ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PRELIMINARY DRAFT

Permit: AK0001155 - ConocoPhillips Alaska Inc.,
Kenai Liquefied Natural Gas Facility

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

Public Comment Period Start Date: insert date
Public Comment Period Expiration Date: insert date
Alaska Online Public Notice System

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

CONOCOPHILLIPS ALASKA, INC.

For wastewater discharges from

Kenai Liquefied Natural Gas Facility
48237 Kenai Spur Highway
Kenai, AK 99611

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual permit AK0001155 – ConocoPhillips Alaska Inc., Kenai Liquefied Natural Gas Facility (permit). 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

Public Comment

Persons wishing to comment on, or request a public hearing for the draft permit for this facility, may do so in writing by the expiration date of the public comment period.

Commenters are requested to submit a concise statement on the permit condition(s) and the relevant facts upon which the comments are based. Commenters are encouraged to cite specific permit requirements or conditions in their submittals.

A request for a public hearing must state the nature of the issues to be raised, as well as the requester's name, address, and telephone number. The Department will hold a public hearing whenever the Department finds, on the basis of requests, a significant degree of public interest in a draft permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision or for other good reason, in the Department's discretion. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. The public may also submit written testimony in lieu of or in addition to providing oral testimony at the hearing. A hearing will be tape recorded. If there is sufficient public interest in a hearing, the comment period will be extended to allow time to public notice the hearing. Details about the time and location of the hearing will be provided in a separate notice.

All comments and requests for public hearings must be in writing and should be submitted to the Department at the technical contact address, fax, or email identified above (see also the public comments section of the attached public notice). Mailed comments and requests must be postmarked on or before the expiration date of the public comment period.

After the close of the public comment period and after a public hearing, if applicable, the Department will review the comments received on the draft permit. The Department will respond to the comments received in a Response to Comments document that will be made available to the public. If no substantive comments are received, the tentative conditions in the draft permit will become the proposed final permit.

The proposed final permit will be made publicly available for a five-day applicant review. The applicant may waive this review period. After the close of the proposed final permit review period, the Department will make a final decision regarding permit reissuance. A final permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at Alaska Administrative Code (AAC) section 18 AAC 15.185.

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

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

Director, Division of Water

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

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

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

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

Commissioner

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

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

Documents are Available

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

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 43335 Kalifornsky Beach Road Soldotna, AK 99615 907-262-5210

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1.0 INTRODUCTION

1.1 Applicant

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

Name of Facility:	ConocoPhillips Alaska Inc., Kenai Liquefied Natural Gas (LNG) Facility
APDES Permit No:	AK0001155
Facility Location:	48237 Kenai Spur Highway, Kenai, AK, 99611
Mailing Address:	P.O. Box 66, Kenai, AK 99611
Facility Contact:	Mr. Gary Rupe, Cook Inlet Health, Safety & Environmental Supervisor

Outfall Location

Discharge Location (Outfall)	Receiving Water	Latitude	Longitude
001	Cook Inlet	60˚ 40’ 41” North	151˚ 23’ 37” West

See Figure 1, Facility Map, in Appendix A.

1.2 Authority

On October 31, 2008, the Environmental Protection Agency (EPA) approved an application by the State of Alaska to administer the National Pollutant Discharge Elimination System (NPDES) Program in the State of Alaska, which regulates the discharge of wastewater to those waters of the United States (U.S.) under the jurisdiction of the State of Alaska. The state program is known as the APDES Program. Transfer of authority to administer the APDES Program occurred in four phases with oil and gas facilities transferring as part of the fourth and final phase, which occurred on October 31, 2012. At the time of transfer, all NPDES permits within the state became APDES permits. Accordingly, the Alaska Department of Environmental Conservation (DEC or Department) is now the APDES permitting authority for regulating the discharges associated with the APDES individual permit AK0001155 – ConocoPhillips Alaska, Inc., Kenai Liquefied Natural Gas Facility (permit).

Section 301(a) of the Clean Water Act (CWA) 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 proposed individual permit reissuance is being developed in accordance with regulations 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) 46.03.020(13).

1.3 Permit History

Phillips Petroleum Company began operating the facility in 1969 and NPDES permit AK0001155 was originally issued on June 14, 1974. On September 29, 1978 Phillips Petroleum Company submitted an application for permit reissuance to EPA who responded by issuing an administrative extension of the original permit, which has remained in effect.

On June 30, 2006 the current owner, ConocoPhillips Alaska, Inc. (CPAI), submitted a reissuance application to EPA who reviewed but did not reissue the permit before the NPDES program transferred to DEC. On August 22, 2013 CPAI submitted a permit reissuance application to DEC for reissuance under the APDES Program. The reissued permit will provide renewed authorization to discharge wastewater from sources identified in the permit application and as described in the permit.

2.0 BACKGROUND

2.1 Facility Information

The CPAI Kenai Liquefied Natural Gas Facility (facility) processes Cook Inlet and Kenai Peninsula natural gas into LNG for export to Pacific Rim markets. Natural gas is transported from surrounding production wells to the facility by two 10.75-inch subsea pipelines and one 16-inch onshore pipeline. The facility was built by Phillips Petroleum and Marathon Oil in 1969. Phillips later merged with Conoco and ConocoPhillips subsequently purchased Marathon's interest. From 1969 to 2010, the facility shipped LNG to Japan under long-term contracts with Tokyo Gas and Tokyo Electric. Shipments since have been on a per-vessel basis.

Facility operations were suspended in 2012 in response to a depletion of available natural gas reserves in the Cook Inlet area. Since 2012, new natural gas discoveries have occurred in the area and supplies are currently sufficient to accommodate LNG exports. In April 2014, CPAI received authorization from the U.S. Department of Energy to resume LNG exports for two years and the facility has restarted production. One LNG vessel was loaded in May 2014 and additional shipments were anticipated on approximately one month intervals.

The facility employs the ConocoPhillips Optimized Cascade Process® to purify, cool and condense natural gas into LNG. The natural gas is first treated to remove contaminants, including water, carbon dioxide, and mercury before entering the liquefaction section of the plant. The liquefaction process then chills the gas to approximately –260 degrees Fahrenheit in successively colder heat exchangers that use propane, ethylene, and methane as refrigerants. The resulting LNG is then pumped into insulated storage tanks to await loading onto LNG carrier ships. Gases, which continually boil out of the LNG, as it warms slightly in the storage tanks, are captured and returned to the process to be re-liquefied. At the receiving terminals, the LNG is transferred from the carriers into storage tanks to await use.

2.2 Wastewater Treatment System

The facility wastewater sources originate from the two contributing collection systems that combine just prior to final treatment in an aeration pond as shown on the process flow diagram in Appendix A, Figure 2. The first contributing collection system primarily includes cooling towers and process boiler waste streams that have chemical additives including sodium hypochlorite, pH control, oxygen scavenger, algaecide, corrosion/scale inhibitor, and deposit control agents. Facility storm water and a softner regerator waste stream combines with the cooling tower and boiler waste streams prior to commingling with second contributing system.

The second contributing collection system primarily includes reverse osmosis (RO) reject water and domestic wastewater but also includes oily waste streams from floor drains and the natural gas process unit. These oily waste streams are treated using an oil/water separator (OWS) before

commingling with the domestic waste streams and receiving biological treatment in a waste activated sludge (WAS) treatment plant. The WAS plant includes a comminuter, primary clarifier, biological treatment, secondary clarifier, and chlorination. Effluent from the WAS commingles with the untreated waste stream from the first contributing system prior to final treatment in the polishing pond treatment system. The total combined average daily flow is 74,600 gallons per day (gpd) and the volumes per waste stream source is shown in Table 1.

Table 1: Process Unit Flowrates Per Collection System

Collection System 1 Flows (gpd)		Collection System 2 Flows (gpd)	
Cooling Towers	20,000	Domestic Wastewater	3,750
Boiler Condensate	35,000	Reverse Osmosis (RO) Reject	1,250
Softner Regenerator	3,600	Floor Drains	950
Storm Water	10,000	Gas Processing Unit	50
Collection System 1 Total	**68,600**	**Collection System 2 Total**	**6,000**

The combined waste streams from the first and second contributing systems receive final treatment in a polishing pond system. The polishing pond system includes a detention pond and an aeration/oxidation pond that provides continued biological treatment, volatilization, settling, and pH control prior to discharging. The detention pond is typically bypassed but is available to provide flow equalization or a means to hold off-specification effluent. The effluent discharged to Cook Inlet from the polishing pond is the compliance point for Outfall 001.

2.3 Effluent Characterization

Because the waste streams discussed in Section 2.2 are commingled in the polishing pond system, the characterization of the effluent is based on a relative mixture of upstream inputs. The dominant portion of the mixture is from cooling water and boiler condensate that includes sodium hypochlorite that increases total residual chlorine (TRC) and oxygen scavengers that may increase five-day biochemical oxygen demand (BOD_5).

Building floor drainage and storm water from the process area can potentially contain oil and grease (O&G). Therefore, floor drains are treated with an OWS, and Best Management Practices (BMPs) are implemented to minimize O&G occurrences in storm water. Similar to floor drains, wastewater from the natural gas process unit is also treated by the OWS to remove O&G prior to receiving treatment in the WAS plant. The natural gas process unit waste stream may contain ammonia and mercury. However, the flow from the natural gas process unit is less than 50 gpd so the facility effluent is not expected to have high concentrations of these constituents.

