, manage, and control the discharge from the jockey pump, firewater pump testing and maintenance, berth fire foam system testing, and hydrant maintenance and testing per Section 7.3.1.9.
10. Over-water Construction and Maintenance: The permittee must maintain BMPs to maximize containment and minimize the discharge of wastes generated during construction or maintenance activities over water per Section 7.3.1.10.

4.2.2 Effluent Limits and Monitoring Requirements for Outfall 002 - STP

Effluent limits and monitoring requirements for Outfall 002 – STP are summarized in **Table 4.**

Table 4: Effluent Limits and Monitoring Requirements for STP (Outfall 002)

Parameter (Units)	Effluent Limits		Monitoring Requirements	
	MDL	**AML**	**Frequency**	**Sample Type**
Flow (gpd)	10,000	Report	Continuous	Calculation or Meter
pH (SU)	$6.0 \leq pH \leq 9.0$		1/week	Grab or Meter
TSS (mg/L)	60	30	1/month	Grab
BOD_5 (mg/L)	60	30	1/month	Grab
EC Bacteria [1] (cfu/100 ml)	4,225	2,106	1/month	Grab
FC Bacteria (FC/100 ml)	Report		1/month	Grab

Notes:

1. All effluent EC bacteria average results must be reported as the geometric mean. When calculating the geometric mean, replace all results of zero, 0, with a one. The geometric mean of "n" quantities is the "n^{th}" root of the quantities. For example the geometric mean of FC bacteria results of 10, 20, and 30 is $(10 \times 20 \times 30)^{1/3} = 18.2$.

During the term of the Permit, the permittee must develop and implement specific BMPs that help ensure compliance with permit limits per Section 7.3.2. The specific BMPs may include operation procedures, training objectives, maintenance activities, facility modifications, or other elements deemed necessary to ensure compliance.

4.3 Chronic WET Monitoring

The Permit will require the permittee to conduct chronic WET testing of the Outfall 001 discharge in accordance with the following requirements.

4.3.1 Test Species and Methods

The permittee is required to conduct chronic WET testing on Outfall 001 for one vertebrate and one invertebrate species. The permittee must conduct the WET testing to screen for the most sensitive invertebrate species in Section 4.3.1.2. The elimination of the less sensitive species over more sensitive invertebrate species must be approved by DEC in writing for use in subsequent chronic WET tests. Upon identification of the most sensitive test species, the permittee may submit a written request to eliminate the less sensitive species in subsequent WET analysis for DEC approval. DEC can also approve written requests to substitute the less sensitive species during periods when the more sensitive species is unavailable. The permittee shall not make any changes to the selection of test species or dilution series without prior written approval by DEC.

4.3.1.1 Vertebrate Species

For survival and growth tests, the permittee must use the fish species *Atherinops affinis* (topsmelt). In the event that topsmelt is not available, *Menidia beryllina* (inland silverside) may be used as an alternate. The permittee shall document the use of alternate species in the DMR for the testing.

4.3.1.2 Invertebrate Species

For larval development tests, the permittee must use bivalve species *Crassostrea gigas* (Pacific Oyster) or *Mytilus spp*. (mussel) and *Americamysis bahia* (formally *Mysidopsis bahia*, mysid shrimp) for survival and growth. Due to seasonal variability, testing may be performed during reliable spawning periods (e.g., December through February for mussels and June through August for oysters).

4.3.2 Monitoring Frequency

The Permit specifies WET monitoring to be conducted once per quarter for invertebrates and twice per year for vertebrates on Outfall 001 - BWTF.

4.3.3 Procedures.

The permittee must conduct chronic WET testing using the following procedures.

4.3.3.1 Methods and Endpoints

For the mysid shrimp and the alternate fish species (inland silverside) the presence of chronic toxicity must be estimated as specified in *EPA Short-Term Methods for*

Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition (EPA-821-R-02-014).

For the bivalve species (Pacific Oyster and mussel) and the primary fish species (topsmelt) chronic toxicity must be estimated as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136). The WET testing will determine the 25 % effect concentration (EC_{25}) endpoint estimate of the effluent concentration that would cause a 25 % reduction in normal embryo development for the bivalves or in survival for fish and/or mysid shrimp. The WET testing will also determine the inhibition concentration (IC_{25}) point estimate of the effluent concentration that would cause a 25 % reduction in the growth of the fish and/or mysid shrimp.

4.3.3.2 Reporting Results

Results must be reported on the DMR using TU_c, where $TU_c = 100/EC_{25}$ or $100/IC_{25}$. The reported EC_{25} or IC_{25} must be the lowest point estimate calculated for the applicable survival, growth or normal embryo development endpoints. The permittee must report the no observed effect concentrations (NOECs) in the full WET test report. DEC may compare this information with the IC_{25} during reissuance of this Permit.

4.3.3.3 Acute Toxicity Estimates

Although acute WET testing is not required, the permittee must provide an estimate of acute toxicity based on observations of mortality when appropriate (e.g., vertebrates). Acute toxicity estimates, if available, must be documented in the full report.

4.3.3.4 Dilution Series

A series of at least five dilutions and a control must be tested. The recommended initial dilution series to screen for toxicity is 0.9, 1.8, 3.6, 7.5, 15, 50, and 75 % (or the maximum dilution after salinity adjustment) along with a control of dilution water (0 % effluent). In subsequent tests, the dilution series should be modified to bracket toxicity endpoints observed during previous tests. DEC may provide written direction to modify the previous dilution series or the permittee may request written approval from DEC to modify the dilution series based on previous test results.

4.3.3.5 Hold Times

The logistics of shipping WET samples to the lower 48 can be challenging as poor weather delays or missed connections during shipping can result in violation of the standard 36-hour hold time. If extenuating circumstances occur, WET samples hold times can exceed 36 hours but must not exceed 72 hours. The permittee must document the conditions that resulted in the need for the holding time to exceed 36 hours and any potential effect the extended hold time could have on the test results and include in the test report.

4.3.3.6 Additional Quality Assurance Procedures

In addition to those quality assurance measures specified in the methodology, the following quality assurance procedures must be followed:

a) If organisms are not cultured by the testing laboratory, concurrent testing with reference toxicants must be conducted, unless the test organism supplier provides control chart data from at least the previous five months of reference toxicant testing. Where organisms are cultured by the testing laboratory, monthly reference toxicant testing is sufficient.

b) If either of the reference toxicant tests or the effluent tests does not meet all test acceptability criteria as specified in the test methods manual, then the permittee shall re-sample and re-test within the following month.

c) Control and dilution water must be receiving water, or salinity adjusted lab water. If the dilution water used is different from the culture water, a second control, using culture water must also be used.

4.3.4 WET Reporting.

4.3.4.1 DMRs and Full Report Deliverables:

The permittee shall submit chronic WET test results on next month's DMR following the month of sample collection. The permittee must also submit the full WET Toxicity Report as an attachment to the DMR per Section 4.4.1.

If the results of any chronic WET test exceed 56.5 TU_c, the permittee shall include a written submittal to DEC explaining the cause of the high results and the steps taken to reduce the toxicity as an additional attachment to the DMR. In addition, the permittee shall repeat the WET testing within 30 days of receiving the report of high toxicity. Following review of the repeated test results, DEC may require additional testing per Section 4.6.

4.3.4.2 Full Report Preparation:

The report of results shall include all relevant information outlined in Section 10 of Report Preparation in the *U.S. EPA Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition* (EPA-821-R-02-014).

4.3.4.3 Additional Reporting Information:

In addition to toxicity test results, the permittee shall report:

a) The date and time of sample collection and initiation of each test,

b) The discharge flow rate at the time of sample collection, and

c) The results of the effluent analysis for chemical parameters for Outfall 001 as defined in Section 4.2.1, and

d) All raw data and statistical analysis from the tests, including reference toxicant tests.

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4.4 Electronic Discharge Monitoring Reports

4.4.1 E-Reporting Rule, Phase I (DMRs)

The permittee must submit a DMR for each month by the 28th day of the following month. DMRs shall be submitted electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127). Authorized persons may access permit information by logging into the NetDMR Portal (http://cdxnodengn.epa.gov/oeca-netdmr-web/action/login). DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in Permit Appendix A – Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g. full WET reports, mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website (http://dec.alaska.gov/water/Compliance/EReportingRule.htm) that contains general information about this new reporting format. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

4.4.2 E-Reporting Rule, Phase II (Other Reporting)

Phase II of the E-Reporting Rule specifies that permittees will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin during the term of the Permit. Permittees should monitor DEC's E-Reporting website (http://dec.alaska.gov/water/Compliance/EReportingRule.htm) for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with Permit Appendix A – Standard Conditions.

4.5 Monitoring Frequency Reductions

DEC can reduce monitoring frequencies for selected parameters in a permit for permittees showing a record of good compliance during the previous permit cycle. DEC utilizes the *EPA Interim Guidance For Performance-Based Reduction of NPDES Permit Monitoring Frequencies* (interim guidance) in combination with the consideration of other factors to determine whether or not to reduce monitoring frequencies in a permit. The interim guidance provides the statistical basis for assessing potential reductions and other factors include consideration of the size and type of facility, future data analyses needs, and other issues pertinent to each permit.

The 2012 Permit limits TSS in the Outfall 001 discharge to an AML of 25 mg/L under normal operating conditions and specifies a sampling frequency of three times per week. Review of DMR data under normal operations from Nov. 2015 through Oct. 2018 shows a long-term average of 8.28 mg/L equaling 33 % of the AML which, when assessed per the interim guidance, indicates the monitoring frequency can potentially be reduced to once per week in the Permit. Having considered the impacts of once per week monitoring in light of other permit reissuance needs, DEC concludes weekly TSS monitoring is sufficient and is reducing it in the Permit.

