ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – FINAL

Individual Permit: AK0000841 - Tesoro Alaska Petroleum Company Kenai Refinery

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

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Anchorage, AK 99501

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

TESORO ALASKA PETROLEUM COMPANY LLC

For wastewater discharges from

Kenai Refinery
Mile 22.5 Kenai Spur Highway
Kenai, AK, 99611

Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual permit AK0000841 - Tesoro Alaska Petroleum Company LLC, Kenai Refinery (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 Kenai Refinery 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, and
- proposed monitoring requirements in the Permit.

Appeal Process

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

Director, Division of Water

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

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

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

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

Commissioner

Alaska Department of Environmental Conservation
410 Willoughby 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 Rd. - Suite 11 Soldotna, AK 99669 (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:	Tesoro Alaska Petroleum Company LLC, Kenai Refinery
APDES Permit Number:	AK0000841
Facility Location:	Mile 22.5 Kenai Spur Highway, Kenai, AK 99611
Mailing Address:	P.O. Box 3369, Kenai, AK 99611
Facility Contact:	Mr. Gerald Warrick, Environmental Compliance Administrator

Outfall Location

Outfall	Description	Latitude	Longitude
001	Refinery Effluent	60.677704° North	151.395501° West

Outfall locations and waste stream sources are shown on Figure 1 - Facility Map, Figure 2 – Wastewater Line Diagram, and Figure 3 – Secondary Containment Areas.

1.2 Authority

On October 31, 2008, the United States (U.S.) Environmental Protection Agency (EPA) approved an application from the State of Alaska to administer the National Pollutant Discharge Elimination System (NPDES) Program in the State of Alaska. The state program is known as the APDES Program and regulates the discharge of wastewater to waters of the U.S. under the jurisdiction of the State. 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 became APDES permits. Accordingly, the Alaska Department of Environmental Conservation (Department or DEC) is now the APDES permitting authority for regulating the discharges associated with individual permit AK0000841 Tesoro Alaska Company, LLC (Tesoro) Kenai Refinery (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 unless authorized by an APDES permit. The proposed individual permit reissuance is being developed per 18 AAC 83.115 and 18 AAC 83.120. A violation of a condition contained in the permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statute (AS) 46.03.020(13).

1.3 Permit History

Based on readily available records for the Tesoro Refinery wastewater permitting action, a permit chronology is presented as follows:

1970s: The first Permit issuance occurred sometime in the 1970s.

1991: The Permit was reissued March 19, 1991 with an expiration date of April 17, 1996.

1995: Tesoro submitted a timely application for permit reissuance to EPA on September 28, 1995 and EPA administratively extended coverage under the expired Permit until EPA reissued the Permit.

2001: The existing Permit was issued to Tesoro on May 1, 2001 and became effective June 4, 2001. The existing Permit expired June 5, 2006

2006: EPA received a timely application for permit reissuance on January 3, 2006. On May 19, 2006 EPA issued administrative extension under the existing Permit until a new Permit could be reissued.

2012: The authority to administer APDES permits for oil and gas facilities in State waters in Alaska transferred from EPA to DEC on October 31, 2012.

2013: Tesoro submitted an initial revised application to DEC on June 17, 2013 and several revisions since based on coordination and requests for additional information by DEC. The most recent submittal included updated effluent characterization data through March 2016.

2.0 BACKGROUND

2.1 Facility Information

The Tesoro Kenai Refinery is located on the eastern shore of Cook Inlet at Mile 22.5 on the Kenai Spur Highway, approximately 11 miles north of the City of Kenai. The Refinery has a rated processing capacity of 72,000 barrels of crude oil per day. Refined petroleum products are delivered to customers via a common-carrier pipeline linked to the Port of Anchorage and Anchorage International Airport, through terminals in Kenai and Anchorage, and via the marine terminal located adjacent to the refinery.

Crude oil is delivered to the marine terminal by tankers, pipelines, and trucks where it is pumped into onsite storage tanks to await processing at the refinery. The crude is processed in the crude unit to separate fuel gas, fuel oil, liquefied petroleum gas (LPG), naphtha, light straight run, and diesel. LPG, naphtha, and light straight run are then fed through the LPG unit, reformer unit, hydrocracker unit, vacuum unit, diesel desulfurization unit, and isomerization unit to produce finished fuels including propane, fuel gas, gasoline, jet-A fuel, diesel, and bunker fuel. The refinery also produces asphalt during the summer months. A chronological history of facility construction and improvements follows:

1969: Refinery begins operation with an original capacity at the crude unit of 17,500 barrels/day (BPD).

1981: Hydrocracker unit begins operation. This unit produces jet fuel, ultra-low sulfur diesel fuel #1, motor gasoline blend components, and LPG for processing in the de-isobutanizer unit.

Sulfur unit begins operation to convert hydrogen sulfide into elemental sulfur.

1984: Refinery processing capacity increases to 72,000 BPD with a substantial increase in the production of #6 fuel oil.

Hydrocracker unit expanded.

Amine unit/sour water stripper unit installed. This unit, in conjunction with the sulfur recovery unit, "scrubs" hydrogen sulfide from transportation fuel components and transports the hydrogen sulfide to the sulfur recovery unit for further processing.

1985: Hydrogen unit begins operation with a capacity to produce 12.8 million standard cubic feet per day of high purity hydrogen. This unit added to supply additional hydrogen for the 1984 hydrocracker expansion.

Sulfur unit expanded

Mid 1980s: Rotating Biological Contactors (RBCs) added to industrial wastewater treatment system.

1993: De-isobutanizer (DIB) unit begins operation. This unit separates pentanes, iso-butanes, and normal butanes from the mixed LPG product resulting in improved quality of motor gasoline and allows refinery to double the maximum processing rate of LPG with tighter quality control specifications.

1994: Vacuum distillation unit begins operation increasing operating capacity of 24,500 BPD. Its addition reduces the volume of #6 fuel oil produced and has the capability to produce asphalt.

1996: Facility commences seasonal asphalt production for sale during the road construction season.

1997: Hydrocracker and sulfur units again expanded.

1998: Filtration unit added to industrial wastewater treatment system, but shortly thereafter removed from service due to inoperability.

2006: Sulfur unit again expanded.

2007: Diesel desulfurizing unit installed. This unit uses hydrogen, under high pressure and a temperature catalyst, to remove organic sulfur from diesel products. The sulfur is converted into hydrogen sulfide, scrubbed in the amine unit, and processed in the sulfur recovery unit.

2010 The megasplitter was installed in the Crude Unit to meet EPA standards for lower benzene concentrations in gasoline.

2011: DIB rerated.

2.1.1 Wastewater Sources

Refinery operations create wastewater sources that are continuous (e.g., waste sources from refinery process units), continuous but diminishing over time (e.g., contaminated groundwater treatment system), or intermittent. Intermittent sources include wastewater derived from periodic maintenance of process units (e.g., turnaround wastes), precipitation events (e.g., contaminated runoff from process area containments), or water contained in pipelines, tanks, or impoundments (e.g., hydrostatic test water) or petroleum contaminated water (e.g., spills or monitoring well purge water). Figure 2 – Wastewater Line Diagram depicts the general source contribution and the refinery wastewater treatment systems (RWTS) in place at the refinery.

Oil refining processes generate liquid waste streams that have come into contact with hydrocarbon process streams. As a result of contact with these streams, the liquid waste contain entrained oil, hydrocarbons, and metals that become dissolved in the water due to contact with the oil. Process waste streams from each refinery process unit are discharged to a common collection system for treatment. Periodic maintenance and cleaning is performed at process units (refinery turnaround) that generates small volume, high strength waste streams that are typically contained and slowly discharged to the collection system to avoid organic overloading the RWTS. Some of these turnaround waste streams have chemical constituents that require additional monitoring and unique permit stipulations (e.g., catalyst regeneration).