Domestic wastewater effluent from the WAS plant contributes BOD_5, fecal coliform (FC) bacteria, TRC, and total suspended solids (TSS). TSS concentrations have been observed to increase in the polishing pond system during the summer due to algae growth.

The groundwater source water for the facility contains naturally occurring elevated arsenic concentrations. An RO system was recently installed to reduce arsenic in the facility's drinking water. Although the reject water from the RO system contains arsenic, the overall mass and concentration of arsenic in the effluent is not expected to change.

The following sections provide characterization information for the combined effluent from the polishing ponds at the point of compliance.

2.3.1 Characterization Based on Permit Performance History

Discharge Monitoring Reports (DMRs) from March 2010 through February 2015 were reviewed to evaluate compliance with effluent limits and characterize the effluent as shown in Table 1.

Table 2: Characterization Based on Limited Parameters (May 2008 to Feb 2015)

Limit Parameter	Units	Existing Limits [1]			Observed Range (Low - High, Average)
		Daily Maximum	Weekly Average	Monthly Average	
Flow	million gallons per day (MGD)	N/A	N/A	N/A	(0 - 0.239, 0.063)
BOD_5	pounds per day (lb/day)	84	N/A	42	(0.1– 19.3, 2.6)
TSS	lb/day	84	N/A	42	(0.1 – 44.4, 5.1)
O&G	lb/day	14	N/A	7	(0.0 - 10.2, 2.6)
FC Bacteria	FC/100 milliliter (ml)	400	200	N/A	(0.0 – 20.0, 0.8)
pH	Standard Units (SU)	6.0 to 9.0			(6.8 - 8.2, 7.6 [2])

Notes:
1. Mass-based limits are based on a flow of 0.17 MGD.
2. Median of pH provided in lieu of average.

The limited parameters consist of technology-based effluent limits (TBELs) and water quality-based effluent limits (WQBELs). FC bacteria and pH are the only limited parameters that have applicable water quality criteria. These WQBELs will be carried forward as parameters of concern (POCs) and subject to a reasonable potential analysis (RPA).

2.3.2 Characterization of TBEL Parameters Based on Concentrations

The TBELs in the existing permit were established using mass-based limits. These TBELs will be carried forward as POCs but will be evaluated as to whether mass-based limits are necessary to control pollutants in the discharge. TSS and BOD_5 are included in the permit due, in part, to a domestic wastewater source, which per governing regulations 18 AAC 72.050 must receive minimum treatment defined as a secondary level of treatment. The definition for secondary treatment in 18 AAC 72.990(59) refers to meeting concentration levels for BOD_5 and TSS. Characterization of these TBEL parameters based on concentration is shown in Table 3.

Table 3: Characterization Based on TBEL Concentrations (May 2008 through Feb 2015)

TBEL Parameter	Units	Monthly Average[1]	Daily Maximum[1]	Observed Range (Low - High, Average) [3]	Data Set
BOD_5	milligrams per liter (mg/L)	30 [2]	60 [2]	(0.6 - 29.2, 8.3)	120
TSS	mg/L	30 [2]	60 [2]	(0.5 – **53.0**, 10.2)	124
O&G	mg/L	5 [2]	10 [2]	(0.1 - **12.6**, 4.2)	107

Notes:
1. Weekly average of 45 mg/L definition per 18 AAC 72.990(59) is not applicable.
2. Concentrations for which the existing mass-based limits were calculated at 0.17 MGD.
3. Values above TBEL concentrations shown in bold are not considered limit exceedances.

2.3.3 Characterization Based on Application and Additional Sampling

DMR data from May 2008 through February 2015 and historic data collected to support the application was reviewed for evaluating water quality POCs. Table 3 provides a summary of this review.

Table 4: Characterization Based on Water Quality Parameters

Water Quality Parameter	Units	Data Set [1]	Water Quality Criteria			Observed Range [3] (Low - High, Average)
			Acute [2]	Chronic	Human Health	
Temperature	Celsius (C°)	>1,000	15	N/A	N/A	3.8 [4] - **27, 17.8**
TRC	micrograms per liter (µg/L)	>1,000	13	7.5	N/A	**0 - 1,240, 13(0**
Arsenic	µg/L	8	69	36	10	**105 - 134, 116.1**
Ammonia as Nitrogen [5]	mg/L	21	23.1	3.5	N/A	0.26 - 1.28, 0.68
Total Aqueous Hydrocarbons (TAqH)	µg/L	5	15	N/A	N/A	0.85 - 2.0, 1.77
Chromium VI	µg/L	4	1100	50	N/A	4.29 - 5.15, 4.73
Copper	µg/L	11	5.8	3.7	N/A	**24.2 - 41, 32.0**
Manganese [6]	µg/L	8	N/A	N/A	100	**172 - 262, 209.5**
Mercury	µg/L	11	1.8	0.94	0.051	**0.097 - 1.15, 0.257**
Nickel	µg/L	10	72.7	6.9	4600	1.6 - 5.89, 4.0
Zinc	µg/L	11	95.1	86.1	69000	36.2 - **81.1**, 52.9

Notes:

1. Value represents the number of detectable data points.
2. Where only an instantaneous maximum limit is applicable, the value is presented as acute.
3. Values that exceed water quality criteria are presented in bold.
4. The long-term average winter effluent temperature is presented as the low value.
5. The ammonia criteria is based on a temperature of 15 C°, pH of 8.0, and salinity of 20 parts per thousand.
6. The manganese human health criteria is derived from the Red Book and does not use the fish ingestion bio-concentration factor (BCF) approach or similar methods established in 1980.

All of the parameters that exceeded water quality criteria in the table above are considered POCs for which an RPA was conducted (see Appendices B and C). Although reported values are below water quality criteria, ammonia and TAqH are also considered POCs for RPA based on facility processes. Lastly, nickel has a maximum observed concentration that is slightly less than the chronic aquatic life criteria. Given consideration to the size and potential variability of the data set, nickel warrants further evaluation in the RPA and is considered a POC.

2.4 Compliance History

2.4.1 Limits Exceedances

A review of facility compliance from May 2008 through February 2015 of the previous permit cycle was conducted to evaluate compliance history. The review indicates the permittee had no effluent violations during this time period.

2.4.2 Reporting Violations

A review of reporting violations for the same time period found that the permittee was late in reporting pH values for the months of July, August and September 2011. In addition, the permittee incorrectly reported FC bacteria effluent results in July and August 2011. The permittee communicated the missing pH values and corrected FC bacteria results on November 22, 2011.

3.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

3.1 Basis for Permit 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 a permit issued by the APDES Program 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 (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 a particular pollutant be the more stringent of either TBEL or WQBEL. TBELs are set via EPA-rule makings in the form of Effluent Limitation Guidelines (ELGs) and correspond to the level of treatment that is achievable using available technology. There are currently no ELGs applicable to LNG facilities. In situations where ELGs have not been developed or have not considered specific discharges or pollutants, a regulatory agency can develop case-by-case TBELs based on best professional judgment (BPJ). The permit retains TBEL domestic wastewater parameters BOD_5 and TSS from the existing permit. However, these TBELs were converted from mass-based to concentration-based to be consistent with 18 AAC 72. This conversion is based on the Department's determination that the discharge is adequately limited by concentrations and that the domestic discharge component is not dependent upon production rates of the facility. The Department establishes limits for domestic wastewater sources citing requirements for minimum treatment per 18 AAC 72.050 and the definition of secondary treatment per 18 AAC 72.990(59). The definition establishes effluent concentrations for TSS and BOD_5 that, when considering design flows, is consistent with the mass-based limits of the existing permit.

For non-domestic wastewater, the Department establishes TBELs for the parameter O&G using case-by-case BPJ citing ELGs in 40 CFR 419 - Petroleum Refinery Point Sources and the more stringent limits in the existing permit but converting to concentration based limits similar to BOD_5 and TSS. All other effluent limits are WQBELs.

A WQBEL is designed to ensure that the WQS are maintained and the waterbody as a whole is protected. WQBELs may be more stringent than TBELs. In cases where both TBELs and WQBELs have been generated, the more stringent of the two limits will be selected as the final permit limit. There were no parameters where this comparison were necessary in the development of limits. The Department establishes a new WQBEL for TRC; TRC was found to be the driving parameter for both the chronic and acute mixing zone. The water quality parameters FC bacteria and pH limits were retained from the existing permit but became more stringent in order to comply with WQS and are a reflection of facility performance. Characterization of the effluent indicates the TBELs and WQBELs are attainable.

3.2 Effluent Limits and Monitoring

3.2.1 Effluent Limits and Monitoring Requirements

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed in a permit. Per Appendix B, the permit establishes TBELs for BOD_5, TSS, and O&G and WQBELs for TRC, FC bacteria, and pH. The permit also requires monitoring to collect characterization data to support future permit applications and inform Department decisions. The permittee is responsible to conduct the monitoring and report results on DMRs as described in the Permit. Limits and monitoring requirements are shown in Table 4.