The 2012 Permit limits TAH in the Outfall 001 discharge to an AML of 0.21 mg/L and specifies a sampling frequency of once per week. Review of DMR data for Nov. 2015 through Oct. 2018 shows a long-term average of 0.0045 mg/L equaling 2 % of the AML which, when assessed per

the interim guidance, could potentially be reduced to once every two months in the Permit. Having considered other factors, DEC believes reducing the frequency to once every two months would not provide sufficient information for evaluation during the next reissuance. Therefore, DEC is reducing the frequency for TAH in the Permit to once per month.

4.6 Additional Monitoring

DEC may require additional monitoring of effluent or receiving water for facility or site-specific purposes, including, but not limited to: data to support applications, demonstration of water quality protection, obtaining data to evaluate ambient water quality, evaluating causes of elevated concentrations of parameters in the effluent, and conducting chronic WET toxicity identification and reduction evaluations. If additional monitoring is required, DEC will provide the permittee or applicant the request in writing.

The permittee also has the option of taking more frequent samples than required under the Permit. These additional samples must be used for averaging if they are conducted using the Department approved test methods (generally found in 18 AAC 70 and 40 CFR 136 [adopted by reference in 18 AAC 83.010]). The results of any additional monitoring must be included in the calculation and reporting of the averaged data on DMRs as required by the Permit and Standard Conditions Part 3.2 and 3.3 (Permit Appendix A).

Monitoring for effluent limitations must use methods with method detection limits that are less than the effluent limitations or are sufficiently sensitive. Monitoring effluent or receiving water for the purpose of comparing to water quality criteria must use methods that are less than the applicable criteria or are sufficiently sensitive. Per 40 CFR 122.21(a)(3), a method approved under 40 CFR 136 is sufficiently sensitive when:

> (A) The method minimum level (ML) is at or below the level of the applicable water quality criterion for the measured parameter, or
>
> (B) The method ML is above the applicable water quality criterion, but the amount of the pollutant or pollutant parameter in the discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge (e.g., not applicable to effluent or receiving water monitored for characterization), or
>
> (C) The method has the lowest ML of the analytical methods approved under 40 CFR 136 for the measured pollutant or pollutant parameter (e.g., the receiving water concentration or the criteria for a given pollutant or pollutant parameter is at or near the method with the lowest ML).

5.0 ANTIBACKSLIDING

Per 18 AAC 83.480, “effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the 2012 Permit.” Per 18 AAC 83.480, a permit may not be reissued “to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the Permit is renewed or reissued.”

Effluent limitations may be relaxed as allowed under 18 AAC 83.480(b), CWA Section 402(o) and CWA Section 303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified

permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made.

CWA Section 303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions, the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations.

CWA Section 303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy. Even if the requirements of CWA Section 303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or ELGs (if applicable).

State regulation 18 AAC 83.480(b) only applies to effluent limitations established on the basis of CWA Section 402(a)(1)(B), and modification of such limitations based on effluent guidelines that were issued under CWA Section 304(b). Accordingly, 18 AAC 83.480(b) applies to the relaxation of previously established case-by-case TBELs developed using BPJ. To determine if backsliding is allowable, the regulation provides five regulatory criteria in 18 AAC 83.480(b)(1-5) that must be evaluated and satisfied.

5.1 Antibacksliding of WQBELs

The 2012 Permit included WQBELs for both FC and EC bacteria in the Outfall 002. The development of WQBELs in the Permit resulted in a limit for EC bacteria using characterization data reported since the UV system began operation in 2016 that was less stringent than the EC bacteria limit in the 2012 Permit. Accordingly, this represents an allowable backsliding of a WQBEL based on new information. The less stringent limit for EC bacteria is protective of water quality and complies with the state Antidegradation Policy (See Section 6.5.2 *Finding B*).

Reissuance of the Permit includes removal of specified TRE/TIE requirements for treated ballast water based on an exceedance of a chronic WET trigger. However, the authority for the Department to require a TRE/TIE is not removed but rather is now included in Permit Section 1.5.3 - Additional Monitoring. Hence, the Department will consider whether a TRE or TIE is appropriate and to what degree it is implemented on a case-by-case basis. Although the authority to require toxicity identification or reduction evaluations has not diminished, DEC considers the removal of the mandatory specified requirement as backsliding of a water quality permit condition. Note that during development of the Permit for reissuance there was no reasonable potential for the discharge to exceed, or contribute to an exceedance, of chronic WET criteria at the boundary of the chronic mixing zone and, accordingly, a limit for chronic WET is not required per 18 AAC 83.435(e) or 18 AAC 70.030(a). Per CWA 402(o)(1). Backsliding is allowable as long as it does not violate an ELG and complies with WQS including the Antidegradation Policy per CWA 303(d)(4). See Section 6.5.2 Finding B for further discussion.

6.0 ANTIDEGRADATION

6.1 Legal Basis

Antidegradation is implicit in CWA Section 101(a) goals, explicitly referenced in CWA Section 303(d)(4)(B), and implemented through 40 CFR 131.12. Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy and implementation methods. Alaska's current antidegradation policy and implementation methods are presented in 18 AAC 70.015 *Antidegradation policy* (policy) and in 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act* (implementation methods). For these state regulations to apply under the CWA, they must be previously approved by EPA per CWA Section 303(c)(3). The policy and implementation methods have been amended through April 6, 2018; are consistent with the CWA and 40 CFR 131.12; and were approved by EPA on July 26, 2018.

The following subsections document the Department's conformance with the policy and implementation methods for reissuance of APDES Permit AK0023248.

6.2 Receiving Water Status and Tier Determination

Per the implementation methods, the Department determines a Tier 1 or Tier 2 classification and protection level on a parameter by parameter basis. The implementation methods also describe a Tier 3 protection level applying to designated waters, although at this time no Tier 3 waters have been designated in Alaska.

The marine waters of Port Valdez, covered under the Permit, are not listed as impaired (Categories 4 or 5) in the *2014/2016 Integrated Report*. Therefore, no parameters have been identified where only the Tier 1 protection level applies. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

Per 18 AAC 70.015(a)(2), if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality.

Prior to authorizing a reduction of water quality, the Department must first analyze and confirm the findings under 18 AAC 70.015(a)(2)(A-D) are met. The analysis must be conducted with implementation procedures in 18 AAC 70.016(b)(5)(A-C) for Tier 1 protection, and under 18 AAC 70.016(c)(7)(A-F) for Tier 2 protection. These analyses and associated finding are summarized below.

6.3 Tier 1 Analysis of Existing Use Protection

The summary below presents the Department's analyses and findings for the Tier 1 analysis of existing use protections per 18 AAC 70.016(b)(5) finding that:

> ***(A) existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;***
>
> The Department reviewed water quality data, environmental monitoring studies, and information on existing uses in the vicinity of Discharges 001 – BWTF and 002 – Domestic Wastewater

submitted by the applicant. The Department finds the information reviewed as sufficient to identify existing uses and water quality necessary for Tier 1 protection.

(B) existing uses will be maintained and protected;

Per 18 AAC 70.020 and 18 AAC 70.050, marine waters are protected for all uses. Therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (DEC 2008) apply and were evaluated to ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected.

(C) the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).

The Permit will require that the discharge shall not cause or contribute to a violation of WQS. As previously stated the marine waters of Port Valdez covered under this Permit are not listed as impaired; therefore, no parameters were identified as already exceeding the applicable criteria in 18 AAC 70.020(b) or 18 AAC 70.030.

The Department concludes the terms and conditions of the Permit will be adequate to fully protect and maintain the existing uses of the water and that the findings required under 18 AAC 70.016(b)(5) are met.

6.4 Tier 2 Analysis for Lowering Water Quality Not Exceeding Applicable Criteria

6.4.1 Scope of Tier 2 Analysis

Per 18 AAC 70.016(c)(2), an antidegradation analysis is only required for those waterbodies needing Tier 2 protection and which have any new or existing discharges that are being expanded based on permitted increases in loading, concentration, or other changes in effluent characteristics that could result in comparative lower water quality or pose new adverse environmental impacts. Additionally, per 18 AAC 70.016(c)(3), DEC is not required to conduct an antidegradation analysis for a discharge the applicant is not proposing to expand.

Given this Fact Sheet is the basis for reissuing a 2012 Permit authorizing two discharges, DEC reviewed the information provided by the applicant to determine if either of the discharges require a Tier 2 evaluation. The review indicates the information provided is sufficient and credible per 18 AAC 70.016(c)(4) and identifies the Outfall 002 discharge parameter EC bacteria as the only parameter that will exceed the loadings or concentrations authorized in the 2012 Permit. Accordingly, EC bacteria in Outfall 002 is the only parameter that could lower water quality or pose other adverse environmental impacts and is the focal point of the Tier 2 Analysis.

6.5 Tier 2 Analysis

Per 18 AAC 70.015(a)(2), if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water (i.e., Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that the most practicable and effective pollution prevention, control, and treatment methods are being used such that lowering of water quality is necessary. Upon making this determination, the specific requirements of the policy noted in 18 AAC 70.015(a)(2)(A)-(D) must be met. The Department's findings are presented below.

6.5.1 Tier 2 Alternatives Analysis

Per 18 AAC 70.016(c)(4)(C-F) the applicant must submit a description and analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the expanded discharge. The analysis must identify the water quality environmental impacts, and relative costs for each practicable alternative.

The STP was under a compliance schedule in the 2012 Permit for installation of disinfection equipment. APSC conducted an alternative analysis for selection of a disinfection treatment system that applies to EC bacteria, which is still valid. The following paragraphs summarize APSC's analyses process leading to the decision to address these requirements by adding UV technology to the STP.