Catalyst regeneration at the facility typically occurs less than once per year. The regeneration process takes several days, and is a batch process with average discharges of approximately 10 gallons per minute (gpm). The catalyst regeneration process involves combustion that is known to produce dioxin (2,3,7,8-TCDD), which is treated with activated carbon and filtration. The existing Permit requires dioxin monitoring and reporting of the catalyst regeneration waste as an internal source contributing to the overall refinery discharge.

Precipitation and snowmelt collected within the refinery process unit containment areas is considered contact storm water (e.g., contaminated runoff) and is also collected for treatment in the RWTS. However, precipitation that falls outside the process unit areas is not considered contact storm water and is diverted to storm water conveyances and discharged without treatment. Tesoro also manages accumulated storm water in secondary containment areas (SCAs) from precipitation and snowmelt events. If the water in an SCA is observed to come into contract with petroleum, as determined by presences of an oily sheen, the water is diverted to the RWTS for treatment and discharged through the refinery outfall. If the SCA does not have a sheen, the water is considered storm water and pumped or drained to surrounding storm water conveyances.

Tesoro also discharges treated groundwater from a contaminated site located on the refinery and adjacent properties. Contaminated groundwater is treated using air stripping before being commingled in the RWTS. The existing Permit includes a daily maximum limitation of 5 micrograms per liter (μg/L) benzene as an internal outfall to the overall refinery discharge. Because the groundwater contamination appears to be nearing cleanup levels, the volume of this waste stream has diminished but authorization under the Permit for this wastewater still appears necessary. During the summer, commingling of treated groundwater upstream of the RBCs is beneficial as it helps to cool refinery wastewater prior to biological treatment. In the existing Permit, treated groundwater can be commingled either before or after the RWTS. Given the low volume of the treated groundwater and benefits of lowering refinery wastewater temperature in the summer, the applicant has elected to only commingle upstream of the RBCs thus eliminating the internal outfall as the waste source is treated by the RBC along with the other sources treated by the RWTS.

Also included in the existing Permit are sources of contained water from hydrostatic testing of pipelines associated with projects at the refinery and other sources originating from the neighboring Kenai Pipeline (KPL) facility. The KPL facility serves the refinery by transferring incoming crude oil from pipelines, trucks, and tankers. Waste sources from KPL include, but may not be limited to, tank draws, hydrostatic test water, spill response water, contaminated groundwater from monitoring wells, washdown water from cleaning pipeline pigs and related equipment, and seasonal storm water accumulations. These occasional waste water sources can be included with the other waste streams discharged through the RWTS.

2.1.2 Refinery Wastewater Treatment System

The RWTS meets the model treatment technology presented in the development document for Code of Federal Regulations (CFR) Chapter 40, Part 419 - Petroleum Refining Point Source Category (40 CFR 419). Model treatment includes flow equalization, initial oil and solids removal, advanced oil and solids removal, biological treatment, and other final polishing steps. The RWTS consists of six American Petroleum Institute (API) gravity separator/ skimming tanks, a coalescing plate interceptor (CPI), dissolved air flotation (DAF) systems, two rotating biological contactors (RBCs), three ponds (Polishing Ponds 2, 3, and 4), and an acid injection system to control pH during the summer when the ponds have high algal activity (See Figure 4 – RWTS).

Algae growth has been determined to cause elevated concentrations of total suspended solids (TSS) and wide fluctuations of pH during the summer that makes meeting pH and TSS limits difficult to achieve. Algae causes a diurnal fluctuation in pH due to production of oxygen and consumption of carbon dioxide (increases pH) to support cell growth in daylight followed by consumption of oxygen and production of carbon dioxide (decreases pH) during darkness. To control high pH, Tesoro injects acid directly into the last cell of the pond to reduce pH levels prior to discharge. TSS increases in the effluent as a result of algae growth that increases cell mass and this has resulted in difficulties meeting TSS limits during the summer. Therefore, the existing Permit includes higher limits for TSS during the months of June thru September.

After final treatment, the refinery effluent is discharged to Cook Inlet via Outfall 001. Outfall 001 consists of a single eight inch diameter port mounted on a pier owned by Kenai Liquefied Natural Gas Facility with its discharge outlet located approximately 1,000 feet from the shoreline (See Appendix A, Figure 1).

2.2 Effluent Characterization

2.2.1 Mass-Based Characterization

The results of maximum daily loadings reported on Discharge Monitoring Reports (DMRs) submitted from February 2013 through March 2016 were reviewed to characterize the effluent and compare data with the maximum daily limits (MDLs) and average monthly limits (AMLs) in the existing Permit. Table 1 compares the DMR data with parameters limited in the existing Permit on a mass basis.

Table 1: Mass Based Characterization (February. 2013 through March 2016)

Mass Limit Parameter	Existing Limits[1]		Observed Range [2] (Low – High, Average)
	MDL	AML	
Ammonia (Total as NH_3)	143	65	20 - 63, 37
Five Day Biochemical Oxygen Demand (BOD_5)	314	173	14 – **374,** 83
Total Suspended Solids (TSS) - October to May	223	141	12 – 190, 51
TSS - June to September	349	223	70 - **267**, 176
Oil and Grease (O&G)	67	38	4 – 44**,** 15
Chemical Oxygen Demand (COD)	2,002	1,084	139 – 899, 341
Sulfide	2.05	0.91	< 0.001 – 0.09, 0.02
Phenolic Compounds	1.34	0.62	< 0.001 – 0.11, 0.036
Total Chromium	2.43	1.29	< 0.001 – 0.33, 0.051
Hexavalent Chromium	0.19	0.10	< 0.001 – 0.07, 0.022

Notes:
1. All units are pounds per day (lbs/day).
2. Reported values that exceeded existing effluent limits are shown in bold.

Based on the mass of parameters discharged, the characteristics of the refinery wastewater are consistently below mass loading limits in the existing Permit. The BOD_5 value of 374 occurred during turnaround and is not representative of typical BOD_5 loadings. Although there was one high value of TSS reported during the summer (267 lbs. /day), the discharge was still compliant with the existing Permit upon averaging weekly sample results (See Section 2.3.1).

2.2.2 Concentration Based Characterization

Although the majority of limits in the existing Permit are mass-based technology based effluent limits (TBELs), representative concentrations of water quality parameters is also necessary to evaluate water quality based effluent limits (WQBELs) in addition to TBELs. Concentration data from February 2012 through March 2016 are compared to State water quality criteria as summarized in Table 2.