Table 5: Outfall 001 - Effluent Limits and Monitoring Requirements

Parameter	Effluent Limits			Monitoring Requirements	
	Units	Monthly Average	Daily Maximum	Sample Frequency	Sample Type
Flow	MGD	Report	0.35	Continuous	Recorded
Temperature	Degrees Celsius (C°)	N/A	Report	Weekly [b]	Recording
pH	SU	6.5 ≤ pH ≤ 8.5		Weekly [b]	Grab
BOD_5	mg/L	30	60	Quarterly	Composite [c]
TSS	mg/L	30	60	Quarterly	Composite [c]
O&G	mg/L	5	10	Twice Monthly	Grab
TRC	µg/L	565	1,240	Weekly [b]	Grab
FC Bacteria[c]	FC /100 mL	14	40	Monthly	Grab
Enterococci Bacteria [d, e]	Count per /100 mL	N/A	Report	Monthly	Grab
Total Ammonia, as N	mg/L	N/A	Report	Quarterly [f]	Grab
TAqH	µg/L	N/A	Report	Quarterly [f]	Grab
Copper	µg/L	N/A	Report	Monthly	Grab
Mercury	µg/L	N/A	Report	Monthly	Grab
Chronic Whole Effluent Toxicity (WET)	Chronic Toxicity Unit (TU_c)	N/A	Report	Semiannually [g]	Composite [c]

Parameter	Effluent Limits			Monitoring Requirements	
	Units	Monthly Average	Daily Maximum	Sample Frequency	Sample Type

Notes:

a. The wastewater discharge volume shall not exceed the maximum hydraulic design flow rate that is based on the mixing zone application for the permit.

b. Parameters that are continuously monitored need only be reported weekly.

c. Composite samples must consist of at least eight grab samples collected at equally spaced intervals over a 24-hour period and proportionate to flow so that composite samples reflect influent/effluent quality during the compositing period.

d. All effluent FC and enterococci bacteria average results must be reported as geometric mean.

e. Monitoring for enterococci bacteria is only required during the months of May through October.

f. A quarter is defined as: January 1 through March 31; April 1 through June 30; July 1 through September 30; October 1 through December 31.

g. Semiannually consists of one sample taken in the 1st quarter and one sample taken in the 3rd quarter. If after the first three years no chronic toxicity is observed, the permittee may submit a written request for Department approval to reduce the WET testing frequency to annual.

3.2.2 Monitoring Frequency Reductions

DEC has the authority to consider reduced reporting and monitoring requirements in reissued permits when the permitted facilities had a record of good compliance and pollutant discharges at levels below permit requirements during the previous permit cycle. DEC references EPA's *Interim Guidance For Performance-Based Reduction of NPDES Permit Monitoring Frequencies* to evaluate monitoring frequency reductions based on reporting and compliance from May 2008 through February 2015. The evaluation indicates the long term averages for BOD_5 and TSS were less than 25 percent (%) of their monthly average limits and the reissued permit thus reduces their compliance monitoring frequencies to once per quarter.

The existing permit limits FC bacteria discharges to a daily average of 200 FC/100 mL and a weekly average of 400 FC/100 mL and was monitored twice per month. The reissued permit reduces the limits for FC bacteria to a monthly average of 14 FC/100 mL and a daily maximum of 40 FC/100 mL. From May 2008 through February 2015, the long term average concentration was less than 25% of the new monthly average limit of 14 FC/100 mL. Therefore the reissued permit authorizes a monitoring frequency of once per month for FC bacteria to be consistent with the requirements for enterococci bacteria.

3.2.3 Additional Effluent Monitoring

The permittee has the option of taking more frequent samples than required under the permit. These additional samples can be used for averaging if they are conducted using the Department – approved test methods (generally found in 18 AAC 70 and in the Title 40, Code of Federal Regulations (CFR), Part 136 (40 CFR 136) [adopted by reference in 18 AAC 83.010], and if the Method Detection Limits (MDLs) are less than the effluent limitations. All data collected during the permit term must be provided to the Department with the next application for reissuance. This information is necessary to adequately characterize the effluent and conduct an RPA.

3.2.4 Chronic WET Monitoring

WET testing was not required in the existing permit. The permit requires the permittee to conduct chronic WET testing twice per year. Initially, the permittee must conduct the WET

testing to screen for the two most sensitive species of the plant, vertebrate animal, and invertebrate animal species noted below:

- Plant (Germination and Growth Test Method 1009.0): Macrocystis pyrifera (giant kelp) static non-renewal toxicity test.
- Vertebrate (survival and growth): Atherinops affinis (Topsmelt). In the event that topsmelt is not available, Menidia beryllina (inland silverside) may be used as a substitute. The permittee shall document the substitute species in the DMR following the testing.
- Invertebrate: For larval development tests, the permittee must use bivalve species Crassostrea gigas (Pacific Oyster) or Mytilus sp. (mussel). For fertilization tests the permittee must use echinoderms Strongylocentrotus purpuratus (purple sea urchin) or Dendraster excentricus (sand dollar). 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).

A series of at least five dilutions and a control must be tested. The recommended initial dilution series is 0, 6.25, 12.5, 25, 50, and 100. On subsequent tests, the dilution series must be redesigned based on observed toxicity from previous tests to provide useful toxicity information for evaluation during permit reissuance.

The presence of chronic toxicity must be estimated as specified in 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). For the bivalve species, 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). Both the no observed effects concentration (NOEC) and 25 percent inhibition concentration (IC25) must be provided in the full WET report. The chronic toxicity results reported on the DMR must use TUc = 100/IC25. The reported IC25 must be the lowest IC25 calculated for the applicable survival, growth or fertilization endpoints. If the endpoint is estimated to be above the highest dilution, the permittee must indicate this on the DMR by reporting a less than value for TUc based on the highest dilution. The Department may compare the reported TUc based on IC25 with one based on NOEC during evaluation of data during the next permit reissuance.

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

- 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 last 5 months of reference toxicant testing. Where organisms are cultured by the testing laboratory, monthly reference toxicant testing is sufficient.
- 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 must re-sample and re-test as soon as possible.
- Control and dilution water should 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.

Although acute WET monitoring is not required, the permittee must estimate acute toxicity based on observations of mortality during chronic tests and include this information in the WET report.

Semiannual monitoring will provide the data necessary to ascertain if WET limits, or triggers, are necessary in subsequent permit reissuances and to ensure the discharge is not imparting toxicity in the receiving water. If no chronic toxicity is reported after three years of monitoring, the permittee may make a written request for Department approval to reduce the chronic WET monitoring frequency to annual. The permittee must continue semiannual WET monitoring until receiving written Departmental approval that WET monitoring can be reduced in frequency.

4.0 RECEIVING WATERBODY

4.1 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. Regulations in 18 AAC 83.435 require that conditions in permits ensure compliance with 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. The Department has determined that all marine use classes must be protected in the state waters in Cook Inlet.

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 at the location of the permitted discharge.

An Ocean Discharge Criteria Evaluation (ODCE) is not required for discharges from the facility. Per 40 CFR 125, Subpart M an ODCE is required for a point source that occurs seaward of the baseline of the territorial sea. Because the facility is landward of the baseline, further ODCE analysis is not required.

4.2 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.

Cook Inlet is not included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010 as an impaired waterbody nor is the subject waterbody listed as a CWA 303(d) waterbody requiring a TMDL.

4.3 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240 – 70.270, as amended through June 23, 2003 (mixing zone regulations), the Department may authorize a mixing zone in a permit. The applicant submitted an initial mixing zone application on August 22, 2013 and a revised mixing zone application on May 13, 2014. The mixing zone application provides information required by 18 AAC 70.260 (application requirements), including the information and available evidence necessary to demonstrate consistency with mixing zone regulations. The Department reviewed the application and available information and is authorizing mixing zones for TRC, TAqH, ammonia, arsenic, copper, mercury, nickel, zinc, and temperature.

The applicant used the Cornell Mixing Zone Expert System (CORMIX) 8.0G mixing zone model with input data representing critical ambient conditions in Cook Inlet and estimated effluent characteristics of the subject waste streams. The Department further evaluated and verified the applicant's mixing zone model. Using current meter data near the site, the mixing zone analysis included consideration of the following critical ambient tidal conditions, flow velocities, and water column densities to determine the following mixing zone properties:

- Winter and summer 10 percentile flow of 0.29 meters per second (m/s) and uniform density water column, and
- Winter and summer 90 percentile of 1.69 m/s and uniform density water column.

The maximum capacity of the treatment facility, 0.35 MGD, was the critical discharge flow rate used in the model. The applicant also reviewed existing wastewater flow rates and effluent characteristics over the previous five years to estimate maximum expected discharge concentrations for the POCs. The applicant's analyses determined TRC to be the POC requiring the most dilution but considered the highest observed concentration of 1,240 µg/l to be an outlier. Upon review, the Department concurred that TRC is the POC requiring the most dilution, but found insufficient basis to exclude the highest observed concentration from the mixing zone analysis, and revised the mixing zone size accordingly. All water quality criteria must be met at the boundary of the authorized mixing zone. The Department verified that all other parameters authorized for the mixing zones will fit within the mixing zone sized for TRC and that the resulting mixing zone sizing is based on the most conservative mixing zone dimensions calculated in the four separate analyses.

Both the acute and chronic mixing zones are rectangular in shape with the area centered on Outfall 001 and aligned with the long axis parallel to the shoreline. The acute and chronic mixing zones extend from the seafloor to the sea surface and have the following aerial dimensions and dilution factors.