The permittee evaluated four disinfection treatment alternatives as well as a tuck haul alternative to another treatment facility owned by the Municipality of Valdez that would eliminate the discharge at the VMT. The treatment alternatives would result in the same level of environmental protection by attaining the bacteria limits of the 2012 Permit. The truck haul alternative represented the highest level of environmental protection of zero discharge.

The four treatment alternatives included UV, chlorination/de-chlorination, ozonation, and chloramine disinfection systems. The evaluation of the ozonation and chloramine alternatives determined that, while both technologies are used in drinking water treatment, they were not practicable as treatment technologies for the STP and did not receive further evaluation. The evaluation of chlorination/de-chlorination systems also identified it as a proven technology but not an ideal choice as a retrofit solution due to additional space needs (for chemical storage, chlorine contact tank, additional equipment, etc.) and the need for additional monitoring of the discharge. Evaluation of the truck haul alternative noted that it would essentially shut down the sewage treatment system and eliminate the Outfall 002 outfall by collecting sewage in the lift station wet well and trucking it to local Valdez municipal treatment plant. Ultimately, the UV treatment option was identified as a readily available, easily maintainable, appropriately sizable, and proven technology that does not generate residual, cross-media pollutants.

A present worth cost analysis was completed to compare the relative costs associated with the practicable alternatives evaluation. The highest present worth costs was chlorination/dechlorination at $962,000, the second highest was truck haul at $860,000, and lowest was UV at $667,000. Currently, APSC believes that the UV alternative is the appropriate treatment for the STP and the ongoing optimization of the overall STP performance will result in attaining lower bacteria limits in the future. DEC concurs with APSC alternative analysis and that continued operation of the UV system combined with the implementation of improved operational BMPs is the most practicable and effective method of pollution prevention, control, and treatment but would also require some lowering of water quality under 18 AAC 70.015(a)(2)(A).

6.5.2 Basis for Reduction of Water Quality

Based on the above finding, the Department can authorize a reduction in water quality only after the applicant has submitted evidence in accordance with the following requirements under 18 AAC 70.015(a)(2):

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

The VMT and related oil facilities in Valdez have been important to the local economy for over 40 years and comprise the first five in the top ten major industries in the area. Review of a May 2017 report titled "The Role of the Oil and Gas Industry in Alaska's Economy" (by the McDowell Group for the Alaska Oil and Gas Association) provides the following summary of oil and gas industry impacts to the local community:

- Approximately 290 primary company employees reside in Valdez, accounting for $41 million in annual wages.
- Approximately 150 oil industry support service company employees reside in Valdez with an annual wages of $14 million.
- An additional 250 jobs in Valdez are also connected to primary companying and employee spending in Valdez, accounting for approximately $16 million in annual wages.
- The oil and gas industry paid $43.4 million in property taxes to the City of Valdez in 2016, approximately 88 percent of local tax revenues.

Given that the VMT serves as the transshipment port for all oil production from the Alaska North Slope oil fields and oil taxation revenue constitutes the majority the state operating budget, the vicinity of the VMT's economic importance extends beyond the local community of Valdez and includes the entire state of Alaska.

Based on the above information, the Department determined that the permitted activities are necessary to accommodate important economic and social development, the anticipated lowering of water quality is necessary for these purposes, and that the finding is met.

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

18 AAC 70.020(b) specifies the State's protected water use classes, subclasses, and water quality criteria. The Permit places limits and conditions on the discharge of pollutants. The limits and conditions are established after comparing TBELs and WQBELs and applying the more stringent of these limits, or any other requirements from statutes or regulations that may be more stringent. The water quality criteria, upon which the WQBELs are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. The Permit includes authorization of a cylindrically shaped, 0.72 m radius, chronic mixing zone on Outfall 002 based on EC bacteria being the driving parameter. All water quality criteria are met at, and beyond the boundary of this chronic mixing zone. Accordingly, because the water quality criteria that ensures protection of existing uses are met and the analysis considered all use classes and subclasses, the existing uses of the waterbody as a whole are protected.

18 AAC 70.030(a) applies to WET limits and requires that an effluent discharged to a water may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TU_c, at the point of discharge, or if the department authorizes a mixing zone in a permit at or beyond the mixing zone based on the minimum effluent dilution achieved in the mixing zone. Chronic WET is one of the authorized mixing zone parameters for Outfall 001 but no limit is required. As discussed in Section 3.3.2.2, the authorized chronic mixing zone for Outfall 001 was sized for zinc being the driving parameter and has a dilution factor of 56.5. The maximum expected chronic toxicity in the effluent requires a dilution factor of 51.6 and will not result in reasonable potential to exceed or contribute to an exceedance, of 1.0 TU_c at the boundary of the authorized chronic mixing

zone. Hence, no chronic WET limit is imposed in the Permit and the requirements of 18 AAC 70.030(a) are met.

(C) The resulting water quality will be adequate to fully protect existing uses of the water. As discussed in part (B) of the preceding Tier 1 analysis, marine waters are protected for all uses and this requirement is thus met at the boundary of the Outfall 002 mixing zone.

(D) All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements...

The applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.015(d). The definition includes the four components noted below:

(1) Any federal technology-based effluent limitation identified in 40 C.F.R. 122.29 and 125.3, revised as of July 1, 2017 and adopted by reference;

Although EPA has developed national secondary treatment standards for publically-owned treatment works (POTWs) it has not done so for non-POTWs discharging domestic wastewater and in the absence of national standards TBELs for these facilities are instead developed on a case-by-case basis. Under 40 CFR 125.3(a), the TBELs for existing facilities must represent the minimum level of control that must be imposed in a permit and for existing facilities based on Best Practicable Control Technology Currently Available, Best Conventional Pollutant Technology, and Best Available Technology Economically Achievable and must consider appropriate for the class or category of the discharge and any unique factors related to the facility. The TBELs analysis presented in Appendix B documents the TBELs analysis for the VMT and addresses this requirement.

(2) any minimum treatment standards identified in 18 AAC 72.050;

This part of the definition addresses the minimum treatment standards for domestic wastewater discharges. Per 18 AAC 72.050(a)(4) domestic wastewater discharges into the waters of the U.S. must have received secondary treatment prior to discharge. As described in earlier Section 2.1.2.2, the Outfall 002 STP is an SBR system meeting secondary treatment standards required under 18 AAC 72 and this part of the definition is thus met.

(3) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter; and

This part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 15, 18 AAC 72, and 18 AAC 83. The Permit is consistent with the minimum treatment requirements of 18 AAC 72 and 18 AAC 83 and neither the regulations in 18 AAC 15, nor any other state legal requirement that the Department is aware of, impose more stringent treatment requirements than 18 AAC 70. Therefore, this part of the definition is met.

(4) any water quality-based effluent limitations established in accordance with 33 U.S.C. 1311(b)(1)(C)(Clean Water Act, sec. 301(b)(1)(C).

Alaska WQBELs are presented in the "Water Quality Criteria for Toxics and Other Deleterious Substances" (amended through December 12, 2008) and in 18 AAC 70.020 (amended through April 6, 2018). The water quality criteria presents criteria taken the

EPA development documents cited in the references column and the Alaska Drinking Water Regulations in 18 AAC 80. Therefore, this part of the definition is met.

In addition, the Permit requires the VMT to implement BMP Plans to minimize the production and discharge of pollutants and for ambient water quality monitoring. These requirements provide additional oversight of treatment processes and protection of the receiving waters and overall environment in the vicinity of the VMT.

In addition to the above analyses, DEC also researched available information to identify potential nonpoint sources of EC and FC bacteria discharging, or otherwise impacting, the receiving waters of Port Valdez in conformance with 18 AAC 70.016(c)(7)(C)(i-iii).

FC and EC bacteria originate in the intestinal tracks of warm-blooded animals including birds, dogs, marine mammals, and humans. Elevated environmental concentrations of these bacteria typically occur where high concentrations of these animals live adjacent to the shoreline (e.g. bird or marine mammal rookeries) and where untreated discharges human or other animal waste occur. The VMT is a relatively isolated (approximately 12 road miles from Valdez town site) and controlled access facility that does not discharge untreated human or animal waste from point or nonpoint sources to the receiving waters of Port Valdez.

Per the documentation of the four parts, of the highest statutory and regulatory treatment requirements shown above, this finding is met.

7.0 OTHER PERMIT CONDITIONS

7.1 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.

7.2 Quality Assurance Project Plan

The permittee is required to develop and implement a facility-specific (QAPP) that ensures all monitoring data associated with the Permit are accurate and to explain data anomalies if they occur. The permittee is required to develop and implement procedures in a QAPP that documents standard operating procedures the permittee must follow for collecting (e.g., EPA Method 1669 or similar industry standard), handling, storing and shipping samples; laboratory analysis (e.g., most sensitive methods); and data reporting. If a QAPP has already been developed and implemented, the permittee must review and revise the existing QAPP to ensure it includes the necessary content. The permittee must submit a letter to the Department within 90 days of the effective date of the Permit certifying that the QAPP has been revised and implemented. The QAPP shall be retained onsite and made available to the Department upon request.

7.3 Best Management Practices Plan

A Best Management Practices Plan (BMP plan) presents operating and housekeeping measures intended to minimize or prevent the generation and potential release of pollutants from a facility

to the waters of the U.S. during normal operations and additional activities. Per 18 AAC 83.475(4), "A permit must include best management practices to control or abate the discharge of pollutants and hazardous in a permit when the practices are reasonably necessary to achieve effluent limitations and standards…"

Within 90 days of the effective date of the Permit, the permittee must review, revise as necessary, implement the BMP Plan to address current activities at the terminal and submit written certification of the review, revision and implementation to DEC.