Table 2: Concentration Based Characterization (February 2012 through March 2016)

Parameter	Units	Data Set	Water Quality Criteria			Observed Range (Low – High, Average)[1]
			Acute	Chronic	Human Health	
Temperature	Degrees Celsius (°C)	4	--	1° above ambient	--	**16.6 - 17.3, 16.9**
pH	SU	80	6.5 - 8.5 at all times			**4.7 – 9.0,** 7.8[2]
Ammonia - NH_3	Milligrams Per Liter (mg/L)	210	8.1 [3]	1.2 [3]	--	**1.4- 28, 12.7**
Total Residual Chlorine (TRC)	µg/L	4	13	7.5	--	< 10 – **60, 14**
Cyanide [4]	µg/L	11	1.0	1.0	220,000	**< 5.0 - 15.0, 7.1**
Phenolic Compounds	µg/L	37	--	--	4,600,000	< 1 - 60, 18
Sulfide	µg/L	214	--	2.0 [5]	--	< 1 - **34.0**, **4.4**
TAH	µg/L	211	--	10	--	0.41 - **487**, 4.3
TAqH	µg/L	209	--	15	--	0.01 - **487**, 3.5
Arsenic	µg/L	6	69	36	--	**87.3** – **157, 104**
Chromium VI	µg/L	48	1,108	50	--	< 1.0 - 30.0, 9.2
Copper	µg/L	11	5.8	3.7	--	1.08 – **31.7, 5.0**
Lead	µg/L	5	221	8.5	--	< 0.2 – 2.63, 0.61
Manganese	µg/L	5	--	--	100	**189** – **231, 204**
Mercury[5]	µg/L	4	2.1	1.1	0.051	0.043 **– 0.137, 0.077**
Nickel	µg/L	5	75	8.3	4,646	3.6 – 4.3, 3.9
Selenium	µg/L	5	291	71	11,022	19.6 – 22.7, 20.7
Zinc	µg/L	5	95	86	72,939	14.0 – 40.8, 21.4

Notes:

1. Values that exceed water quality criteria are presented in bold.
2. Median of pH is provided in lieu of average.
3. Ammonia – N water quality criteria are based on pH = 8.0 SU, temperature = 15° C, and salinity = 20 grams per kilogram.
4. Cyanide is measured as Weak Acid Dissociated (WAD).
5. Water quality criteria for sulfide is based on undissociated hydrogen sulfide while observed range is based on total sulfide data.
6. Mercury criteria and reported results are presented as total mercury.
7. Criteria and reported results for all metals other than mercury are presented as total recoverable units.

Those parameters presented in bold in Table 2 that exceeded state water quality criteria are designated as parameters of concern (POCs) and, with the exception of pH, sulfide, and temperature, were further evaluated per the Reasonable Potential Analysis (RPA) process summarized in Appendix C. In addition, WQBELs for ammonia, cyanide, phenolic compounds, and chromium were developed as part of this permitting action to compare to corresponding mass-based TBELs in Appendix B. Sulfide was not considered in the RPA and WQBEL evaluation due to lack of data correlating total sulfide measured in the effluent to the water quality criteria based on undissociated hydrogen sulfide.

2.2.3 Narrative Water Quality Criteria Characterization

The existing Permit includes a narrative limitation that the permittee shall not discharge any floating solids, visible foam in other than trace amounts, or oily wastes that produce a sheen on the surface of the

receiving water. The ability of the permittee to make observations of the receiving water surface is hindered by restricted access to the pier where the discharge occurs. DEC believes that it may not be necessary to observe the water surface to comply with narrative water criteria if it can be reasonably demonstrated that the narrative requirement can be met by conducting tests of the effluent prior to discharge. Therefore, DEC requested the permittee to characterize the effluent by conducting weekly observations at the point-of-discharge combined with concurrent Static Sheen Tests (EPA Method 1617) of the effluent after the last treatment step prior to discharge. Monitoring began in August 2015 with no visible floating solids, foam, or sheen being observed in any of the outfall monitoring events and no visible sheen was observed in any of the concurrent Static Sheen Tests.

2.2.4 Secondary Containment Area Wastewater Characterization

The facility discharges uncontaminated storm water accumulations from SCAs to surrounding storm water conveyances after verifying the absence of a visual sheen. If a sheen is observed, the contaminated SCA water is directed to the RWTS for treatment and discharged as part of the Outfall 001 effluent.

DEC requested the applicant to provide analytical results of SCA water for TAH, TAqH, and total organic carbon (TOC) to characterize the source during permit development. Water from ten SCAs was tested in November 2015 and all TAH and TAqH results were observed to be below detection limits. Water from the same SCAs was tested again in July 2016 and all TAH results were below detection limits and 8 of 10 results for TAqH were below detection limits. The two detectable TAqH results were 0.0618 μg/L and 32.6 μg/L. The high result was attributed to an associated repair of the SCA liner at the time of sampling and the other detectable result is well below the water quality criteria of 15 μg/L. Based on evaluation of the data, DEC has determined that the SCA water that does not have a sheen does not exceed water quality criteria and is appropriately characterized as storm water and the current disposal practices are appropriate.

2.2.5 Catalyst Regeneration Wastewater Characterization

The existing Permit requires monitoring of dioxin (2,3,7,8-TCCD) during catalyst regeneration operations, an operation that typically occurs approximately once per year during refinery turnaround. Review of DMRs from the previous permit cycle indicates that dioxin discharges have been reported three times: June 2012, September 2012, and May 2014. The results were reported as 1 picogram/liter (pg/L), 1pg/L, and 0.33 pg/L, respectively, and indicate the activated carbon and filter process used to treat catalyst regeneration wastewater is working effectively. The applicable water quality criterion for dioxin is 30 pg/L based on drinking water uses.

2.2.6 Whole Effluent Toxicity Characterization

The existing Permit requires semiannual monitoring of acute and chronic whole effluent toxicity (WET) to provide toxicity data for future permit development. DEC reviewed results of 10 recent sampling events (2011 through 2015) and the acute WET test results indicated the acute toxicity is low. The reported acute toxicity units (TU_a) were less than one in six of the results and ranged from 1.3 to 2.3 in the remaining four results.

18 AAC 70 – Alaska Water Quality Standards (WQS) do not include a criterion for acute toxicity to evaluate within the acute mixing zone (note that mixing zone regulations circa 2003
18 AAC 70.255(d) actually refer to the mixing area as “a smaller initial mixing zone” rather than

formally titling it an acute mixing zone) so it is not appropriate to consider acute WET results in the RPA. However, WQS establishes a chronic toxicity criterion of 1.0 chronic toxicity unit (TU_c) that must be met within the boundary of the chronic mixing zone per 18 AAC 70.030. If there is reasonable potential for the chronic criterion to be exceeded, or contribute to an exceedance, at the boundary of the mixing zone the Permit must include a limit for chronic toxicity per 18 AAC 70.030 and 18 AAC 83.435(e).

The Department reviewed chronic WET results during the same period as the acute. In all but one result the 25 % inhibition endpoint was not observed in the highest dilution tested (7.2 %) resulting in TU_c being less than 13.9. Higher dilutions were needed to observe toxicity endpoints in these tests. The one detectable result occurred when the no observed effect concentration (NOEC) was observed at the second highest dilution of 3.6 % resulting in a TU_c of 27.8, which is still below the toxicity trigger of 57 (critical dilution of 1.8 %) in the existing Permit that was set by the minimum effluent dilution achieved in the mixing zone (18 AAC 70.030).

DEC has become aware that when dilution series are prescribed to be concentric around a toxicity trigger (two dilutions above and below the critical dilution), the dilution series is not necessarily designed to capture the actual effluent toxicity endpoints. If endpoints are not observed, the information obtained may not ultimately be useful in evaluating effluent toxicity. This condition is present in the current data that reflects a lack of observed endpoints in the chronic WET results; only one test during the period of review resulted in an observation of an inhibition endpoint. Considering there is only one detectable chronic toxicity result, conducting an RPA with this data is challenging. In order to assess whether there is reasonable potential, DEC assumed a default coefficient of variation of 0.6 for the 10 samples evaluated resulting in an approximate reasonable potential multiplier of 2.5. This relates to a maximum expected TU_c of 69.5 that, when considering authorized dilution in the chronic mixing zone, (dilution factor 95) is projected to be 0.73 TU_c at the boundary of the chronic mixing zone. Therefore, because the projected TU_c at the boundary of the chronic mixing zone is less than one, there is no reasonable potential for chronic WET to exceed, or contribute to an exceedance, of the chronic toxicity criterion and a chronic WET limit is not required. However, a refined WET monitoring program appears appropriate given the above synopsis.