- The acute mixing zone will extend from the sea surface to the sea floor with a length of 123 meters, a width of six meters, and an associated dilution factor of 95.
- The chronic mixing zone will extend from the sea surface to the sea floor with a length of 176 meters, a width of 14 meters and an associated dilution factor of 165.

Appendix D, Mixing Zone Analysis Checklist, outlines criteria that must be considered when the Department analyzes an applicant's request for a mixing zone. These criteria include the size of the mixing zone, treatment technology, designated and existing uses of the waterbody, human

consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met in order to authorize a mixing zone. The following sections summarize this analysis.

4.3.1 Size

In accordance with 18 AAC 70.255, the Department determined that the sizes of the mixing zones for the facility wastewater discharge are appropriate and are as small as practicable. The size of the mixing zones are a small fraction of the area, or width, of Cook Inlet. Critical ambient tidal velocities of 1.69 m/s and 0.29 m/s representing the 90th and 10th percentiles, respectively, were used in the CORMIX model. These ambient tidal velocities are based on data collected in the vicinity of the discharge. Using the 10^{th} percentile tidal velocity of 0.29 m/s, a drifting organism can traverse the acute mixing zone in 469 seconds (under eight minutes), which is less than the 15 minutes typically used to evaluate lethality. Water quality criteria representing the most stringent use classification is met at the boundary of the chronic mixing zone. There are no known sensitive aquatic resources within the vicinity of the mixing zone and the sediment observed consists of coarse grained material that does not support a rich benthic environment. The mixing zone is protective of aquatic life. Although some constituents in the discharge have the potential to pose a human health risk, the dispersion in the water column and the lack of fine grained sediment in the vicinity of the discharge prevent localize exposure to these constituents. The mixing zone is protective of human health.

4.3.2 Technology

18 AAC 70.240(a)(3) 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 defined in 18 AAC 70.990(30) [2003]. Accordingly, there are three parts to the definition, which are:

- Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as amended through August 15, 1997, adopted by reference at 18 AAC 83.010;
- Minimum treatment standards in 18 AAC 72.040; 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 applicable federal technology-based ELGs that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case BPJ. There are no ELGs applicable to the permitted discharge. The limits developed for domestic wastewater discharges for BOD_5 and TSS are based on 18 AAC 72.050 and the definition of secondary treatment as per 18 AAC 72.990(59) and comply with minimum treatment standards in 18 AAC 72.050. In comparison to oil refineries, the O&G TBEL established using BPJ is more stringent than ELGs for contaminated storm water runoff at oil refineries per 40 CFR 419.12 (e)(2). The permit authorizes 10 mg/L where the comparable ELG limits O&G to 15 mg/L. The Department determines that the first part of the definition has been met.

The second part of the definition from the WQS appears to be in error, as 18 AAC 72.040 considers discharge of sewage to sewers and not minimum treatment. The correct reference appears to be 18 AAC 72.050, minimum treatment for domestic wastewater. The application of

18 AAC 72.050 was previously discussed (See Section 3.1 and Appendix B). 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 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.

4.3.3 Existing Use

In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of the Cook Inlet. All water quality criteria must be met at the boundary of the authorized chronic mixing zone. Water quality criteria serves to specifically protect the uses of the waterbody as a whole. Given all water quality criteria will be met at the boundary of the mixing, the existing uses will be protected. Furthermore, the discharge volumes and ambient receiving water characteristics at the discharge location have been examined to ensure human health and the biological integrity of Cook Inlet will be maintained and fully protected under the terms of the permit as required in 18 AAC 70.245 (a)(1) and (a)(2).

4.3.4 Human Consumption

In accordance with 18 AAC 70.250 and 18 AAC 70.255, the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Additionally, the discharge has not precluded or limited established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Significant flushing in Cook Inlet is expected to rapidly disperse the low-volume discharges.

4.3.5 Spawning Areas

Per 18 AAC 70.255(h), a mixing zone is not authorized in an area of anadromous fish spawning or resident fish for spawning redds, Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon. The permit does not authorize the discharge of effluent to open waters of a freshwater lake or river. Therefore, there are no associated discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

4.3.6 Human Health

In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized by the permit shall be protective of human health. An analysis of the effluent data submitted with application for reissuance indicate that the level of treatment at the facility is protective of human health. The quality of the effluent is expected to meet human health criteria.

Cook Inlet, is a very dynamic waterbody and constantly changing tidal velocities and directions cause a continuous reworking and scouring of fine-grained sediments in the vicinity of the

discharge, and as a result, bioaccumulative pollutants are not expected to persist in the bottom sediments or biota. The resulting bottom sediments at the vicinity of the discharge are characterized as sands, gravels, and cobbles with minor fractions (0.6 to 1.2 percent) of silt and clay. Analysis of metals and hydrocarbons in these sediments indicate there is no distinguishable difference in concentrations in the vicinity of the discharge with background sediment (Kent and Sullivan, 2005). Sediment concentrations are much lower than published criteria (Long, 1993). Furthermore, the benthic sediment at the vicinity of the discharge does not support the propagation of shellfish or other benthic species that could be consumed by humans.

Bioconcentration from the water column is also not expected. Contaminant concentrations detected in fish in Cook Inlet are similar to those in fish collected throughout Alaska (ATSDR, 2009). The detailed review of available information has not resulted in reasonable evidence that the discharge will pose a health risk when considering likely pathways of exposure at the vicinity of the discharge.

4.3.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.250(a)(2)(A-C), 18 AAC 70.250(b)(1), 18 AAC 70.255(g)(1) and (2), and 18 AAC 70.255(b)(1) and (2), pollutants for which the mixing zone will be authorized will not result in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Based on the mixing zone being sized to prevent lethality to drifting organisms (See Section 4.3.1), low discharge volume, outfall structure and location, coarse-grained benthic conditions, and tidal fluctuations at the point of discharge, the Department concludes aquatic life and wildlife will be maintained and protected.

4.3.8 Endangered Species

In accordance with 18 AAC 70.250(a)(2)(D), the mixing zone will not cause an adverse effect on threatened or endangered species. Impacts to overall water quality, and any threatened or endangered species therein, are not expected based on the small size of the mixing zone, the discharge characteristics, and the extreme tidal fluctuations associated with the receiving water. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) indicated that there are two listed endangered species. The following endangered species may occur in Cook Inlet in the approximate vicinity of the discharge: Cook Inlet Beluga Whale (Delphinapterus leucas) and Stellar Sea Lion (Eumetopias jubatus). See Section 8.1 and 8.2 for more information on endangered species.

5.0 ANTIBACKSLIDING

State regulation 18 AAC 83.480 requires that “effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit.” 18 AAC 83.480(c) also states that a permit may not be reissued “to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued.”

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation or if the Department determines that technical mistakes were made.

CWA §303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions; the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations.
CWA §303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or ELGs.

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 previously established case-by-case TBELs developed using BPJ. To determine if backsliding is allowable under 18 AAC 83.480(b), the regulation provides five regulatory criteria (18 AAC 83.480[b][1-5]) that must be evaluated and satisfied. This permitting action modifies case-by-case TBELs established in the 1974 permit for BOD_5, TSS, and O&G. The basis of the original mass-based TBELs using case-by-case BPJ is not known. The modification merely converts these mass-based limits to concentration-based limits, which are effectively equivalent. The evaluation and justification for the modification of these limits is discussed below:

> **18 AAC 83.480. Reissued permits**
>
> (b) In the case of effluent limitations established on the basis of 33 U.S.C. 1342(a)(1)(B), a permit may not be renewed, reissued, or modified on the basis of effluent guidelines promulgated under 33 U.S.C. 1314(b) after the original issuance of the permit to contain effluent limitations that are less stringent than the comparable effluent limitations in the previous permit, except that a permit under this subsection may be renewed, reissued, or modified to contain a less stringent effluent limitation applicable to a pollutant, if:
>
> > (2) information other than revised regulations, guidance, or test methods that would have justified the application of a less stringent effluent limitation is now available but was not available at the time of permit issuance, or the Department determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under 33 U.S.C. 1342(a)(1)(b);

The existing, administratively extended permit became effective on June 14, 1974. In the decades since the issuance of the original permit, additional information and data have become available demonstrating effective treatment levels for BOD_5, TSS, and O&G. Upon reviewing this data, the Department concluded that mass-based limits are not a function of production at the facility and that concentration-based limits would be equivalent and effectively control pollutants in the discharge.

The second sentence of 18 AAC 83.480(c) indicates that case-by-case TBELs developed by BPJ may not be renewed, issued, or modified to contain a less stringent effluent limitation if implementation of the less stringent limitation would result in a violation of WQS. The concentration-based limits are equivalent to the previous mass-based limits and this modification will not result in a violation of WQS.

6.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the designated uses of the waterbody, WQBELs may be revised as long as the revision is consistent with the State antidegradation policy.

The antidegradation policy in the WQS (found at 18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section of the fact sheet analyzes and provides rationale for the Department decision to reissue the permit with respect to the antidegradation policy.

The Department's approach in implementing the antidegradation policy, found in 18 AAC 70.015, is based on the requirements in 18 AAC 70 and the *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods, July 14, 2010 (Interim Methods)*. Using these requirements and policies, the Department determines whether a waterbody, or portion of a waterbody, is classified as Tier 1, Tier 2, or Tier 3 where a higher numbered tier indicates a greater level of water quality protection. The receiving water for discharges from the facility is Cook Inlet, which is a Tier 2 water.