In each subsequent year of the Permit, the permittee must establish a committee to review and revise the BMP Plan as necessary to address any modifications or changes to operational practices at the terminal and to continue to meet the objectives and specific requirements of the Permit. The permittee must submit written certification to DEC that the BMP Plan review committee has reviewed the BMP Plan, and modified if necessary, by January 31st of each year the Permit remains in effect.

7.3.1 Outfall 001 Specific BMP Plan Requirements:

The Outfall 001 BMP Plan shall address standard operation procedures and the following unique conditions at the VMT:

7.3.1.1 Storm Water

The permittee must develop and implement BMPs to eliminate contamination to the extent practicable in storm water at the VMT using storm water pollution prevention practices. For the Permit, the term "storm water" is given the meaning of "storm water" associated with industrial activity as defined in 40 CFR 122.26(b)(14). The BMPs must specify monitoring storm water discharges to meet the minimum monitoring requirements of 40 CFR 122.44(i)(4)(i, ii, and iii). If the evaluation required by 40 CFR 122.44(i)(4)(i) identifies that additional measures are necessary to reduce pollutant loading, then the storm water pollution prevention practices shall be amended within six months to appropriately reduce pollutant loading.

7.3.1.2 SCA Water Diversions

The Permit allows for the discharge of uncontaminated SCA water to drainage conveyances adjacent to each SCA as storm water during extreme rain events that either threaten damage to infrastructure or noncompliance due to hydraulic overloading of the BWTF. The permittee must notify DEC prior to discharging SCA water as storm water. The Permittee must develop specific BMPs to address procedures to ensure contaminated SCA is treated in the BWTF and not discharged to drainage conveyance systems. The BMPs must include requirements to observe for sheen prior to discharge, estimates of flow volumes discharged, and accurate reporting of spills in the SCA. Observations and reporting requirements must be maintained in an operation log included in the BMP Plan or an electronic database. If a sheen is observed or a spill is reported, the SCA water shall be considered contaminated and treated in the BWTF until confirmation samples indicate the SCA water meets water quality criteria for TAH of 10 μg/L. Confirmation test results must be maintained in the BMP Plan with the operation log. Alternatively, the permittee may submit plans to the Department describing an alternative treatment system that could be employed to treat contaminated SCA water to meet TAH water quality criteria prior to

discharging as storm water. Treatment systems for discharge SCA water must be approved by DEC for use as a BMP.

7.3.1.3 BTT Monitoring and Algae Control

The permittee must develop and implement BMPs for monitoring the BTT for operational parameters in order to evaluate and implement procedures or modifications to ensure compliance with effluent limits of pH and TSS. The BMPs must specify monitoring, as appropriate, to identify algae growth and diurnal fluctuations affecting limited parameters. BMP components to control algae may include operational modifications, non-toxic chemical additions, pH adjustments, or other measures deemed appropriate for controlling algae. Measured parameters must be maintained in an operating log or electronic database and made available to DEC upon request.

7.3.1.4 Methanol Detection, Control, and Treatment

To account for an event where methanol is used to freeze-protect the TAPS and enters the BWTF, the permittee must develop specific BMPs to detect, control, or treat the impacted wastewater to meet existing effluent limits. BMPs may include segregation strategies, enhanced treatment, operational adjustments, or other considerations.

7.3.1.5 Incoming Ballast Water Reviews

The permittee must develop and implement BMPs to address incoming ballast water review procedures, identification of pollutants or substances that are not allowed for discharge, notification and record keeping requirements. At a minimum, the BMP must specify examination of tanker oil record books, obtaining a complete VMT Ballast Water Survey Form that establishes the amount and constituents of ballast water and bilge water to be offloaded. If the Survey Form indicates that the ballast water or bilge water contains unpermitted substances, then the ballast water or bilge water shall not be offloaded to the BWTF. Copies of pertinent pages from the tanker oil record book and the completed Survey Form must be maintained at the VMT and made available to DEC upon request. The permittee must notify active tankers within 30 days of modifications to the BMP Plan that may affect those vessels.

7.3.1.6 Coagulant and Other Treatment Chemicals

The permittee must maintain BMPs that address the appropriate type, amount, and use of coagulants or other treatment chemicals that may be introduced into the BWTF.

7.3.1.7 Air Stripper Media Maintenance

The permittee must maintain BMPs for pollution control, permit compliance, and preventing the discharge of air stripper media during BTT air stripper maintenance.

7.3.1.8 Scraper Pig Cleaning and Wash Water Treatment

The permittee must maintain BMPs to address removal of excess crude oil and residues from scraper pigs to reduce pollutants in wash down water from entering the IWS and being treated in the BWTF.

7.3.1.9 Terminal Fire Water System Tests

The permittee must maintain BMPs to limit, manage, and control discharges from the jockey pump, firewater pump maintenance and testing, berth fire foam system testing, and hydrant maintenance and testing. The uncontrolled release of Aqueous Fire-fighting Foam (AFFF) containing perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic (PFOS) to the environment is not permitted unless such action is warranted by an emergency. Any non-emergency action associated with AFFF must be performed with appropriate controls to prevent releases to the environment, including storage, training, and maintenance of the firefighting system. If an environmentally suitable substitute becomes available and approved for use by other agencies having jurisdiction, APSC must remove, dispose, and replace the legacy AFFF.

7.3.1.10 Over-water Construction and Maintenance

The permittee must maintain BMPs to maximize containment and minimize the discharge of wastes generated during construction or maintenance activities over water to the extent technically and economically feasible. Activities covered include, but may not be limited to, surface preparation, hydro-blasting, cleaning demolition, metal cutting, and welding.

7.3.2 Outfall 002 Specific BMP Plan Requirements

The permittee must develop and implement BMPs for Outfall 002 that help ensure compliance with permit limits. BMPs may include standard operation procedures specific treatment system and equipment, addressing upsets, minimizing and controlling the growth of adverse microorganisms, and research/outreach activities to optimize performance and compliance of the STP.

7.4 Environmental Monitoring Program

The Permit will require an environmental monitoring program (EMP), focusing on the collection and testing of sediment samples for PAHs, and ambient water samples for zinc, to assist in future permit development. The environmental monitoring of sediment samples is aimed at investigating the environmental effects of the Outfall 001 discharge on the surrounding sediments and allow them to be compared with the results of similar investigations conducted under previous permits. The monitoring of ambient zinc concentrations in the water column sufficiently outside the boundary of the chronic mixing zone to provide ambient data to support future RPA analyses. EMP requirements are summarized below:

7.4.1 EMP Plan

Develop and submit an EMP plan for review and comment by the DEC Wastewater Discharge Authorization Program Oil and Gas Permitting Section at least 90 days in advance of the initial sampling event. The plan shall address the following:

1. Specify a sampling and analysis schedule to include testing events occurring the first and third full-calendar years following reissuance of the Permit.
2. The collection of receiving water for the detection of ambient zinc concentrations should be collected at the approximate elevation as the Outfall 001 discharge and sufficiently beyond the boundary of the chronic mixing zone to be considered

ambient. A minimum of four samples shall be collected and include samples collected during both the ebb and flood tides. All testing shall conform to the additional monitoring requirements of Section 4.6.

3. Identify sediment sampling locations adjacent to Outfall 001 and other near-field locations. The Permittee must also collect and test samples from farther afield of the outfall to provide a baseline comparison to near-field locations and temporal and spatial variability. The number and locations of the sediment samples should consider statistical significance based on past sample events.
4. Describe sediment sample collection, preservation, testing and quality assurance methods for PAH and total organic carbon (TOC). Hydrocarbon analyses shall be performed using gas chromatography/mass spectrometry (GC/MS) methods that are sufficiently sensitive. Sediment chemistry data shall be normalized to both dry weight and total organic carbon.
5. Describe receiving water sample collection, preservation, testing and quality assurance methods for ambient water samples.
6. Describe how the sampling and analysis plan will facilitate comparison of new and historical test results to assess and describe impacts of the effluent on the receiving water and sediment.

7.4.2 Reports of Testing Events

Submit a report of EMP findings to DEC by January 31 of the year following the completion of each testing event. Each EMP submittal shall be submitted electronically in pdf or other format approved by DEC. Each report of findings shall:

1. Discuss how the environmental monitoring addresses the requirements of the Permit.
2. Describe the sampling collection, preservation, and analytical methods and quality assurance/quality control procedures used,
3. Provide a data summary and interpretative narrative of results addressing the magnitudes and probable source(s) of hydrocarbon parameters detected, the environmental significance of the results, and observed changes in parameter characteristics over time and distance from the outfall.
4. Compare results of sediment hydrocarbon analyses to historic Port Valdez values and published guidelines which include the National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NOS OMA 52, *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program* (Long and Morgan, Second Printing August 1991). If the above criteria are revised or new criteria are published, the most recent criteria should be used for comparison.

7.4.3 Summary Report

Submit a summary report to DEC with the next application for reissuance. The summary report shall evaluate how the new EMP data relates to historical data, any observed trending in environmental conditions, and provide recommendations for future sediment monitoring.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act

Per Section 7 of the Endangered Species Act (ESA), federal agencies are required to consult with NOAA, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult under Section 7 regarding wastewater discharge permitting actions. However, this does not absolve DEC from complying with Section 9 and 10 of the ESA. DEC voluntarily send an email to both the FWS and NOAA on August 17, 2017 notifying the agency of current permit development activities and requesting critical habitat listings in the vicinity of the terminal and has not received a response from either agency.

DEC also consulted the NOAA Marine Mammal Species Range and Critical Habitat Interactive map located online at https://alaskafisheries.noaa.gov/esa-consultations and accessed the ESA Species interactive map to identify ESA species of concern in the waters adjacent to the facility.

DEC also accessed the FWS Information, Planning, and Conservation System website at https://ecos.fws.gov/ipac/location. The Department used this website to gain an approximate determination that the area surrounding the facility that the Steller Sea Lion, Fin Whale, and Humpback Whale may occur in the area.