2.3 Compliance History

2.3.1 Limit Exceedances

A review of facility compliance from February 2012 through March 2016 was conducted to evaluate compliance history of the existing Permit. The review reveals that the facility experienced two effluent exceedances during this time period as summarized below:

- The April 2014 DMR reported a minimum pH value of 4.7 which exceeded the authorized minimum of 6.5. However, this exceedance did not persist more than 60 minutes and was not considered a violation.
- The April 2012 DMR reported a maximum BOD_5 discharge of 374 lb/day which exceeded the authorized maximum of 314 lb/day. The high BOD_5 loading was attributed to turnaround activities being conducted at the time of sampling.

2.3.2 Reporting Violations

A review of reporting violations for the same time period found no reporting violations by the permittee.

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 TBELs or WQBELs.

3.1.1 TBEL Evaluation

As discussed in Appendix B, TBELs are either set using case-by-case best professional judgement (BPJ) or set via EPA rule makings in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment achievable in selected industries using available treatment technology. Mass-based ELGs applicable to the petroleum refining industry are promulgated in 40 CFR 419.The Tesoro Kenai refinery produces petroleum products by use of topping and cracking processes addressed under 40 CFR 419, Subpart B - Cracking Subcategory as documented in Appendix B, Part B.1. The TBELs established in the existing Permit were derived using case-by-case BPJ. The performance of the refinery RWTS indicates these TBELs in the existing Permit are attainable. During TBEL development, DEC has compared TBELs using the strict application of the ELGs to case-by-case developed BPJ TBELs.

The TBEL analysis considers the ELGs for parameters listed below and compares them to the TBELs in the existing Permit developed using a case-by-case BPJ analysis. If the most stringent TBEL is attainable, it is put forward to compare to WQBELs. Those TBEL parameters which have corresponding water quality criteria are identified with an asterisk to indicate that the TBEL parameter has corresponding water quality criteria for which a WQBEL must be developed and compared to the most stringent and attainable TBEL to determine the most stringent limit overall in the Permit. If the parameter does not have corresponding water quality criteria, a comparison of WQBEL is not possible and the most stringent TBEL is adopted.

BOD_5
TSS
COD
Oil & Grease
Phenolic Compounds *
Ammonia (as N) *
Sulfide
Hexavalent Chromium *
Total Chromium*, and
pH *

EPA's development of the TBELs presented in the existing Permit is documented in a technical memorandum dated April 4, 2000. The methods used by EPA were case-by-case BPJ while accounting

for recent modifications to the refinery as well as newly promulgated ELGs. Stated simply, the case-by-case TBELs using BPJ from the 1991 Permit were modified to account for new refinery process units and increased throughput using the newly promulgated ELGs. The development of the existing Permit also established less stringent TSS limits applicable to June through September using case-by-case BPJs to account for seasonal increases in TSS associated with algal growth during those months (See Section 2.1.2). This seasonal limitation was first adopted in the 1991 Permit and continued in the existing Permit.

The TBELs derived strictly from the ELGs evaluated the facility in accordance with 40 CFR 419.26 - Standards of Performance for New Sources (NSPS) based on the facility having been significantly modified since the existing Permit was issued as summarized in Section 2.1. The analysis includes a comparison of the newly calculated TBELs to those in the existing Permit (See Appendix B Table B-4), which indicates that many of the existing TBELs are more stringent than the newly calculated values. Based on this comparison, DEC is using the most stringent TBELs from either the existing or reissued Permit to compare with WQBELs. The reissued Permit will continue the previously established TSS limit for the months of June through September because facility continues to produce higher TSS during these months.

3.1.2 WQBELs Evaluation

Per Section 2.2.2, the POCs applicable to the RPA included ammonia, TRC, TAH, TAqH, cyanide, arsenic, manganese, mercury, and copper. Only copper was determined to have reasonable potential to exceed, or contribute to an exceedance, of water quality criteria at the boundary of both the acute and the chronic mixing zones. Accordingly, a WQBEL for copper is adopted in the Permit.

3.1.3 Most Stringent Limit Determination

Whenever a TBEL parameter has corresponding water quality criteria, a WQBEL for the parameter must be calculated and the resulting WQBEL must be compared to the TBEL for selection of the most stringent limit in the final permit. Of the POCs evaluated in the mass-based TBEL analysis, DEC has corresponding concentration-based water quality criteria for phenolic compounds, ammonia (as N), and hexavalent chromium. Appendix B – Basis for Effluent Limitations includes development of concentration-based WQBELs for each of these POCs that were converted to mass-based limits using the maximum 30-day flow of 0.380 million gallons per day (mgd) observed during the previous Permit term. This conversion allowed comparison of WQBELs in mass-based loadings to TBELs using the same mass loading units. The comparisons revealed that the applicable TBELs are more stringent than the corresponding WQBELs. Therefore, the Permit includes TBELs for parameters listed in Section 3.1.1 and a concentration-based WQBEL for copper.

3.2 Effluent Limits and Monitoring Requirements

In accordance with AS 46.03.110(d), the Department may specify the terms and conditions for discharging wastewater in a permit. The Permit retains TBELs from the existing Permit and adds a new WQBEL for copper as an outcome of the RPA. WQBEL limits for TAH and TAqH are not carried forward from the existing Permit as this parameter did not demonstrate reasonable potential to justify development of a WQBEL in this permit reissuance, however, monthly monitoring has been retained as these parameters remain POCs. The internal outfall for treated groundwater has been removed from the Permit. The permittee is responsible for conducting monitoring and

reporting as described in the Permit. Limits and monitoring requirements for the Permit are shown in Tables 3 and 4.

Table 3: Effluent Limits and Monitoring for Outfall 001 - Refinery Effluent

Parameter	Effluent Limits			Monitoring Requirements	
	Units	MDL	AML	Frequency	Sample Type
Flow	mgd	Report	Report	Continuous	Recorded
pH	SU	6.0 to 9.0 [1]		Continuous	Recorded
Temperature	C	Report	N/A	1/Week	Grab
Specific Conductance	Microsiemens per centimeter	Report	N/A	1/Week	Grab
Free Oil [2]	Present/absent	No Discharge	No Discharge	1/Week	Grab
O&G	lb/day	67	38	1/Week	Grab
BOD_5	lb/day	314	168	1/Week	Grab
COD	lb/day	2,002	1,084	1/Week	Grab
TSS - October through May	lb/day	217	136	1/Week	Grab
TSS - June through September	lb/day	349	223	1/Week	Grab
Sulfide, Total	lb/day	0.80	0.23	1/Week	Grab
Ammonia - N	lb/day	143	65	1/Week	Grab
Phenolic Compounds	lb/day	1.34	0.62	1/Quarter	Grab
Total Chromium	lb/day	2.43	1.29	1/Quarter	Grab
Hexavalent Chromium	lb/day	0.19	0.10	1/Quarter	Grab
Copper, Total Recoverable	µg/L	219	73	1/Month	Grab
Undissociated Hydrogen Sulfide	µg/L	Report	N/A	1/Month	Grab
TAH	µg/L	Report	N/A	1/Month	Grab
TAqH	µg/L	Report	N/A	1/Month	Grab
Mercury, Total	µg/L	Report	N/A	1/Quarter	Grab
Cyanide	µg/L	Report	N/A	1/Quarter	Grab
Chronic WET[3]	TU_c	Report	N/A	Semiannually	Grab

Notes:

1. Per 40 CFR 401.17, the effluent limits for pH at facilities requiring continuous monitoring may be exceeded for the excursion periods noted below:
   i. The total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month;
   ii. No individual excursion from the range of pH values shall exceed 60 minutes.
2. Testing for "free oil" shall be in accordance with EPA Method 1617 - Static Sheen Test.
3. Semiannually consists of one sample taken in the 1st half and one sample taken in the 2nd half defined as January 1 through June 30 and July 1 through December 31 of each year, respectively. WET samples must be collected during refinery turnaround, as applicable for a given year. See Section 3.2.2 for details.