Wastewater discharged under this permit is subject to a Tier 2 antidegradation analysis, as detailed in the *Interim Methods*. The State antidegradation policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (Tier 2), that quality must be maintained and protected unless the Department finds that the five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-(E) are satisfied. These five findings are:

1. **18 AAC 70.015 (a)(2)(A).** Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

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

   The 2009 Alaska Economic Performance Report written by the Department of Commerce, Community and Economic Development (DCCED) indicates that Alaskan oil and gas industry continues to be the largest source of state revenue while creating some of the highest paying jobs in the State (DCCED, 2011). The oil and gas industry supports local economies by purchasing significant amounts of equipment, parts, fuel, food, freight, and other services.

   In addition, the Alaska Department of Natural Resources (DNR) tracks oil and gas activity in the state when it develops findings for lease sales (DNR, 2011). The January 2009 Best Interest Finding for the lease sale in Cook Inlet included the following socio-economic information on the oil and gas industry:

   - Oil and gas is an important component of revenues to support government services to Alaskans. At the end of the state's 2007 fiscal year, oil and gas revenues represented 88 percent of the total revenue to the state.

   - The Alaska state-wide economy depends heavily on revenues related to petroleum development, which totaled $4.57 billion in fiscal year 2007. The petroleum industry is Alaska's largest industry, annually spending $2.1 billion, including $422 million on payroll and $1.7 billion on goods and services.

- Overall, this spending generates 33,600 jobs, $1.4 billion in payroll, and value added to the Alaska economy of $1.8 billion for total output of $3.1 billion. Oil and gas accounts for 12 percent of private sector jobs and 20 percent of private sector payroll. The oil and gas industry has the highest monthly wage in Alaska, averaging $7,754, which is 2.8 times higher than the statewide average of $2,798.

- The oil and gas industry has been important to the economy of the Kenai Peninsula for over 40 years, and five of the top 10 employers are connected to the oil industry. Direct impact of the oil and gas industry has been estimated at 674 jobs with a payroll of $63 million. Indirect economic impacts are estimated to be an additional 2,822 jobs and $94 million in payroll. The induced impacts were 777 jobs and $20 million in payroll. Total economic impact on the Kenai Peninsula was 4,273 jobs and $177 million in payroll, which was 26 percent of the area's employment and 36 percent of the area's payroll. Taxable properties for the oil and gas industry were reported at $607 million, and 8 of the top 10 property taxpayers in the borough were oil and gas industry companies.

- The facility results in approximately $130 million per year of local economic impact including approximately 110 direct and indirect jobs and an annual payroll of approximately $17 million.

The Department concludes that the lowering of water quality is necessary to accommodate important economic or social development in the area where the water is located and that the finding is met.

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

The permit limits and conditions ensure WQS are not violated in the receiving water. The permit includes limits for pH and FC bacteria that are based on meeting water quality criteria at the point of discharge. The mixing zone is sized according to the assimilative capacity of the receiving water and is driven by TRC, which has WQBELs established in the permit. All other pollutants authorized in the mixing zone will meet applicable water quality criteria at the boundary of the mixing zone. As discussed in Section 4.1, no site-specific criteria has been developed for Cook Inlet in the vicinity of the discharge. In addition, WET monitoring requirements will verify there is no toxicity in the effluent. Therefore, the Department concludes that this finding is met.

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

As previously mentioned, Cook Inlet is protected for all marine use categories per 18 AAC 70.020(a)(2)(A-D). The authorized mixing zones are appropriately sized and the limits established in the permit are protective of WQS. All water quality criteria will be met at the boundary of the mixing zone to protect existing uses. After a review of the expected volume of discharge, the types and concentrations of monitored parameters, and permit limits and

conditions imposed by the permit, the Department concludes that the resulting water quality will be adequate to fully protect existing uses and that this finding has been met.

4. **18 AAC 70.015(a)(2)(D).** The methods of pollution prevention, control, and treatment found by the Department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.

   There are no applicable ELGs or established treatment technology for this discharge. All TBELs are case-by-case based on BPJ. The technology employed at the facility are consistent with those treating waste streams with similar characteristics.

   The facility wastewater is a mixture of domestic and non-domestic sources in two collection systems that ultimately become commingled and treated through the polishing pond system prior to discharge through a single outfall. The first contributing collection system are the cooling towers and boilers. Lesser intermittent sources include softener regeneration waste and non-contact storm water. This waste stream is treated by only in the polishing pond system.

   The second contributing collection system includes a mixture of domestic and non-domestic wastewater sources that is treated by the WAS plant described in Section 2.2. The domestic wastewater source is from facility urinals, toilets, showers, sinks, etc.. The non-domestic sources include RO reject water and potential oily waste streams from floor drainage and the gas processing unit. Reject water from the drinking water RO is combined with domestic wastewater directly ahead of the WAS plant. The potentially oily waste streams are pretreated using an OWS to remove free oil prior to receiving biological treatment in the WAS plant that removes dissolved hydrocarbons. Effluent from the WAS plant commingles with the first contributing collection system for final treatment in the polishing pond system. The polishing pond system includes a detention pond that can be used for quiencent settling, flow equalization, or storage of insufficiently treated effluent that requires additional treatment to meet permit limits. The multiple barrier treatment scheme at the facility has resulted in high quality effluent based on review of DMR data and compliance history.

   The Department concludes that the most effective technological and economical pollution prevention, control, and treatment methods are used to disperse, treat, remove, and reduce pollutants is being used and this finding is met.

5. **18 AAC 70.015(a)(2)(E).** All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.

   Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30), as amended through June 26, 2003, and *Interim Methods*. Accordingly, there are three parts to the definition, which are:

   - Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as amended through August 15, 1997, adopted by reference at 18 AAC 83.010;
   - Minimum treatment standards in 18 AAC 72.040; and
   - Any treatment requirement imposed under another state law that is more stringent than requirement of this chapter.

As discussed previously, the discharge is a combination of domestic and non-domestic sources. The limits for domestic wastewater are referenced to State regulations and are consistent with the mass-based limits in the existing permit. For non-domestic wastewater sources, EPA has not published ELGs specifically for LNG facilities. The only comparable ELG is 40 CFR 419 Petroleum Refinery Point Sources. Therefore, TBELs are established using case-by-case BPJ referencing the existing permit and State regulations for domestic wastewater and comparing to technology used to control contaminated storm water at oil refineries, for which ELGs are available for non-domestic sources. The TBELs include BOD_5 and TSS for domestic wastewater and O&G for non-domestic wastewater. The methods used to treat and control the discharge meet the first part of the definition.

As discussed in Section 4.3.2, the second part of the definition is in error and should reference 18 AAC 72.050 – Minimum Treatment. As discussed above and in Sections 3.1 and 4.3.2 as well as Appendix B, the substance treated and controlled will meet the minimum treatment standards.

The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. The permit is consistent with 18 AAC 83 and neither the regulations in 18 AAC 15 nor another state legal requirement that the Department is aware of imposes more stringent treatment requirements than 18 AAC 70.

The Department concludes that the discharge is being treated to the highest statutory and regulatory requirements and this finding has been met.

7.0 OTHER PERMIT CONDITIONS

7.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to draft or update the Quality Assurance Project Plan (QAPP) that consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. If a QAPP has already been developed and implemented, the permittee need only to review the existing plan to make sure it is up to date and all necessary revisions are made. The permittee must submit a letter to the Department within 120 days of the effective date of the permit certifying that the QAPP has been implemented. The plan shall be retained onsite and made available to the Department upon request.

7.2 Best Management Practices Plan

BMPs are measures that are intended to prevent or minimize the generation and potential for the release of pollutants from industrial facilities to the waters of the U.S. through normal operations and ancillary activities. Pursuant to CWA Section 402(a)(1), development and implementation of BMP Plans may be included as a condition in APDES permits. CWA Section 402(a)(1) authorizes DEC to include miscellaneous requirements that are deemed necessary to carry out the provision of the CWA in permits on a case-by-case basis. BMPs are required to control or abate the discharge of pollutants in accordance with 18 AAC 83.475.

The permittee must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility that materially increases the generation of pollutants or their release or

potential release to the receiving waters. The permittee must also amend the BMP Plan, as appropriate, when facility operations covered by the BMP Plan change. All changes to the BMP Plan must be reviewed by the facility engineering staff and manager. Changes to the BMP Plan shall be consistent with the objectives and specific requirement as described in Section 2.3 of the permit. The permit requires the permittee to develop or update and implement a BMP plan within 180 days of the effective date of the final permit. The permittee must submit a letter to the Department within 120 days of the effective date of the permit certifying that the BMP Plan has been implemented. The BMP Plan shall be kept onsite and made available to the Department upon request.

7.3 Receiving Water Sampling and Analysis Plan

The permittee is required to develop and implement a Sampling and Analysis Plan (SAP) to support sampling and analysis of selected parameters in the Outfall 001 effluent and receiving water in the vicinity of the discharge to support future permit development. The permittee must conduct four sampling events during the permit cycle and submit the results with the next application for reissuance. The list of parameters to be sampled and analyzed will include, but may not be limited to, the following:

- Ammonia,
- Arsenic,
- Copper,
- Manganese,
- Mercury,
- Nickel, and
- Zinc.