8.2 Essential Fish Habitat

Essential fish habitat (EFH) includes waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a State agency, DEC is not required to consult with these federal agencies regarding EFH; DEC did however voluntarily send an email request to FWS on August 17, 2017 notifying the agency of current permit development activities and requesting critical habitat listings in the vicinity of the terminal and has not received a response.

DEC additionally accessed EFH information at NOAA's Habitat Conservation Interactive EFH Mapper located at: http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html. The tool did not identify habitat areas of particular concern in the vicinity of the discharge and reported "No Essential Fish Habitats (EFH) were identified at the report location."

8.3 Ocean Discharge Criteria Evaluation

CWA Section 403(a), Ocean Discharge Criteria, prohibits the issuance of a permit under CWA Section 402 for a discharge into the territorial sea, the water of the contiguous zone, or the oceans except in compliance with Section 403. Permits for discharges seaward of the baseline on the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation (ODCE).

The Permit requires compliance with Alaska WQS. Consistent with 40 CFR 125.122(b), adopted by reference at 18 AAC 83.010(C)(8), discharges in compliance with Alaska WQS shall be presumed not to cause unreasonable degradation of the marine environment. EPA made the connection between the similar protections provided by ODCE requirements and WQS when promulgating ocean discharge criteria rules in 1980, as stated, "the similarity between the

objectives and requirements of [state WQS] and those of CWA Section 403 warrants a presumption that discharges in compliance with these [standards] also satisfy CWA Section 403." (Ocean Discharge Criteria, 45 Federal Register 65943.). As such, given the Permit requires compliance with Alaska WQS, unreasonable degradation to the marine environment is not expected and further analysis under 40 CFR 125.122 is not warranted for this permitting action.

8.4 Permit Expiration

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

9.0 References

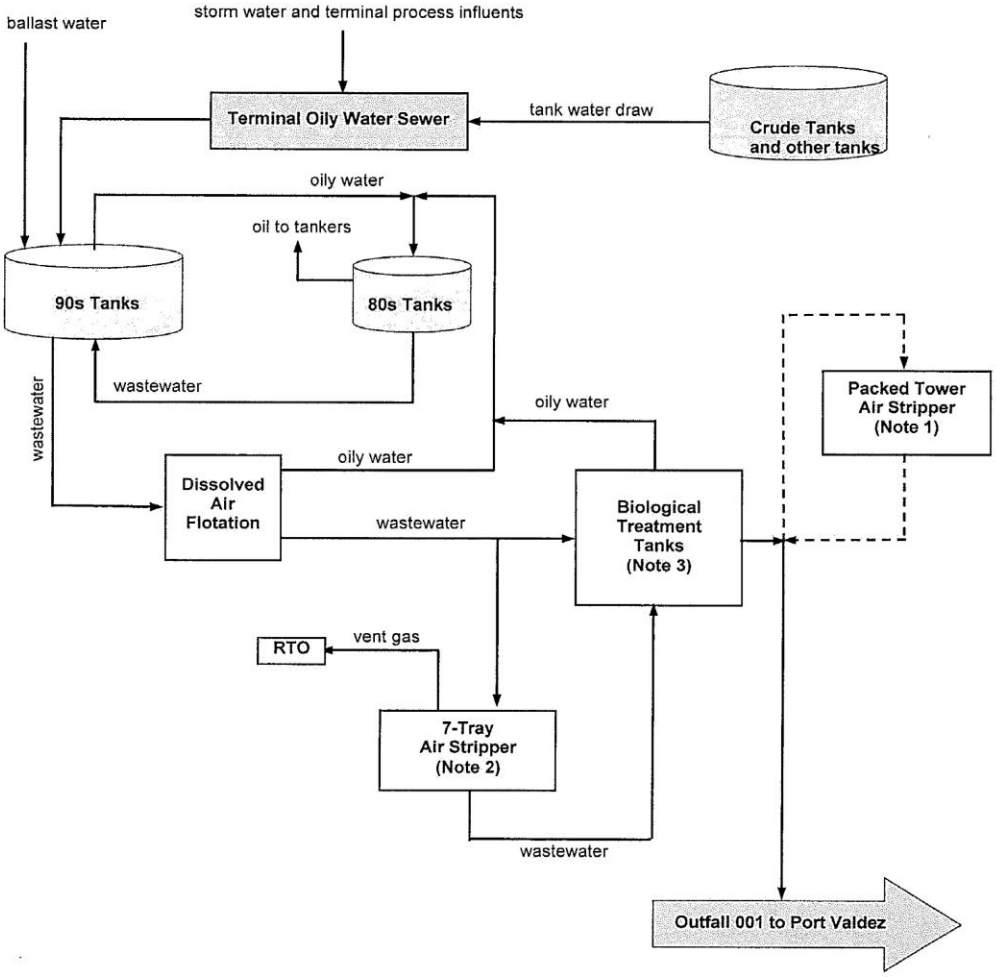
1. Alaska Department of Commerce, Community, and Economic Development. Division of Economic Development. *2009 Alaska Economic Performance Report*. February 2011.
2. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
3. Alaska Department of Environmental Conservation. *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*.
4. Alaska Department of Environmental Conservation. *18 ACC 70. Water Quality Standards*, as amended through June 26, 2003.
5. Alaska Department of Environmental Conservation. *18 ACC 70. Water Quality Standards*, as amended through July 1, 2008.
6. Alaska Department of Environmental Conservation. *18 ACC 70. Water Quality Standards*, as amended through April 8, 2012.
7. Alaska Department of Environmental Conservation. *18 ACC 70. Water Quality Standards*, as amended through February 19, 2016.
8. Alaska Department of Environmental Conservation. *18 AAC 83. Alaska Pollutant Discharge Elimination System Program*. As amended Through October 23, 2008.
9. Alaska Department of Environmental Conservation. 18 ACC 72. Wastewater Disposal, as amended through December 23, 2009.
10. Alaska Department of Environmental Conservation. *Interim Antidegradation Implementation Methods*. Division of Water. Policy and Procedure No. 05.03.103. July 14, 2010.
11. Long, E.R. and L.G. Morgan, *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program*, NOAA Technical Memorandum NOS OMA 52, Seattle, WA, Second Printing August 1991.
12. U.S. EPA, *Technical Support Document for Water Quality-based Toxics Control*. Office of Water, EPA/505/2-90-001, PB91-127415. Washington D.C., March 1991.
13. U.S. EPA, *Interim Guidance for Performance-Based Reduction of NPDES Monitoring Frequencies*. Office of Water, EPA 833-B-96-001, Washington D.C., April 1998.
14. Institute of Marine Science, College of Fisheries and Ocean Sciences, University of Alaska Fairbanks, *Environmental Studies in Port Valdez, Alaska: 2017, (Final Report to Alyeska Pipeline Service Company)*, Fairbanks, Alaska July 2018

APPENDIX A. FIGURES

Figure A-1: Location Map – Valdez Marine Terminal

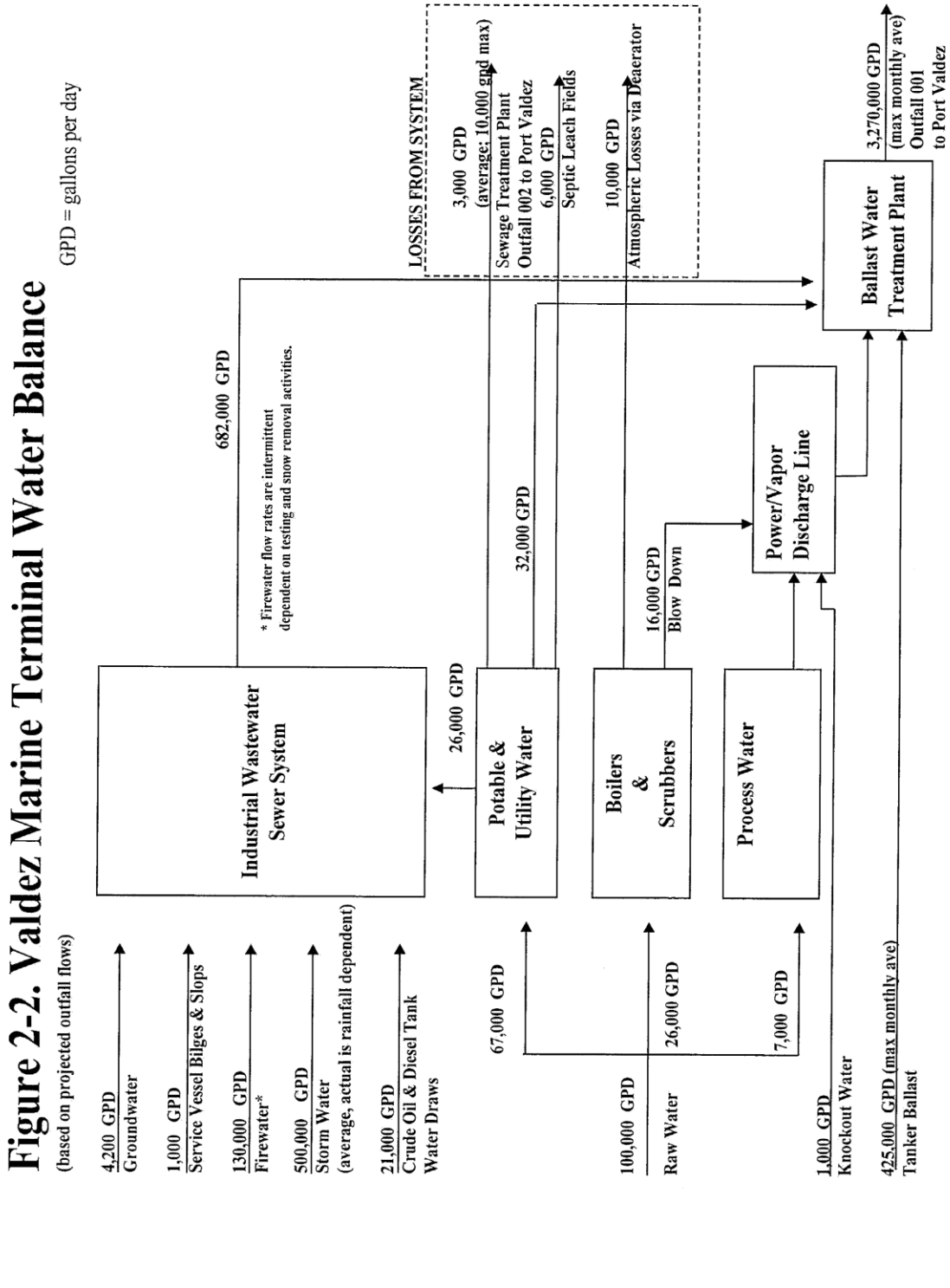
Figure A-2: Ballast Water Treatment Facility Schematic

Figure 2-1. Simplified Diagram of VMT-BWT Facility



Notes
1. Packed tower air stripper used as needed following biological treatment tanks (BTTs).
2. 7-Tray air strippers used to supplement biological treatment.
3. Two biological treatment tanks (BTTs) with one typically in operation and one in standby.