The Permittee must develop specific best management practices (BMPs) that help ensure compliance with permit limits during refinery turnaround and treatment and monitoring of 2,3,7,8 TCDD in

reformer catalyst regeneration (See Section 7.2.3.1). The Permittee must also develop specific BMPS to help ensure compliance with pH and TSS limits during periods of high algal growth in the polishing ponds. BMPs include, but may not be limited to: identification of conditions, corrective actions (e.g., additional treatment or acid injection), and operating procedures (See Section 7.2.3.2.).

The discharge of oil (sheen) in SCA water to surrounding storm water conveyances is prohibited. The permittee must develop specific BMPs that describe the methods used to divert contaminated SCA water to the RWTS in the event of an observed sheen. If a sheen is observed, the permittee shall divert these waters to the RWTS for treatment and discharge as part of the Outfall 001 discharge.

3.2.1 Electronic Discharge Monitoring Reports

Per 18 AAC 83.455(b), reporting provisions allow flexibility in determining the frequency of reporting. Reporting requirements may differ based on the discharge. Currently, DEC is transitioning to an e-reporting system in accordance with 40 CFR 127. In the interim, permittees must sign and certify DMRs and all other reports in accordance with the requirements of Appendix A, Part 1.12, Signatory Requirements and Penalties. All signed and certified legible original documents and reports must be submitted to the Department at the Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

Upon implementation of the e-reporting system, the Permittee is responsible for electronically submitting DMRs and other reports in accordance with 40 CFR 127. Reports submitted in compliance with the E-Reporting Rule are not required to be submitted as hard copies unless requested by the Department. The start dates for e-reporting are provided in 40 CFR 127.16. DEC has established a website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm which contains general information about this new reporting format. As DEC implements the E-Reporting Rule, more information will be posted on this webpage. Training modules and webinar's for NetDMR can be found at https://netdmr.zendesk.com/home. The permittee will be further notified by DEC in the future about how to implement the conditions in 40 CFR 127.

3.2.2 Monitoring Frequency Reductions and Increases

DEC has the authority to consider reduced monitoring and reporting requirements in reissued permits when permittees' have 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 (Frequency Reduction Guidance)* to inform the Department's decision on monitoring frequency reductions based on reporting and compliance. DEC also considers other factors such as the need for data in the RPA and WQBEL process during the next Permit reissuance. DEC evaluated DMR data from February 2012 through March 2016 to estimate long-term averages for phenolic compounds, TAH, TAqH, and total and hexavalent chromium. When comparing to the AMLs, all of the long-term averages were less than 25 % of their corresponding AMLs. Per Table 1 of the *Frequency Reduction Guidance*, these parameters qualify for frequency reduction based on past performance. Based on this evaluation and consideration of data needs to inform future Permit decisions, DEC has reduced monitoring frequencies for phenolic compounds and chromium from monthly to quarterly and for TAH and TAqH the frequency has been reduced from weekly to monthly for Outfall 001.

While considering data needs to support future Permit decisions, DEC has increased the monitoring frequencies for mercury and cyanide from annually to quarterly. In addition, DEC requires monitoring

for temperature and specific conductance during the next Permit cycle. The additional data collected for these parameters may be used in future mixing zone analysis and RPA and WQBEL determinations.

3.2.3 Additional Effluent Monitoring

The permittee has the option of taking more frequent samples than required under the Permit, or DEC may request this additional information. 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 40 CFR 136 [adopted by reference in 18 AAC 83.010], and if the method detection limits are less than the effluent limitations and sufficiently sensitive. 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 Summary of WET Monitoring Requirements

As discussed in Section 2.2.6, there is no acute toxicity criterion in WQS. Therefore, the requirement to conduct acute WET testing using rainbow trout is discontinued in the Permit. However, a requirement to observe and report on mortality during the chronic WET tests is added to obtain acute toxicity information. The primary objective of conducting WET analysis is to obtain appropriate characterization of effluent toxicity. To this end, DEC requires collection of meaningful data that estimates the potential highest toxicity in the effluent and the variability that can be used in an RPA. Therefore, the WET requirements have been modified to always include the critical dilution but to vary the remaining dilution series to bracket the observed toxicity from previous test results. In addition, DEC requires the permittee to collect effluent samples that correspond with the timing of the perceived highest toxicity event during annual refinery turnaround. By collecting chronic WET data that captures perceived highest toxicity and the variability, DEC will be able to better assess the applicability of WET testing during the next permit cycle. Because DEC requires sampling during refinery turnaround, accelerated testing is retained in the Permit for this next term.

The Permit requires chronic WET testing of the vertebrate and invertebrate species listed below:

- 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. Each WET report shall document the species used in testing.
- Invertebrate: For larval development tests, the permittee must use bivalve species Crassostrea gigas (Pacific Oyster) or Mytilus sp. (mussel). The initial screening of invertebrate testing shall also include the mysid shrimp, Americamysis bahia (formally Mysidopsis bahia) for survival and growth. Due to seasonal variability, testing may be performed during reliable spawning periods (e.g. December through February for mussels and June through August for oysters).

A series of at least five dilutions including the critical dilution (1.0 %) and a control must be tested. The recommended initial dilution series is 1.0, 3.125, 6.25, 12.5, 25, 50, and 75% (or maximum hypersaline dilution per test method) along with a control of dilution water (0% effluent). If a test does not identify the 25 % effect concentration (EC_{25}) for a specific species and inhibition endpoint, DEC may require subsequent tests to use a modified dilution series that increases the likelihood of observing the EC_{25} endpoint and providing more accurate estimates of chronic toxicity. In addition, the permittee may request written approval from DEC to modify the dilution series based on previous test results.

The presence of chronic toxicity shall be estimated as specified in EPA *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, Third Edition (EPA-821-R-02-014). For the bivalve species, 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 NOEC and 25 % inhibition concentration (IC_{25}), or 25 % effect concentration (EC_{25}), must be provided in the full WET report. The chronic toxicity results reported on the DMR must use $TU_c = 100/IC_{25}$ or $100/EC_{25}$. The reported EC_{25} or IC_{25} must be the lowest point estimate 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 TU_c based on the highest dilution. The Department may compare the reported TU_c based on IC_{25} with one based on NOEC during evaluation of data during the next Permit reissuance. 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.

The Permit specifies semi-annual Chronic WET testing of both vertebrate and invertebrate species in order to identify the most sensitive test species for toxicity testing. Upon identification of the most sensitive test species, the permittee may submit supporting information (e.g., historic findings of the most sensitive species) and request DEC approval to discontinue WET testing of the less sensitive species. The permittee shall not make any changes to the selection of test species or dilution series without prior written approval by DEC.