7.3.1 Sampling and Analysis Plan Requirements

The SAP must describe coordinated sampling of effluent and receiving water during the second and fourth year of the permit. Effluent water samples will be grab samples collected at the Outfall 001 compliance sampling location on the same day that receiving water samples are collected. Receiving water samples will be grab samples collected during ebb and flood tides at locations where the effluent and receiving water are completely mixed beyond the chronic mixing zone. The SAP must identify proposed sampling locations and predicted tidal conditions (ebb and flood) for each sampling event. Sampling events should be conducted to account for seasonal variability of the receiving water on a schedule approved by the Department. The sampling program shall use appropriate sample collection procedures, sample preservation, and testing methods to ensure samples are accurate and represent the characteristics of the sampled waters.

7.3.2 Submittals:

A SAP identifying proposed sample schedules, locations, collection procedures, sample preservation and testing methods shall be submitted for review and approval by Department permitting staff (APDES Oil & Gas Permitting Section) at least 90 days in advance of the initial testing event.

The permittee must contact DEC upon receipt of unusual results that may impact reissuance of the permit. A summary report SAP must be provided to DEC with an application for reissuance within 180 days prior to permit expiration.

7.4 Standard Conditions

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

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration, NMFS and the FWS if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies for ESA information. However, the Department voluntarily requested this information from these services to inform permit development.

In a letter dated May 9, 2014 NMFS responded that the following species are listed under the ESA and have some potential to be in the vicinity of the facility:

- Cook Inlet beluga whales (Delphinapterus leucas) are sometimes observed in water near Kenai and Nikiski and should be considered when evaluating the effects of this permit. The critical habitat for the Cook Inlet beluga whales covers 7,000 square kilometers (3,013 square miles) of marine environment including the waters surrounding the facility.
- The following fish species were identified as Evolutionarily Significant Units of Pacific salmon stocks listed as occurring within Alaskan waters, but as being highly unlikely to occur within the project area:
    - Lower Columbia River spring Chinook,
    - Upper Columbia River spring Chinook,
    - Lower Columbia River steelhead,
    - Upper Columbia River steelhead,
    - Puget Sound Chinook,
    - Snake River spring/summer Chinook,
    - Snake River fall Chinook,
    - Snake River basin steelhead, and
    - Upper Willamette River steelhead.

NMFS additionally noted that all marine mammals are protected under the Marine Mammal Protections Act and that the harbor porpoise (*Phocoena phocoena)* and harbor seal *(Phoca vitulina)* are regularly documented in and around the Kenai area.

In an email response dated September 23, 2013 FWS asked if there was a federal nexus (i.e. federal funding or permits involved in the reissuance of the permit) and indicated that projects

without a federal nexus are referred to their website at http://www.fws.gov/alaska/fisheries/endangered/ for additional technical assistance. The permit does not involve a federal nexus and the website was reviewed for additional ESA information. The short-tailed albatross (*Phoebastria albatrus)* and the Steller's eider (*Polysticta stelleri*) may occur in the vicinity but are not expected to be impacted by the discharge from the facility.

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. DEC is not required to consult with these federal agencies regarding EFH. However, the Department voluntarily requested this information for the vicinity of the facility on March 26, 2014. On May 9, 2014 NFMS replied that EFH has been designated in the project area for anadromous salmon.

8.3 Permit Expiration

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

9.0 References

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11. ATSDR (Agency for Toxic Substances and Disease Registry). 2009. *Evaluation of Seafood and Plant Data Collected from Cook Inlet near the Native Villages of Port Graham, Nanwalke, Seldovia, and Tyonek, Alaska*. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Atlanta, GA.
12. Kent & Sullivan, Inc. for Tesoro Alaska Company. *2005 Ambient Sediment Sampling Report, NPDES Monitoring Program Tesoro Alaska Company Refinery, NPDES Permit no. AK-0000-84-1*.
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14. 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.
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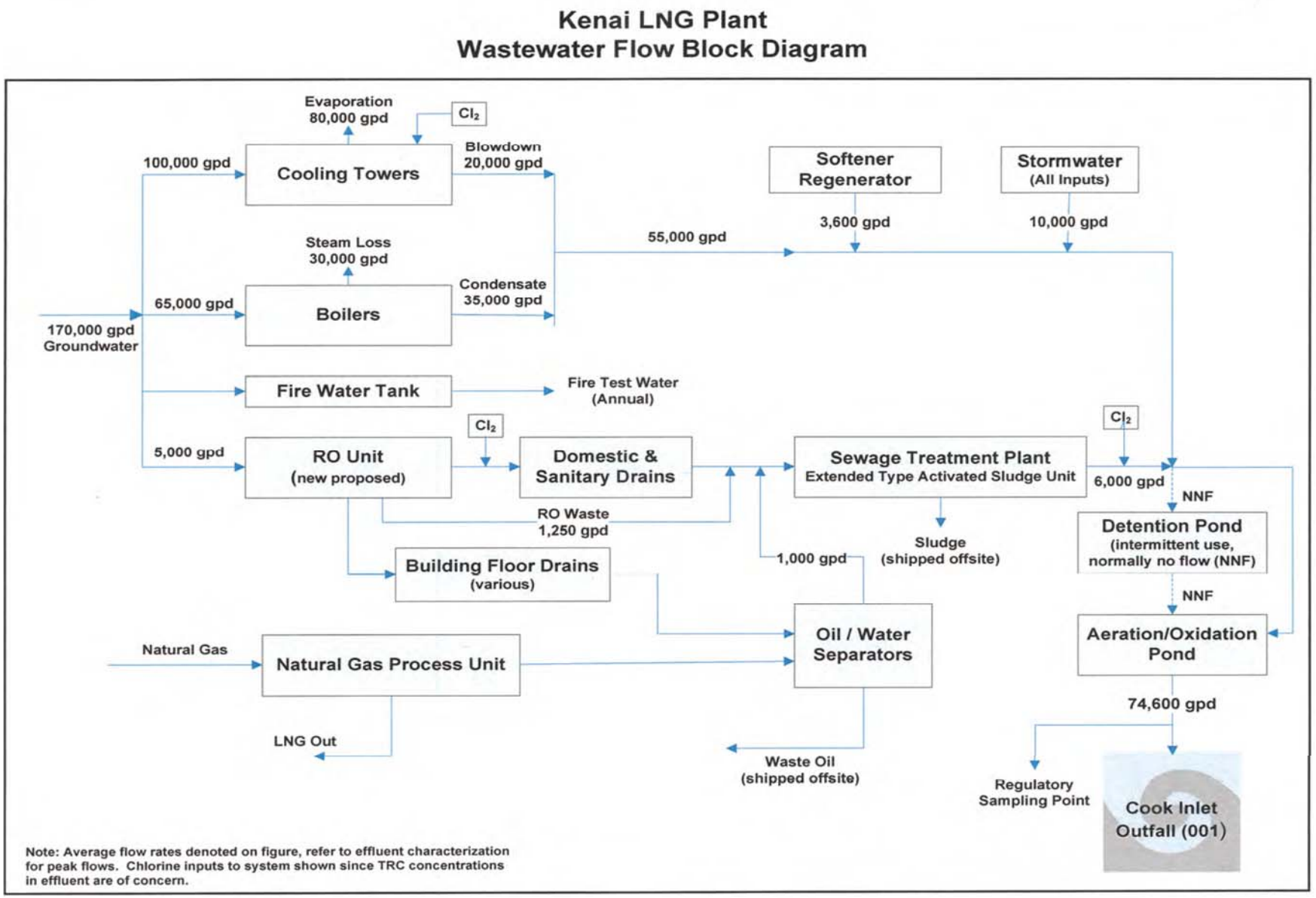
APPENDIX A. FIGURES

Figure 1: ConocoPhillips Alaska Inc. – Kenai Liquefied Natural Gas Facility Map

Figure 2: ConocoPhillips Alaska Inc. – Kenai Liquefied Natural Gas Facility Process Flow Diagram



APPENDIX B. BASIS FOR EFFLUENT LIMITATIONS

The Clean Water Act (CWA) requires that the effluent limitations for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are established by the Environmental Protection Agency (EPA) for many industries and are based on available pollution control technology. The EPA has not promulgated Effluent Limit Guidelines (ELGs) for Liquefied Natural Gas (LNG) facilities. Therefore, per Title 40 of the Code of Federal Regulations, Part 125 Section 3(c)(2) (40CFR §125.3(c)(2)), the Alaska Department of Environmental Conservation (DEC or Department) has the authority to use best professional judgment (BPJ) on a case-by-case basis under Section 402(a)(1) of the CWA to determine appropriate TBELs.

B.1 Technology-Based Effluent Limitations

The ConocoPhillips Alaska, Inc. Kenai LNG Facility (facility) discharges a mixture of domestic and non-domestic wastewater. The existing permit developed mass-based TBELs using case-by-case BPJ for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS). The Department is developing concentration-based TBELs using case-by-case BPJ citing minimum treatment requirements per Title 18 of Alaska Administrative Code (AAC), Chapter 72 – Wastewater Disposal and, Part 50 (18 AAC 72.050) and applying them to the commingled domestic and non-domestic wastewater. These concentration-based limits are equivalent to the mass-based limits in the existing permit when considering average design flow rate 0.17 million gallons per day (MGD). Minimum treatment is defined as a secondary treatment as attaining certain concentrations of BOD_5 and TSS, and a pH that must be greater or equal to 6.0 and less than or equal to 9.0. Per
18 AAC 72.990(59), secondary treatment attains 30 milligrams per liter (mg/L) for BOD_5 and TSS on a monthly average and 60 mg/L as a maximum daily. The Department adopts these BPJ TBELs excluding the average weekly values of 45 mg/L for BOD_5 and TSS in the definition because monthly average and maximum daily limits are sufficient to control these pollutants in the discharge. Review of existing effluent data indicates that these concentration limits are attainable.