Figure A-3: Terminal Water Balance



APPENDIX B. BASIS FOR EFFLUENT LIMITATIONS

Per Alaska Administrative Code (AAC) 18 AAC 83.015, the Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) without first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402. Per these statutory and regulatory requirements, Individual Permit AK0023248 - Alyeska Pipeline Service Company, Valdez Marine Terminal (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), and (3) comply with other state requirements that may be more stringent.

The CWA requires that the limits for each pollutant discharge parameter be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set via rule makings by the Environmental Protection Agency (EPA) in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment that is achievable for a given industry using available technology. In situations where ELGs have not been developed, or have not considered specific discharges or pollutants, a regulatory agency can develop TBELs using best professional judgment (BPJ) on a case-by-case basis. A WQBEL is designed to ensure that WQS are maintained and the waterbody as a whole is protected. In cases where both TBELs and WQBELs have been generated for a particular parameter, the more stringent of the two limits will be selected as the final Permit limit for the parameter.

B.1 TECHNOLOGY BASED EFFLUENT LIMITS (TBELs)

B.1.1 TBELs based on ELGs

ELGs are TBELs developed by the EPA on an industry-by-industry basis and are intended to represent the greatest pollutant reductions that are economically achievable for a given industry. Per 18 AAC 83.430(a)(1), an APDES permit must include conditions meeting the requirements of applicable TBELs if they have been developed for the type of discharge authorized by the permit. There currently are no ELGs applicable to discharges from the Valdez Marine Terminal (VMT).

B.1.2 TBELs based on Case-by-Case Best Professional Judgement

Outfall 001 – Ballast Water Treatment Facility: The 2012 Permit limits pH in the Outfall 001 discharge to between 6.0 and 8.5 SU. DEC evaluated the potential of increases in pH due to seasonal algae growth in the biological treatment tanks (BTTs). While there were exceedances during the previous permit term, none of them had durations that qualified as violations per U.S. Code of Federal Regulations (CFR) Section 40 CFR 401.17. However, based on this new information, DEC is modifying the pH TBEL to be from 6.0 to 9.0 using case-by-case BPJ to accommodate diurnal fluctuations in pH due to algae.

The 2012 Permit established a TBEL using case-by-case BPJ for TSS with an average monthly limit (AML) of 25 mg/L and a maximum daily limit (MDL) of 40 mg/L under normal operating

conditions. A non-routine MDL of 170 mg/L was developed for the day of and the day after activation of the air stripper units in the ballast water treatment facility (BWTF). DEC has evaluated the applicability of these previously developed TBELs and determines that they are still appropriate. Therefore, the TBELs will be retained in Permit.

Outfall 002 – Sewage Treatment Plant: The 2012 Permit includes TBELs for domestic wastewater based on minimum treatment requirements per 18 AAC 72.050 and specified MDLs and AMLs for five-day biochemical oxygen demand (BOD_5) and TSS and limited pH to between 6.0 and 9.0 at all times based on case-by-case BPJ. The 2012 Permit also includes mass-based and average weekly limits for BOD_5 and TSS. The Department is retaining the TBELs using case-by-case BPJ for pH and the concentration based MDL of 60 milligrams per liter (mg/L) and AML of 30 mg/L for BOD_5 and TSS. Although included in the definition of secondary treatment, the Department is not applying the average weekly limit of 45 mg/L in the definition because the MDL and AML are sufficient to control these pollutants in the discharge. Similarly, the mass based MDL and AML for BOD_5 and TSS are not necessary to control these parameters in the effluent and are not retained in the Permit (See Fact Sheet Section 2.1.3.3.1).

B.2 WATER QUALITY BASED EFFLUENT LIMITS

B.2.1 Statutory and Regulatory Basis

Per 18 AAC 70.010, a person may not conduct an operation that causes, or contributes to, a violation of the Alaska WQS. Per 18 AAC 83.435(a), an APDES permit must include conditions to meet any applicable requirement in addition to or more stringent than promulgated ELGs or standards. When evaluating if WQBELs are needed in addition to TBELs, DEC conducts a reasonable potential analysis (RPA) on the parameters of concern (POCs) which were identified during the effluent characterization process (See Fact Sheet Section 2.1.3). POCs are effluent parameters DEC considers to have a possibility to exceed, or contribute to an exceedance of, water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the authority must consider the dilution available in the authorized mixing zone in the RPA. Per 18 AAC 83.435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected concentrations and coefficient of variation), existing controls on point source (e.g., treatment systems) and nonpoint sources of pollution (e.g., ambient receiving water concentrations).

B.2.2 Reasonable Potential Analysis

The Department developed and implemented a *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014* and associated spreadsheet tool that were used in development of the WQBELs in the Permit. The RPA procedure calculates maximum effluent concentrations (MECs) based on the 99th percentile at a 95 percent (%) confidence interval and projects the receiving water concentrations at the boundary of the mixing zones using mass balance to determine whether concentrations of POCs exceed, or contribute to exceedance(s), of water quality criteria at the mixing zone boundaries. The applicable water quality criteria is provided by WQS or the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, 2008 (*Toxics Manual*).

B.2.2.1 Outfall 001 RPA Results

Based on the results of the effluent characterization, DEC conducted an RPA for Outfall 001 discharge parameters zinc, chronic WET, and TAH and determined zinc is the only parameter having reasonable potential to exceed criteria at the acute and chronic mixing zone boundaries (see APPENDIX C). Accordingly, the Permit will include a WQBEL for total recoverable zinc in the Outfall 001 discharge and the parameters chronic WET and TAH will continue to be monitored under the Permit.

B.2.2.2 Outfall 002 RPA Results

The 2012 Permit includes WQBELs for the parameters total residual chlorine (TRC), fecal coliform (FC) bacteria, and enterococci (EC) bacteria in the Outfall 002 discharge. The current RPA only focused on FC and EC bacteria due to ultraviolet disinfection being installed in lieu of chlorination under the 2012 Permit compliance order to control EC and FC bacteria.

RPA calculations for FC bacteria were based on an assumed ambient concentration of 0, a water quality standard of 20 FC/100 ml specified in 18 AAC 70(b)(14), and the calculated MEC of 1,192 FC/100 ml. The calculations show FC bacteria will exceed water quality criteria at the point of discharge and will require a dilution factor of 59.5 to meet water quality criteria.

RPA calculations for EC bacteria were based on assumed ambient concentration of 0, a water quality standard of 35 cfu/100ml specified in 18 AAC 70(b)(14), and a calculated MEC of 2,590 cfu/100 ml. The calculations show EC bacteria will exceed water quality criteria at the point of discharge and will require a calculated dilution factor of 73.5 to meet water quality criteria at the mixing zone boundary. EC bacteria is thus identified as the driving parameter for sizing of the Outfall 002 mixing zone requiring development of a WQBEL. FC bacteria will continue to be monitored

B.2.3 Wasteload Allocations

In the context of this section, a wasteload allocation (WLA) is the concentration of a pollutant that can be discharged to the receiving water and comply with the acute (a) or chronic (c) water quality criteria ($WQC_{a,c}$) when accounting for ambient receiving water concentrations (AWC) and authorized acute or chronic dilution factors ($DF_{a,c}$) in the mixing zones, if applicable.