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

Because WET sampling during refinery turnaround potentially could result in higher chronic WET results, an investigation and accelerated testing is required in the Permit if a TU_c result exceeds the chronic mixing zone trigger of 95 TU_c. The permittee must conduct an investigation upon receipt of the results as to the cause of the exceedance and take corrective actions if the cause is discovered. Upon taking corrective actions, the permittee must conduct another chronic WET test within two weeks of the initial exceedance to confirm that the corrective action was successful. If no investigation was done, or the cause is not discovered during the investigation, the permittee must conduct two biweekly chronic WET tests with the first test within two weeks of the initial exceedance. If the chronic toxicity trigger is not exceeded in the accelerated tests, the permittee resumes chronic WET monitoring at the original frequency of semiannual. If the toxicity trigger is exceeded in an accelerated tests, then the permittee must conduct a Toxicity Reduction Evaluation (TRE).

Permittees required to initiate a TRE must do so in accordance with Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations (TREs) (EPA/600-2-88/070, April 1989). The permittee may also initiate a Toxicity Identification Evaluation (TIE) as part of the TRE process. Any TIE must be performed in accordance with EPA guidance manuals: Marine Toxicity Identification Evaluation (TIE): Phase 1 Guidance Document (EPA/600/R-096-054), 1996); Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I (EPA/600/6-91/005F, 1992); Methods for Aquatic Toxicity Identification Evaluations Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity (EPA/600/R-92/080, 1993); Methods for Aquatic

Toxicity Identification Evaluations, Phase III: Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity (EPA-600/R-92/081, 1993).

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 WQS. Per 18 AAC 83.435, APDES permits must include conditions in permits to 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. The use classes include water supply; water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

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.

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 water quality criteria 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. Accordingly, a TMDL has not been developed and/or approved for the applicable waterbody.

4.3 Mixing Zone Analysis

Per 18 AAC 70.240 – 70.270, as amended through June 23, 2003, the Department may authorize a mixing zone in an APDES permit. The applicant submitted a mixing zone application and technical analysis with the initial application for Permit reissuance and subsequently replaced it with a revised version dated May 28, 2015. The submittals provided information to demonstrate consistency with state mixing zone regulations. The Department reviewed the submittals and conducted an independent analysis to verify conformance with regulations and consistency with DEC mixing zone procedures. The Department's analysis was based on different assumptions of critical conditions and resulted in modifications to the proposed mixing zone. The Department is

authorizing acute and chronic mixing zones for ammonia, TRC, copper, arsenic, and cyanide. The Department is also authorizing a chronic mixing zone only for pH, TAH, TAqH, undissociated hydrogen sulfide, phenolic compounds, manganese, nickel, mercury and chronic WET. These parameters do not require an acute mixing zone either because the maximum expected concentration in the effluent is not expected to exceed acute criteria at the point of discharge (e.g., nickel and mercury), or there is no acute criteria for that parameter (e.g., pH, sulfide, phenolic compounds, TAH, TAqH, manganese, and WET).

The Department used the CORMIX 9.0GTS Mixing Zone Expert System to determine sizes of the acute and chronic mixing zones based upon the following input variables:

- Copper was the POC requiring the most dilution (driving parameter) for both the acute and chronic conditions. The 85th percentile ambient concentration was 1.45 μg/L and the maximum expected discharge concentration was 219 μg/L.
- Critical current conditions were based on the most recent three months of monitoring for NOAA Current Station CO10801 – North of Tesoro Pier collected from July 15 thru September 17, 2008. The current analyses considered tidal data for the three day period centered on the highest tide day in each month (typically on or near the full moon of each month). The resulting 10th percentile flow was 0.25 meters/second (m/s) and the 90th percentile flow was 2.28 m/s.
- A stratified density water column was evaluated for the analysis of summer conditions and a uniform water column was evaluated for the analysis of winter discharge conditions.
- A maximum daily discharge of 720,000 gpd was used based on the maximum discharge capacity of the facility.

Both the acute and chronic mixing zones are rectangular in shape, 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 with the following dimensions and dilution factors:

- The acute mixing zone is rectangular and has a length of 64 meters centered on the diffuser and aligned with the current (128 meters total length), a width of 1 meters, extends from the surface to the seafloor, and an associated dilution factor of 50.
- The chronic mixing zone is rectangular and has a length of 122.5 meters centered on the diffuser and aligned with the current (245 meters total length), a width of 6 meters, extends from the sea surface to the seafloor, and an associated dilution factor of 95.

Appendix D, Mixing Zone Analysis Checklist, outlines criteria that must be considered and met for the Department to authorize 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. Summaries of the Department evaluation of these criteria follow.

4.3.1 Size

Per 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. Using the 10th percentile current velocity of 0.25 m/s, a drifting organism can traverse the acute mixing zone in approximately 4.3 minutes which is less than the 15 minute duration used to evaluate lethality. Applicable water quality criteria representing the most stringent use classification is met at the boundary of the acute and chronic mixing zones. Because there are no known sensitive aquatic resources within the vicinity of the mixing zones, and surrounding sediments consist of coarse grained material that do not support a rich benthic environment, and the rapid dispersion of the plume, the mixing zones are determined to be protective of aquatic life. Similarly, although some of the discharge POCs have potential to pose a human health risk, their dispersion in the water column and the lack of fine grained sediment in the vicinity of the discharge prevent localized exposure to these constituents such that the mixing zones are protective of human health.

4.3.2 Technology

Per 18 AAC 70.240(a)(3), the Department is required 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. ELGs applicable to the Tesoro oil refinery are presented in 40 CFR 419.26 and are summarized in Appendix B of this document. The Permit retains the TBELs developed using case-by-case BPJ from the existing Permit as these are more stringent than TBELs developed per ELGs. 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 is not pertinent to the Permit as the discharge does not include domestic wastewater sources. 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

Per 18 AAC 70.245, mixing zones are to be appropriately sized to fully protect existing uses in Cook Inlet (water quality criteria serves to specifically protect the uses of the waterbody as a whole). All water quality criteria are met at the boundary of the authorized chronic mixing zone. Given that all water quality criteria will be met at the boundary of the mixing zone, 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

Per 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. Although there are existing set net leases near the mixing zone, the mixing zone does not infringe on lease areas. Therefore the discharge will not preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

4.3.5 Spawning Areas

Per 18 AAC 70.255(h), a mixing zone is not authorized in an area of anadromous fish or resident fish spawning redds including arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon. Because the Permit does not authorize the discharge of effluent to freshwater lakes or rivers, there are no discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

4.3.6 Human Health

Per 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 available information reasonably demonstrates that the authorized mixing zone will protect human health. The coarse grained sediments in the vicinity of the discharge do not promote persistence of bioconcentrating pollutants in the sediment. In addition, because the sediment is coarse there is no biota present that could bioconcentrate pollutants if pollutant concentrations were high enough to do so. In addition, the constituents in the effluent that pose a risk to human health are at low concentrations such that human health criteria are met within a short distance from the point of discharge and the potential exposure period for aquatic organisms in the mixing zone is too short to pose a risk to human health based on consumption.

During the previous Permit cycle, two sediment studies were conducted that verified pollutants in sediments within the mixing zone are not persisting as a result of the discharge. Based on the results provided in these reports, DEC has concluded that no further sediment studies are necessary. 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. The resulting bottom

sediments in the mixing zone area are characterized as sands, gravels, and cobbles with minor fractions of silt and clay (0.6 to 1.2 percent). Analysis of metals and hydrocarbons in these sediments indicate concentrations are well below published criteria (Long, 1993) and are indistinguishable from background sediment concentrations (Kent and Sullivan, 2005). Furthermore, the coarse-grained sediment in the mixing zone area does not support the propagation of shellfish or other benthic species that could be consumed by humans. Hence, bioaccumulative pollutants are not expected to persist in bottom sediments or biota.