The existing permit includes TBELs for fecal coliform (FC) bacteria of 200 FC per 100 milliliters (FC/100 ml) as a weekly average and 400 FC/100 ml for a daily maximum. The justification for this TBEL based on BPJ is not known but may be based on meeting water quality criteria for secondary contact. This TBEL is included for comparison with WQBELs developed for FC bacteria.

For non-domestic sources in the discharge, TBELs are being established based on BPJ, specifically for oil and grease (O&G). The basis for the TBEL based on BPJ is the existing permit and a comparison to 40 CFR 419 Petroleum Refinery Point Source Category. Specifically, the contaminated storm water Section 419.12(e)(2) that establishes an instantaneous maximum limit of 15 mg/L. The existing permit established similar, but more stringent, TBELs for O&G using a mass-based limits for an average design flow of 0.17 MGD along with BOD_5 and TSS. Calculating the limits in the existing permit based on concentration using this flow rate results in a maximum daily limit of 10 mg/L and an average monthly limit of 5 mg/L. The Department has reviewed existing data and evaluated the source of constituents in the wastewater and concluded that mass-based limits are not directly linked to a measure of facility operations and can be effectively controlled using other units of measure. Per 18 AAC 83.540, the Department is establishing concentration-based limits for BOD5, TSS, and O&G that are equivalent to the existing mass-based limits calculated using 0.17 MGD. In order to ensure dilution is not used to meet

concentration limits, a maximum daily flow limit of 0.35 MGD is established based on maximum capacity of the system and used as the critical discharge flow rate in the mixing zone analysis. The flow limit is based both on throughput and tied to any WQBELs established in the permit.

B.1.1 Domestic Wastewater Secondary Treatment TBELs

As stated previously, the existing permit established mass-based limits that are equivalent to concentration levels defined by minimum treatment per 18 AAC 72.050. Review of concentration data during the last five years of operation demonstrate that concentration-based limits are as attainable as the mass-based limits. The Department is adopting TBELs using case-by-case BPJ BOD_5, TSS, and pH citing 18 AAC 72.990(59) definitions for secondary levels of treatment. The TBELs applicable to Outfall 001 are listed in Table B-1.

Table B- 1: TBELs Established on Case by Case BPJ

Parameter	Average Monthly	Average Weekly	Maximum Daily	Range
BOD_5	30 mg/L	---	60 mg/L	---
TSS	30 mg/L	---	60 mg/L	---
FC bacteria	---	200 FC/100 ml	400 FC/100 ml	---
pH	---	---	---	6.0 – 9.0 Standard Units (SU)

B.2 Water Quality-Based Effluent Limitations

B.2.1 Statutory and Regulatory Basis

The 18 AAC 70 - Alaska Water Quality Standards (WQS) specify the degree of degradation that may not be exceeded in a waterbody as a result of human actions and prohibits conduct that causes or contributes to a violation of the WQS. Per 18 AAC 70.435, effluent limitations in a permit must control all pollutant parameters that the Department determines are or may be discharged at a level that will cause, have a reasonable potential to cause, or contribute to an excursion above any state WQS. The Department must conduct this reasonable potential analysis (RPA) using procedures that account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving waterbody. The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

B.2.2 Reasonable Potential Analysis

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration for each pollutant of concern downstream of where the effluent enters the receiving waterbody. For marine receiving waterbodies influenced by tidal action, downstream is considered as the direction of tidal flow. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the receiving waterbody concentration. If the projected concentration of the receiving waterbody at the boundary of the mixing zone exceeds the numeric criterion for a limited parameter, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a WQBELs must be developed. Reasonable potential was determined for TRC at both the acute and chronic mixing zone boundaries. The RPA is presented in Appendix C.

B.2.3 Water Quality-Based Effluent Limits

B.2.3.1 Total Residual Chlorine (TRC)

The RPA revealed that only TRC has reasonable potential to exceed water quality criteria at the boundary of the respective acute and chronic mixing zones requiring development of WQBELs. Given that there are no other parameters affected, the TRC maximum daily limit (MDL) is based on maximum expected effluent concentration equaling 1,240 µg/L, which also equals the wasteload allocation (WLA). For the calculated coefficient of variation (CV) of 0.7267 and an assumed four samples per month, the average monthly limit (AML) for TRC is 565 µg/L. The following steps were conducted for calculation of the AML per the EPA Technical Support Document, Part 5.4 Permit Limit Derivation and the DEC *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014.*

- **Determine Long Term Averages (LTAs):** The LTAs are calculated as follows:

  $LTA_{acute} = WLA\ [\exp(0.5\sigma^2 - Z_{95}\sigma)]$, where $\sigma^2 = \ln(CV^2 + 1)$

  $WLA = 1{,}240\ \mu g/L$, $CV = 0.727$, $Z_{95} = 1.645$, and $\sigma^2 = 0.4243$

  LTA_{acute} = 336.94 µg/L

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

  $WLA = 1{,}240\ \mu g/l$, $CV = 0.727$, $Z_{95} = 1.645$, and $\sigma_4^2 = 0.1241$

  $LTA_{chronic}$ = 581.44 µg/L

- **Determine the most limiting (lowest) LTA**

  LTA_{acute} is most limiting = 336.94 µg/L

- **Calculate the MDL and AML**

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

  $CV = 0.727$, $Z_{99} = 2.326$, and $\sigma^2 = 0.4243$

  MDL = 1,240 µg/L

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

  $CV = 0.727$, $Z_{95} = 1.645$, and $\sigma_4^2 = 0.1241$

  AML = 565 µg/L

B.2.3.2 pH

The parameter pH is a parameter of concern (POC) because it is a limit in the existing permit and is included in the state's WQS. An RPA was not conducted for pH because the permit will require the discharge to meet applicable criterion for marine water uses at the end of pipe.

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Per WQS, the most stringent marine water criteria for pH relates to the use of water for the supply for aquaculture and for growth and propagation of fish, shellfish, other aquatic life, and wildlife; and growth and propagation of fish, shellfish, other aquatic life, and wildlife. These standards state that pH "May not be less than 6.5 or greater than 8.5, and may not vary more than 0.2 pH unit outside of the naturally occurring range."

B.2.3.3 Temperature

Per Fact Sheet Section 2.3, temperature is a POC requiring a mixing zone but a limit is not required. The marine water quality criterion is 15 degrees Celsius (C °) and the summer temperature 20.5 C °. Given there is considerable temperature data indicating there would be no potential to exceed the criterion after dilution, an RPA was not conducted for temperature.

B.2.3.4 Fecal Coliform Bacteria

Per Fact Sheet Section 2.3, FC bacteria is a POC as a TBEL in the existing permit. The applicant did not request a mixing zone for FC bacteria and review the data indicates the discharge may exceed the 30-day geometric mean water quality criteria (14 FC/100 mL) based on a single monthly sample. However, the data indicates that maximum criteria (40 FC/100 mL) would not be exceeded and collecting additional samples to comply with the 30-day geometric mean criteria is attainable. Therefore, the criteria is used as the monthly and daily maximum limits for comparing to TBELs.

B.2.4 Selection of Most Stringent Limitations

B.2.4.1 Biological Oxygen Demand and Total Suspended Solids

The permit proposes concentration-based TBELs for BOD_5 and TSS, 30 mg/L average monthly and 60 mg/L maximum daily. There were no corresponding WQBEL to compare these TBELs with for final selection.

B.2.4.2 Oil and Grease

The permit proposes concentration-based TBELs for O&G, 5 mg/L average monthly and 10 mg/L maximum daily. There were no corresponding WQBEL to compare these TBELs with for final selection.

B.2.4.3 pH

The TBEL for pH based on 18 AAC 72 is between 6.0 and 9.0 SU. The WQBEL based on WQS is between 6.5 SU and 8.5 SU. The more stringent WQBELs shall be the permit limit and will apply at the end-of-pipe.

B.2.4.4 Fecal Coliform Bacteria

Comparing the existing TBELs with the end of pipe WQBEL for FC bacteria, the WQBEL is more stringent. Therefore, the permit includes a maximum daily maximum limit of 40 FC/100 ml and an average monthly limit of 14 FC/100 ml. The monthly average will be based on a geometric mean.

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B.2.4.5 Total Residual Chlorine

There were no TBELs in the existing permit to compare to the WQBEL for TRC. Therefore, the maximum daily limit is 1,240 mg/L the monthly average limit is 565 mg/L for TRC.

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APPENDIX C. REASONABLE POTENITAL DETERMINATION

The Alaska Department of Environmental Conservation (Department or DEC) determined if the permitted discharge has reasonable potential (RP) to cause or contribute to a violation of Alaska Water Quality Standards (WQS) in accordance with the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control,* 1991(*TSD*) and the DEC *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30*, *2014 (RPA and Limit Guide)*.