For discharges where information on ambient receiving water concentrations is not available, DEC's practice is to calculate the ambient concentration (Amb) as 15 % of the most stringent applicable water quality criteria. DEC may also assume a concentration of zero, if there is adequate basis for the assumption; as in the case of EC bacteria which is not anticipated to be present in the ambient receiving water. Because water quality criteria for metals are provided as dissolved and limits are required to be reported as total recoverable, conversions using metals translators in *Toxics Manual, Appendix B – Conversion Factors for Saltwater Dissolved Metals Criteria*. The WLA is calculated by rearranging Equation B-3 in *Appendix B* and substituting WQC for receiving water concentration and WLA for the maximum expected concentration. The resulting mass balance equation is:

$$WLA_{a,c} = DF_{a,c}(WQC_{a,c} - Amb) + Amb$$

B.2.3.1 Outfall 001 WLA for Zinc

For zinc, the Outfall 001 inputs for the WLA equation are shown below:

- DF_a = 50.5
- DF_c = 56.5
- WQC_a = 95.10 µg/L total concentration
- WQC_c = 86.14 µg/L total concentration
- Amb = 12.92 µg/L based on 15 % of WQC_c

Inputting the above values into the WLA equation results in the following WLAs for zinc for the Outfall 001 mixing zones:

WLA_a = 4,163 µg/L

WLA_c = 4,150 µg/L

B.2.3.2 Outfall 002 WLA for EC Bacteria

For EC bacteria, there is no applicable acute water quality criteria and WLA was therefore only calculated for the WLA_c. The Outfall 002 inputs for the WLA equation are shown below:

- DF_c = 73.5
- WQC_c = 35 cfu/100ml per 18 AAC 70(b)(14)
- Amb = 0, based on assumption of no EC bacteria in ambient environment

Inputting the above values into the WLA equation results in the following WLA for EC bacteria for the Outfall 002 mixing zone:

- WLA_c = 2,573 cfu/100mL

B.2.4 Long-Term Averages (LTAs)

LTA_{acute} and $LTA_{chronic}$ concentrations are calculated from the acute and chronic WLAs using the following equations:

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

where,

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

z = 2.326 for 99th percentile probability basis

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

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

where,

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

z = 2.326 for 99th percentile probability basis

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

B.2.4.1 Outfall 001 LTAs and End of Pipe Limits for Zinc

Calculations

Determine Long Term Averages (LTAs)

The LTAs acute (a) and chronic (c) exposure were calculated as follows:

$LTA_a = WLA\ [\exp(0.5\sigma^2 - Z_{99}\sigma)]$, where $\sigma^2 = \ln(CV^2 + 1)$

WLA_a = 4,163 µg/L, CV = 1.1, Z_{99} = 2.326, and $\sigma^2 = 0.793$

LTA_{acute} = 780 µg/L

$LTA_c = WLA_c\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

WLA_c = 4,150 µg/l, CV = 1.1, Z_{99} = 2.326, and $\sigma_4^2 = 0.2643$

LTA_c = 1,433 µg/L

Determine the most limiting (lowest) LTA

LTA_c is most limiting = 780 µg/L

Calculate the End of Pipe MDL and AML

$MDL = LTA_a\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$

CV = 1.1, Z_{99} = 2.326, and $\sigma^2 = 0.793$

MDL_{zinc} = 4,163 µg/L

$AML = LTA_a\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$,

CV = 1.1, Z_{95} = 1.645, and $\sigma_4^2 = 0.2643$

AML_{zinc} = 1,592 µg/L

B.2.4.2 Outfall 002 LTA and End of Pipe Limits for EC Bacteria

Calculations

Determine LTA

The LTA_c exposure was calculated as follows:

$LTA_c = WLA_c\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

WLA_c = 2,573 cfu/100ml, CV = 0.6, Z_{99} = 2.326, and $\sigma_4^2 = 0.0862$

LTA_c = 1,357 cfu/100mL

Calculate the End of Pipe MDL and AML

$$MDL = LTA_a\ [\exp(Z_{99}\sigma - 0.5\sigma^2)],\ \text{where}\ \sigma^2 = \ln(CV^2 + 1)$$

$$CV = 0.6,\ Z_{99} = 2.326,\ \text{and}\ \sigma^2 = 0.3075$$

$$\mathbf{MDL_{EC\ Bac} = 4{,}227\ cfu/100mL}$$

$$AML = LTA_a\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)],\ \text{where}\ \sigma_4^2 = \ln(CV^2/4 + 1),$$

$$CV = 0.6,\ Z_{95} = 1.645,\ \text{and}\ \sigma_4^2 = 0.2770$$

$$\mathbf{AML_{EC\ Bac} = 2{,}107\ cfu/100mL}$$

Other Applicable Numeric and Narrative WQBELs

B.2.4.3 pH Criteria

The criteria for pH is no less than 6.5 standard units (SU) and not greater than 8.5 SU. The permittee has experienced difficulties in meeting pH criteria at the point of discharge on Outfall 002 and Outfall 001 due to seasonal influences from algal blooms. Therefore, DEC includes pH in the authorization of the chronic mixing zone to allow for minor exceedance of pH at the point of discharge. Hence, the water quality criteria for pH can be exceeded within the mixing zone but not beyond the TBEL for pH (i.e., 6.0 to 9.0 SU). DEC has assessed the impacts of authorizing TBELs for pH and determined that these limits would not result in exceeding water quality criteria at the boundary of the chronic mixing zone; the criteria will be reached in close proximity of the discharge due to available dilution and buffering capacity of the receiving water.

B.2.4.4 Narrative Requirement WQBELs

Residues: Residues include floating solids, debris, sludge, deposits, foam, or other objectionable conditions. Per 18 AAC 70.020(b)(20)(A)(ii), a discharge "may not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines." Residues will be applied as a standard narrative permit condition in the Permit.

APPENDIX C. REASONABLE POTENTIAL ANALYSIS

This Appendix summarizes the reasonable potential analysis (RPA) procedure used by the Alaska Department of Environmental Conservation (Department or DEC) to determine if development of water quality-based effluent limits (WQBELs) are necessary for individual permit AK0023248 Alyeska Pipeline Service Company, Valdez Marine Terminal (Permit).

Per Alaska Administrative Code (AAC) 18 AAC 83 - Alaska Pollutant Discharge Elimination System (APDES) Program, limits are required in APDES permits to achieve water quality standards established under 33 U.S.C. 1313, including state narrative criteria for water quality. Per 18 AAC 83.435(b), "Effluent limits in a permit must control all pollutants or pollutant parameters, either conventional, non-conventional, or toxic pollutants, that the department determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard (i.e., criteria), including state narrative criteria for water quality." Alaska water quality criteria are established in 18 AAC 70 – Water Quality Standards and the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, 2008 (Toxics Manual).*

After screening parameters in Fact Sheet Section 2.1.3, DEC analyzes parameters of concern (POCs) in the discharge to determine if they will cause, or contribute to, an exceedance of water quality criteria per the RPA procedures described in the *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Analysis and Effluent Limits Development Guide, June 30, 2014* (*RPA and WQBEL Guide*) and the associated spreadsheet tool. The *RPA and WQBEL Guide* and spreadsheet tool are based partly on procedures in the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991 (TSD)* that were modified by the Department.

The spreadsheet calculates the reasonable potential of a discharge of effluent containing a maximum expected concentration (MEC) of a parameter by comparing the projected receiving water concentration at the boundary of the authorized acute or chronic mixing zones to the applicable water quality criteria for that parameter. Reasonable potential exists if the projected receiving waterbody concentration (RWC) at the boundary of the respective mixing zone exceeds the applicable criteria for that parameter. If reasonable potential exists, a WQBEL must be included in the Permit per 18 AAC 83.435. The RPA procedures used by DEC are summarized in subsequent Appendix Sections C.1 and C.2 followed by example calculations specific to terminal wastewater discharges.

C.1 Mass Balance

For discharge of a parameter at the MEC into a marine receiving environment with a known ambient water concentration (AWC), the projected receiving waterbody concentration (RWC) is determined using a steady state model represented by the following mass balance equation:

$$(V_{MEC} + V_{AWC})RWC = V_{MEC}MEC + V_{AWC}AWC \qquad \text{(Equation C-1)}$$

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum projected effluent concentration.

AWC = Ambient waterbody concentration, taken as the 85th percentile of data or 15 percent of the chronic criteria if no ambient data is available. The AWC for zinc was calculated based on 15 percent of the chronic criteria.

V_{MEC} = Volume of the maximum expected effluent discharged into the control volume.

V_{AWC} = Volume of the ambient receiving water in the control volume.

The dilution factor for a discharge to meet water quality criteria at the boundary of a mixing zone is defined as:

Dilution Factor (DF), $DF = \frac{(V_{MEC}+V_{AWC})}{V_{MEC}}$ (Equation C-2)

Upon separating variables in Equation C-1, substituting Equation C-2, and rearranging yields:

$$DF = \frac{(MEC-AWC)}{(RWC-AWC)} \quad \text{(Equation C-3)}$$

Rearranging Equation C-3 to solve for RWC yields:

$$RWC = \frac{(MEC-AWC)}{DF} + AWC \quad \text{(Equation C-4)}$$

For known MEC and AWC, Equation C-3 can be used to determine the required DF for a constituent by substituting water quality criteria for RWC. For cases where a DF and mixing zone have been authorized, Equation C-4 is rearranged to calculate the RWC at the boundary of the mixing zone in the RPA.

C.2 Maximum Projected Effluent Concentration

The spreadsheet tool calculates the MEC by applying a reasonable potential multiplier (RPM) based on a 99th percentile at a 95th confidence interval to the maximum observed concentration (MOC) for a parameter. In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 4.1* rather than assuming a lognormal distribution as described in parts of the TSD in calculating the coefficient of variation (CV). The possible statistical distributions include normal, lognormal, gamma, or non-parametric.

The RPM is calculated differently depending on the type of distribution, CV of the data, and the number of data points. When fewer than 10 valid data points are available, the TSD recommends using the assumption that the distribution is lognormal and the CV is equal to 0.6, a conservative estimate that assumes a relatively high variability.

For data sets with 10 or more valid data points CV is defined as the ratio of the sample standard deviation of the data set to the sample mean.