Per 18 AAC 70.255(c), human health criteria must be met at the boundary of the chronic mixing zone. Unlike aquatic life criteria that have short exposure periods, human health criteria are based on much longer exposure periods (e.g., lifetime exposure). Therefore, when assessing human health criteria at the boundary of the chronic mixing zone, it is appropriate to consider average effluent and receiving water conditions commensurate with the long exposure periods for which the human health criteria are based. Based on average concentrations of mercury and average flow conditions of the effluent and receiving water, the CORMIX model predicts human health criteria for mercury will be met less than 1 meter from the point of discharge. The applicable human health dilution factor is 154 such that the discharge results in only a 0.6 % increase above average background mercury concentrations at the boundary of the chronic mixing zone.

The Department considered the low, long-term average concentration of mercury in the mixing zone, the exposure period of fish (salmon) swimming through the plume, and the pathway of consumption after harvest in nearby set nets. Given the low mercury concentrations and an understanding that salmon are not expected to stay in the mixing zone long enough to bioaccumulate mercury, there is minimal potential for impacts to human health resulting from the discharge of low concentrations of mercury in the mixing zone. The Department has concluded that the available information reasonably demonstrates the discharge will not pose a human health risk when considering likely pathways of exposure and pollutant persistence in 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

Per 18 AAC 83.480, a reissued permit 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 ELGs 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 402(a)(1)(B), and modification of such limitations based on effluent guidelines that were issued under CWA 304(b). Accordingly, 18 AAC 83.480(b) applies to the relaxation of previously established TBELs based on ELGs or TBELs developed using case-by-case 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.

5.1 Less Stringent TBELs

This permitting action does not result in less stringent TBELs than those established in the existing Permit. Therefore, no antibacksliding analysis is required for less stringent TBELs. However, DEC has eliminated a previously established case-by-case BPJ TBEL (5 µg/L benzene) upon removing an internal outfall for the contaminated groundwater treatment system. The permittee may no longer commingle this waste source downstream of the RWTS. Instead of a WQBEL for visible oil and grease (sheen on the receiving water surface), DEC establishes a TBEL applying the Static Sheen Test. Lastly, DEC adopts a TBEL for pH in the Permit of not less than 6.0 and not greater than 9.0; whereas, the existing Permit established a limit of not less than 6.5 and not greater than 9.0 (See Section 5.2 for more information).

5.2 Less Stringent WQBELs and Monitoring

The Permit includes WQBELs and water quality monitoring requirements that are less stringent than in the existing Permit. The Permit removes the acute WET monitoring requirements for rainbow trout, a

fresh water species. The use of a freshwater species for WET testing for a marine discharge is inconsistent with ensuring protection of marine species. Furthermore, 18 AAC 70 does not include acute criteria for WET. Instead, the Permit requires reporting of mortality as part of chronic WET testing on marine species to estimate acute toxicity.

The existing Permit required ambient sediment monitoring studies during the first and fourth year of the Permit term to verify that the discharge is not causing the bioaccumulation of pollutants in the sediment in the vicinity of the mixing zone. Review of the two studies verifies that bioaccumulation is not occurring and DEC has concluded that additional sediment studies are not necessary in the Permit (See Section 4.3.6).

The Department has modified permit conditions to ensure narrative water quality limitations for visible oil and grease (oily sheen or free oil) is met prior to discharge rather than via observation of the receiving water surface. Observations of the receiving water is not practicable due to restricted access at the point of discharge and information provided by the applicant suggests the alternative compliance method is comparable. DEC adopts the Static Sheen Test as the sampling procedure to comply with this WQBEL (Also See Section 3.2).

While characterizing the refinery effluent, DEC determined copper is a primary water quality POC that determined the size and dilution to be authorized in the proposed chronic and acute mixing zones. The existing Permit did not consider copper. As a result of new water quality data for copper and assessment of the assimilative capacity of the receiving water, the proposed mixing zone sizes and associated dilution factors increased. The dilution factors for copper were used in the RPA per the RPA and WQBEL Guidance to derive appropriate WQBELs for the Permit that comply with WQS including the State's Antidegradation Policy.

The Permit establishes a less stringent limit for pH, the pH limit is lowered from 6.5 to 6.0, and removes limits for TAH and TAqH. Based on the data provided by the applicant, there is no reasonable potential for TAH or TAqH to exceed, or contribute to an exceedance, of water quality criteria at the boundary of the chronic mixing zone. Therefore, based on currently established procedures in the *RPA and WQBEL Guidance*, this new information indicates these limits are not necessary. However, TAH and TAqH monitoring at a reduced frequency will continue under the Permit.

The existing Permit established a limitation of pH to not be less than 6.5 nor greater than 9.0. Water quality criteria is not less than 6.5 and not greater than 8.5. DEC has authorized pH exceedances in the chronic mixing zone. Therefore, the adoption of a TBEL limit of not less than 6.0 and not greater than 9.0 will not violate WQS (Also See Section 3.2).

The Permit includes monitoring frequency reductions for five parameters: TAH and TAqH monitoring is reduced from weekly to monthly and phenolic compounds and total and hexavalent chromium monitoring has been reduced from monthly to quarterly in the Permit (See Section 3.2.1).

6.0 ANTIDEGRADATION

CWA 303(d)(4) 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 the 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), 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 Alaska's 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 extraction industry supports local economies by purchasing significant amounts of equipment, parts, fuel, food, freight, and other services.

   In addition, Alaska's 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:

   - 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 tax payers in the borough were oil and gas industry companies.

   - The Kenai Refinery employs approximately 200 full-time employees and 60 specialized contract personnel. The relative economic importance of the Kenai refinery has increased since the May 2014 closure of the Flint Hills refinery in North Pole, Alaska. The Kenai refinery responded to the closure of the North Pole refinery

by increasing production of gasoline, ultra-low sulfur diesel, jet fuel, and asphalt to supply the continuing needs of the Alaskan market.

On March 17, 2016, the Commissioner of the Alaska Department of Natural Resources issued an additional "Final Best Interest Finding and Determination for the Sale of Alaska North Slope Royalty Oil to Tesoro Refining & Marketing Company, LLC" proposing the in-kind sale of approximately 20,000 to 25,000 BBL per day of the State's North Slope royalty oil to the Tesoro Kenai Refinery. The Commissioner's Final Best Interest Finding and Determination includes the final version of the sales contract, provides an analysis of its specific provisions how it will serve the best interests of the state per criteria presented in AS 30.05.183 and AS 32.06.070. This sale of state royalty oil to this in-state processing facility supplies fuel directly to Alaskan fuel consumers and contributes to in-state petrochemical industry employment in a time when it is otherwise decreasing.

The Department finds 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 limits and conditions in the Permit ensure water quality criteria are not violated in the receiving water beyond the boundary of the authorized acute and chronic mixing zones. The Permit includes limits for copper that are based on meeting water quality criteria at the boundary of the acute and chronic mixing zones. All other pollutants authorized in the mixing zone will meet applicable water quality criteria at the boundary of the acute and chronic mixing zones per Section 4.3. The sediment studies conducted under the existing Permit reasonably demonstrated that persistence of pollutants in sediment and biota does not occur in the receiving water and supports the authorization of the mixing zones.

As discussed in Section 4.1, no site-specific criteria has been developed for Cook Inlet in the vicinity of the discharge. In addition, acute WET testing requirements in the existing Permit have been appropriately eliminated in the Permit as there is no acute criterion established in 18 AAC 70. Lastly, chronic WET data was evaluated and there is no reasonable potential for the discharge to exceed, or contribute to an exceedance, of water quality criteria for chronic toxicity. Therefore, WET limits are also not applicable (See Section 2.2.6).