The Department determines RP by comparing the maximum projected receiving waterbody concentration at the boundary of the acute or chronic mixing zone boundary water quality criteria for each parameter of concern (POC). RP to exceed exists if the projected receiving waterbody concentration at the boundary of the respective mixing zone exceeds the applicable criteria for the POC and a water quality-based effluent limit must be included in the permit per (18 AAC 83.435). This Appendix discusses how the maximum projected receiving waterbody concentrations were determined for this discharge to marine waters and summarizes the calculations. To illustrate the procedures and calculations, total residual chlorine is used as this was the only POC that resulted in RP.

C.1 Mass Balance

For a discharge of a parameter at the maximum expected concentration (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.

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.

Definition:

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

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

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

Rearranging Equation C-3 to solve for CRWC yields:

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

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

C.2 Maximum Projected Effluent Concentration

To calculate the MEC, the Department uses the *RPA and Limit Guide* that modifies procedures in *TSD* section 3.3. Specifically, DEC uses a 95th confidence interval with a 99th percentile to determine a reasonable potential multiplier (RPM). 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 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 data points are available, the *TSD* recommends using assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

The CV is defined as the ratio of the standard deviation of the data set to the mean.

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

For data sets with a Normal, Gamma, or Non-parametric (Kaplan-Meier) distribution:

$$CV = \frac{\hat{\sigma}}{\widehat{\mu_n}} \qquad \text{(Equation C-5)}$$

Where: $\hat{\mu_n}$ = estimated mean = $\Sigma[x_i] / k$, $1 \leq i \leq k$
$\hat{\sigma^2}$ = estimated variance = $\Sigma[(x_i - \hat{\mu})^2] / (k - 1)$, $1 \leq i \leq k$
$\hat{\sigma}$ = estimated standard deviation = $(\sigma^2)^{1/2}$
k = number of samples

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

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

Where: $y_i = \ln(x_i)$ for $i = 1, 2, \ldots, k$
$\hat{\mu_y}$ = mean = $\Sigma(y_i) / k$
$\hat{\sigma_y}^2$ = variance = $\Sigma [(y_i - \hat{\mu_y})^2] / (k - 1)$
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 maximum reported effluent concentration at the 95% confidence level. The general equation is as follows:

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

The specific equation depends on whether the data follows a lognormal distribution (Lognormal or Log-Ros) or normal distribution (Normal, Gamma, or Non-parametric). For the lognormal distribution, Equation C-7 becomes:

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$$RPM = \frac{\widehat{\mu_n} + z_{99}\,\hat{\sigma}}{\widehat{\mu_n} + p_n\,\hat{\sigma}} \qquad \text{(Equation C-8)}$$

For the lognormal distribution, Equation C-7 becomes:

$$RPM = \frac{\exp(z_{99}\,\hat{\sigma}_y - 0.5\hat{\sigma}_y^2)}{\exp(p_n\,\hat{\sigma}_y - 0.5\hat{\sigma}_y^2)} \qquad \text{(Equation C-9)}$$

In both Equations C-8 and C-9, the percentile represented by the maximum observed effluent concentration (MOC) is:

$$p_n = (1 - confidence\ level)^{1/n} \qquad \text{(Equation C-10)}$$

Where,

p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 0.95 for this analysis

Although it is possible to have an RPM less than one with large data sets, the Departments policy is set the minimum RPM at one. The MEC is determined by multiplying the MOC by the RPM:

$$\text{MEC} = (\text{RPM}) \times (\text{MOC}) \qquad \text{(Equation C-11)}$$

Either the acute or chronic RWC at the boundary of an authorized mixing can be calculated using Equation 4 and the MEC in Equation 11.The receiving water concentrations at the edge of the mixing zones are then calculated as follows:

$$\text{RWC}_{\text{acute,chronic}} = \frac{\text{MEC} - \text{AWC}}{\text{DF}_{\text{acute,chronic}}} + \text{AWC} \qquad \text{(Equation C-12)}$$

Where:

$\text{RWC}_{\text{acute,chronic}}$ = recieving water concentration at the boundary of the acute or chronic mixing zone, and
$\text{DF}_{\text{acute, chronic}}$ = 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 RP is determined for that parameter and a water quality-based effluent limit (WQBEL) must be developed for that parameter.

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Example Calculations for TRC

The mixing zone analysis identified TRC as the driving parameter for both the acute and chronic mixing zones. The Department authorizes an acute mixing zone with a DF of 95 and a chronic mixing zone with a DF of 165. An RPA was conducted for all POC's to determine which parameters may require WQBELs. The mixing zone analysis and RPA considered facility discharge data collected from May 2008 through February 2015 as summarized below. The following example uses the analysis for TRC given this was the only parameter determined to have RP and the boundary of either mixing zone.

Number of effluent data (n) = 2318
MOC = 1240 µg/L
The data was found to be non-parametric with
$\hat{\mu_n}$ = 249.3, and
$\hat{\sigma}$ = 64.88

For a data set containing 2318 TRC samples:

$$p_n = p_{2318} = (1 - 0.95)^{1/2318}$$
$$= 0.998$$

Because the data was found to be non-parametric, Equation C-8 applies to the RPM calculation.

$$RPM = \frac{\hat{\mu_n} + z_{99}\,\hat{\sigma}}{\hat{\mu_n} + p_n\,\hat{\sigma}}$$

$Z_{99} = 2.326$ for the 99 percentile (from z-calculator)

$Z_{99.8} = 2.881$ for the 99.8 percentile (from z-calculator)

Therefore,

RPM = (249.3 + 2.326 x 64.88)/(249.3 + 2.881 x 64.88) =

RPM = 0.918: Therefore use the minimum RPM value = 1.0.

Using Equation C-12 for acute and chronic TRC,

MEC = (1.0)(1240 µg/L) = 1240 µg/L (maximum projected effluent concentration),

AWC = 0

For DF_{acute} = 95:

$$RWC_{acute} = \frac{1240\ ug/L - 0\ mg/L}{95} + 0\ ug/L = 13.05\ \mu g/L$$

For $DF_{chronic}$ = 165:

$$RWC_{chronic} = \frac{1240\ ug/L_e - 0\ ug/L}{165} + 0\ ug/L = 7.52\ \mu g/L$$

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.

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

Acute 13.05 µg/L > 13 µg/L (acute criteria) **YES**, there is a reasonable potential to violate

Chronic: 7.52 µg/L > 7.5 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 TRC is required. See Appendix B for development of this limit.

C.3 RP Summary for all POC's

An RPA was conducted for each of the 10 POCs identified in Section 2.3 using the acute and chronic dilution factors authorized in the mixing zones and the respective acute, chronic and human health criteria for the POC. Of the 10 POCs, copper, zinc, and TAqH were found to have a lognormal distribution, mercury and nickel had a gamma distribution, and ammonia, TRC, and FC bacteria were found to be normally distributed. The remaining two POCs, manganese and arsenic had too few data points to evaluate a distribution so these were evaluated as lognormal using the default CV of 0.6. Table C-1 summarizes the results of the RPA.

Table C- 1: Reasonable Potential Summary

POC	MOC	n	AWC	CV	RPM	MEC	Water Quality Criteria (Total Recoverable)			RWC		RP
							Acute	Chronic	Human Health	Acute	Chronic	
Ammonia as N (mg/L)	1.28	28	0.18	0.432	1.3	1.66	8.1	1.2	- -	0.20	0.19	No
TRC (ug/L)	1240	23 18	0	0.746	1.0	1240	13	7.5	- -	**13.1**	**7.52**	**YES**
Copper (ug/L)	41.0	11	0.56	0.198	1.4	56.3	5.8	3.7	- -	1.1	0.9	No
Mercury (ug/L)	1.15	11	0.008	1.210	2.0	2.36	1.8	0.94	0.051	0.032	0.022	No
Nickel (ug/L)	8.0	11	1.04	0.412	1.5	12.1	72.7	6.9	4600	1.2	1.1	No
Zinc (ug/L)	81.1	11	12.9	0.264	1.5	123	95.1	86.1	69000	14.1	13.6	No
TAqH (ug/L)	9.3	26	2.25	1.139	2.7	25.2	15	NA	- -	2.5	2.4	No
FC Bacteria (#/100 mL)	20	17 3	3	2.970	1.1	21.7	40	20	- -	3.2	3.1	No
Manganese (ug/L)	262	8	15	0.6	2.8	726	- -	- -	100	22.5	19.3	No
Arsenic (ug/L)	134	8	5.4	0.6	2.8	371	68.6	36.1	- -	9.3	7.6	No

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APPENDIX D. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria presented in the Alaska Administrative Code (AAC) at 18 AAC 70.240 through 18 AAC 70.270 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 Section 4.3.1	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y

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 at Section 4.3 Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 4.3.2	18 AAC 70.240 (a)(3)	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 70.255(f)	
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 4.3.3	18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.3	18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**	Yes Fact Sheet Section 4.3.3	18 AAC 70.250(a)(3)	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 4.3.3	18 AAC 70.250(a)(4)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 4.3.4	18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 4.3.4	18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.5	18 AAC 70.255 (h)	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 4.3.6	18 AAC 70.250 (a)(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 4.3.6		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 4.3.6	18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 4.3.6	18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.6	18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…			

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7		Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.250(b)(1)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 4.3.7	18 AAC 70.255(b)(2)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
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 4.3.8 and Section 8.0	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y