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

For data sets with a normal or gamma distribution or analyzed with the nonparametric method (Kaplan-Meier):

$$CV = \frac{\hat{\sigma}_y}{\hat{\mu}_y} \quad \text{(Equation C-5)}$$

Where: $\hat{\mu}_y = estimated\ mean = \frac{\sum[x_i]}{k}, 1 \leq i \leq k$

$\hat{\sigma}_y{}^2 = estimated\ variance = \sum \frac{[(x_i - \mu)^2]}{k-1}, 1 \leq i \leq k$

$\hat{\sigma}_y = estimated\ standard\ deviation = (\sigma^2)^{0.5}$

$k = number\ of\ samples$

For data sets with a Lognormal or Log-ROS distribution:

$$CV = [\exp(\hat{\sigma}_y^2) - 1]^{0.5} \qquad \text{(Equation C-6)}$$

Where: $y_i = \ln(x_i)\ for\ i = 1,2, \ldots, k$

$\hat{\mu}_y = mean = \sum(y_i)/k$

$\hat{\sigma}_y^2 = variance = \sum[(y_i - \hat{\mu}_y)^2]/(k-1)$

$k = number\ of\ samples$

The RPM is the ratio of the upper bound of the distribution at the 99th percentile to the percentile represented by the MOC, at the 95% confidence level. The lognormal equations C-8 and C-9 are used as the input into Equation C-7 for lognormal distributions:

$$RPM = \frac{C_{99}}{C_{Pn}} \qquad \text{(Equation C-7)}$$

$$C_{99} = \exp[(Z_{99} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \qquad \text{(Equation C-8)}$$

$$C_{Pn} = \exp[(Z_{Pn} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \qquad \text{(Equation C-9)}$$

In the case when data are normal, gamma, or display no discernable distribution, Equations C-10 and C-11 are used as input into Equation C-7:

$$C_{99} = \hat{\mu}_n + Z_{99} * \hat{\sigma} \qquad \text{(Equation C-10)}$$

$$C_{Pn} = \hat{\mu}_n + Z_{Pn} * \hat{\sigma} \qquad \text{(Equation C-11)}$$

In all Equations C-9, C-11, and C-13, the percentile represented by the MOC is:

$$p_n = (1 - confidence\ level)^{1/n} \qquad \text{(Equation C-12)}$$

Where:

$p_n = the\ percentile\ represented\ by\ the\ MOC$

$n = the\ number\ of\ samples$

$Confidence\ Level = 0.95\ for\ this\ analysis$

In the event that the calculated RPM is less than one (1), the RPM value defaults to a value of one (1) per *RPA and WQBEL Guide*. The MEC is determined by multiplying the MOC by the RPM to derive the MEC:

$$MEC = (RPM) * (MOC) \qquad \text{(Equation C-13)}$$

Either the acute or chronic RWC at the boundary of an authorized mixing can be determined using the MEC calculated in Equation C-3 in Equation C-4.The receiving water concentrations at the boundary of the mixing zones are then calculated as follows:

$$\mathrm{RWC_{a,c}} = \frac{\mathrm{MEC} - \mathrm{AWC}}{\mathrm{DF_{a,c}}} + \mathrm{AWC} \qquad \text{(Equation C-14)}$$

Where:

$RWC_{a,c}$ = receiving water concentration at the boundary of the acute or chronic mixing zone,
$AWC_{a,c}$ = applicable water quality criteria, and
$DF_{a,c}$ = the authorized acute or chronic dilution factor.

If the RWC at either the acute or chronic mixing zone boundary is found to be greater than the respective criteria for the constituent, then reasonable potential is determined for that parameter and a WQBEL must be developed for that parameter.

C.3 Example Calculations for Outfall 001 POC Total Zinc

This section summarizes the analysis of the POC zinc in the Outfall 001 discharge as an example of the RPA calculation process.

Characterization of Outfall 001 in Fact Sheet Section 2.1.3 identified the POCs zinc, total aromatic hydrocarbons (TAH), and chronic whole effluent toxicity (WET) as parameters that could potentially trigger reasonable potential and require WQBELs. The RPA identified zinc as the parameter having reasonable potential to exceed water quality criteria and requiring the greatest dilution to meet water quality criteria (WQC) at the boundary of the acute and chronic mixing zones. Example reasonable potential calculations for total zinc are summarized below.

<u>Calculate RPM:</u>

The characterization information for total zinc included 22 data points, with all values above detection. Analysis of the data with the ProUCL statistical software (Version 4.1) identified a lognormal distribution and a CV of 1.10 based on a standard deviation of 293.9 μg/L and a mean of 267.3 μg/L.

Accordingly, the RPM was calculated with the following inputs:

$Z_{99} = 2.326$
$\mathrm{CV} = 1.1$
$\hat{\sigma} = \ln[CV^2 + 1]^{1/2} = 0.793$ μg/L
$n = 22$
$p_{22} = (1 - 0.95)^{(1/22)} = 0.873$
$Z_{P12} = 1.139$ (calculated using spreadsheet equation "normsinv(p_n)"

RPM = [exp (2.326 x 0.793 - 0.5 x 0.793^2)] / [exp (1.139 x 0.793 - 0.5 x 0.793^2)]

= 2.877

Calculate MEC per equation C-13 using the following inputs:

MEC = RPM x MOC

RPM = 2.88

MOC = 1,450 µg/L

MEC = 2.88 x 1,450µg/L = 4,172 µg/L,

Calculate required acute and chronic DFs per equation C-3

$$\mathrm{DFa, c} = \frac{(\mathrm{MEC} - \mathrm{AWC})}{(\mathrm{RWC} - \mathrm{AWC})}$$

RWC = 12.92 µg/L based on 15 % of chronic criteria adjusted for total zinc

AWC_a = 95.10 µg/L based on acute water quality criteria adjusted for total zinc

AWC_c = 86.14 µg/L based on chronic water quality criteria adjusted for total zinc

DF_a = (4,172 µg/L – 12.92 µg/L)/(95.1 µg/L – 12.92 µg/L)

= 50.6 required (DEC authorizes 50.5)

DF_c = (4,172 µg/L – 12.92 µg/L)/(86.14 µg/L – 12.92 µg/L)

= 56.8 required (DEC authorizes 56.5)

Calculate acute and chronic RWC using the authorized $DF_{a,c}$ per equation C-14

$$RWC_{a,c} = \frac{(MEC - AWC)}{DF_{a,c}} + AWC$$

$$\mathrm{RWC_a} = \frac{4{,}172\ \mathrm{ug/L} - 12.92\ \mathrm{ug/L}}{50.5} + 12.92\ \mathrm{ug/L} = 95.28\ \mu\mathrm{g/L}$$

$$\mathrm{RWC_c} = \frac{4{,}172\ \mathrm{ug/L} - 12.92\ \mathrm{ug/L}}{56.5} + 12.92\ \mathrm{ug/L} = 86.53\ \mu\mathrm{g/L}$$

In order to determine if reasonable potential exists for the discharge to violate ambient criteria, the highest projected concentrations at the boundaries of the acute and chronic the mixing zones are compared with their ambient criteria.

As shown in the comparison below, total zinc has reasonable potential to violate applicable ambient criteria at the boundaries of both the acute and chronic mixing zones.

Acute	95.28 µg/L > 95.10 µg/L (acute criteria)	**YES**, there is a reasonable potential to violate
Chronic:	86.53 µg/L > 86.14 µg/L (chronic criteria)	**YES**, there is a reasonable potential to violate

Since there is a reasonable potential for the effluent to cause, or contribute to, an exceedance of acute and chronic water quality criteria for protection of aquatic life, a WQBEL for total zinc is required. See APPENDIX B for development of this limit.

C.3 Outfall 001 Reasonable Potential Analysis Summary

Table C. 1 summarizes the results of the RPA for Outfall 001 POCs total recoverable zinc, TAH, and chronic WET.

Table C. 1 Outfall 001 Reasonable Potential Summary

POC (Units)	MOC	n	AWC	CV	RPM	MEC	Water Quality Criteria		RWC		Reasonable Potential
							Acute	Chronic	Acute	Chronic	
Zinc (ug/L)	1450	22	12.921	1.10	2.87	4172	95.10	86.14	**95.28**	**86.53**	**YES**
TAH (µg/L)	180	118	1.50	2.26	1.6	294.89	--	10.00	--	6.69	No
WET_c (TU_c)	16	24	0	1.37	3.2	51.65	--	1.00	--	0.91	No

Table C.2 summarizes the results of the RPA for Outfall 001 POCs EC bacteria and FC bacteria.

Table C. 2 Outfall 002 Reasonable Potential Summary

POC (Units)	MOC	n	AWC	CV	RPM	MEC	Water Quality Criteria		RWC		Reasonable Potential
							Acute	Chronic	Acute	Chronic	
EC Bacteria (cfu/ 100mL)	980	9	0	0.6	2.6	2,590	--	35.0	--	**35.23**	**YES**
FC Bacteria (FC/ 100mL)	260	10	0	1.13	4.6	1,193	--	20.0	--	16.22	No

Appendix D MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2006)

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 presented in the Alaska Administrative Code (AAC) at 18 AAC 70.240 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollution Discharge Elimination System permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet. However, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Sections 3.3.2 and 3.3.3	18 AAC 70.240 (k)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 3.3.4	18 AAC 70.240 (c)(1)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A – Marine Discharge	18 AAC 70.240(l)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5	18 AAC 70.240(c)(2)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5	18 AAC 70.240(c)(3)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**	Yes Fact Sheet Section 3.3.5	18 AAC 70.240(b)(1)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Section 3.3.5, 3.3.9, and 3.3.10	18 AAC 70.240(m)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(d)(6)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(c)(4)(C)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240 (e) and (f)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8	18 AAC 70.240 (d)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8	18 AAC 70.240 (d)(2)	Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8	18 AAC 70.240(c)(4)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 3.3.8	18 AAC 70.240 (c),(4)(A)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8	18 AAC 70.240(c)(4)(B)	Y

Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.	18 AAC 70.240(e) and (f)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(c)(4)(G)	Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(d)(5)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(c)(4)(E)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(c)(4)(D)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3 and 3.3.9	18 AAC 70.240(d)(7)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(c)(4)(A)	Y

Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Sections 3.3.10 and 8.1	Program Description, 6.4.1 #5 18 AAC 70.240(c)(4)(F)	Y