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.

   As discussed in Section 2.1.2, the Tesoro refinery uses treatment technology that meets the model technology used to develop the ELGs in 40 CFR 419. The Department calculated TBELs based on ELGs in 40 CFR 419.26 - Standards of Performance for New Sources (NSPS), the most conservative TBELs criteria applicable to the facility, and compared them to the TBELs in the existing Permit as discussed in section 3.2.2. The comparison revealed that, with the exception of BOD_5, TSS, and sulfide the existing limits are lower and more stringent than the newly calculated TBELs. Based on review of performance data from the previous Permit cycle the existing limits are attainable and will be retained in the reissued Permit. This analysis indicates the method of pollution, control, and treatment is effective and reasonable.

   Elevated concentrations of TSS and wide fluctuations of pH observed during the months of June through September are attributed to algal growth promoted by long daylight hours during the Alaska summer season. Because this unique condition was not considered during development of the ELGs, TBELs have previously been developed using case-by-case BPJ in the existing Permit and these limits will also be retained in the reissued Permit. Tesoro uses a combination of acid injection and BMPs to help control the impacts of algae during the summer. These treatment strategies are effective, and reasonable, for counteracting algae impacts. For the discharge of SCA water, Tesoro routes any water observed to have a sheen through the RWTS.

   The Department concludes the most effective pollution prevention, control, and treatment is used at the refinery and lowering of water quality is necessary in the vicinity of the discharges.

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.

   TBELs were evaluated based on 40 CFR §419.26 NSPS and, where the ELG was not applicable, case-by-case effluent limits based on BPJ. The adopted TBELS were developed using a combination of ELGs and case-by-case BPJ. The end result of the modified ELGs using case-by-case BPJ is that the limits are more stringent than ELGs for NSPS. As stated in Section 2.1.3, the RWTS meets the model treatment technology assumptions of 40 CFR 419 and the RWTS is able

to attain the more stringent TBELs adopted in the Permit. Therefore, the RWTS meets, or exceeds, the highest statutory and regulatory treatment requirements. In addition, the observed high performance of the RTWS supports monitoring frequency reductions and elimination of limits for TAH and TAqH. Lastly, by ensuring the effluent from the groundwater treatment system is also treated by the RBCs in the RWTS, removal of the internal outfall previously limited in the existing Permit is also appropriate.

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 which is not a constituent of permitted discharge for this facility

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 and 18 AAC 15. The Permit is consistent with 18 AAC 83 and neither the regulations in 18 AAC 15, or other state legal requirement(s) the Department is aware of, impose more stringent treatment requirements than 18 AAC 70.

7.0 OTHER PERMIT CONDITIONS

7.1 Standard Permit 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, signatory authority, and other general requirements.

7.2 Best Management Practices Plan

A BMP Plan is a collection of controls and housekeeping measures which are intended to minimize or prevent the generation and the potential release of pollutants from a facility to the waters of the U.S. through normal operations and ancillary activities. Per CWA Section 402(a)(1), development and implementation of BMPs may be included as a condition in APDES permits. CWA 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. The BMP Plan must be developed to control or abate the discharge of pollutants in accordance with 18 AAC 83.475. A BMP Plan must include certain generic BMPs as well as specific BMPs for controlling pollutants. The Permit requires specific BMP Plan provisions for turnaround activities, groundwater treatment, and refinery discharges impacted by algae.

7.2.1 Implementation and Maintenance of the BMP Plan

A permittee must develop a BMP Plan that achieves the broad objectives outlined in Section 7.2. The BMP Plan for refinery activities shall be located at the permitted facility and made available for Department review upon request. Electronic copies are appropriate so long as they are available during inspections. A qualified person must amend the BMP Plan whenever there is a change in the refinery or

in the operation of the refinery that materially increases the generation of pollutants, their release, or potential release to receiving waters. Changes to the BMP Plan shall be consistent with the objectives and specific requirements as described in the Permit. Facility and environmental managers must review all change to the BMP Plan. Permittees must conduct an annual review and a certification statement must be submitted to the Department annually. The initial BMP Plan must be submitted to DEC for retention in the administrative record within 120 days after the effective date of the Permit. The BMP Plan must include the standard components per Section 7.2.2 and specific requirements in Section 7.2.3

7.2.2 Standard BMP Plan Components

The BMP Plan must be consistent with the general guidance contained in *Guidance Manual for Developing Best Management Practices* (EPA 833-B-93-004, October 1993) or any subsequent revision. The BMP Plan must include, at a minimum, the following items:

- Statement of BMP policy. The BMP Plan must include a statement of management commitment to provide the necessary financial, staff, equipment, and training resources to develop and implement the BMP Plan on a continuing basis.
- Current copies of the Permit and previous three years of annual BMP Plan certification letters.
- Description, location, and sequence of activities, BMP control measures, any stabilization measures, final constructed site plans, drawings, and maps.
- A log of BMP modifications which documents maintenance and repairs of control measures, including date(s) of regular maintenance, date(s) of discovery of areas in need of repair/maintenance, and date(s) that the control measure(s) returned to full function;
- Description of any corrective action taken at the refinery, including the event that caused the need for corrective action (include notice of non-compliance if reporting was required) and dates when problems were discovered and modifications occurred;
- Structure, functions, and procedures of the BMP Committee. The BMP Plan must establish a BMP Committee chosen by the permittee responsible for developing, implementing, and maintaining the BMP Plan.
- A description of potential pollutant sources and their associated discharge numbers.
- An identification and assessment of risks associated with accidental pollutant releases.
- Standard Operating Procedures (Generic BMPs) **t**hat include but are not limited to:

- Good Housekeeping.
- Security.
- Materials compatibility.
- Record keeping and reporting.
- Operation and maintenance plans for wastewater treatment systems and BMP controls. Elements should include preventative maintenance and repair procedures that are developed in accordance with good engineering practices.
- Use of local containment devices such as liners, dikes, and drip pans where chemicals are being unpackaged and where wastes are being stored and transferred.
- Apply chemical cleaning compounds and disinfectants in accordance with manufacturer instructions and suggested application rates.
- Employee training and records of employee training date(s), etc.
- Inspections and regular evaluation of BMP controls including evaluation of planned facility modifications to ensure that BMP Plan is considered and adjusted accordingly.

7.2.3 Specific BMP Requirements

In addition to the generic BMPs listed in Section 7.2.2, DEC requires the following specific BMPs be included in the BMP Plan for the applicable discharges.

7.2.3.1 Refinery Turnaround Waste

The periodic shutdown and maintenance activities associated with refinery turnaround has the potential to result in Permit limit exceedances unless consideration is given to appropriate handling of high-strength or off-specification wastewater that is treated and disposed in the RWTS. The permittee must develop and implement BMPs to help ensure compliance with Permit limits and conditions during this essential activity. BMPs are expected to include, but not be limited to: storage of high-strength or off-specification wastewater and introduction into the RWTS at a rate that will not organically or hydraulically overload treatment units; pretreatment to remove constituents that the RWTS cannot treat (e.g., pretreatment for 2,3,7,8 TCDD); prioritization and sequencing of processing multiple turnaround waste through the RWTS; alternative disposal of waste that is incompatible with the RWTS treatment capabilities or Permit conditions.

7.2.3.2 Algae Impacted Effluent

During the summer, the polishing ponds in the RWTS that provides final treatment of the effluent occasionally becomes impacted by algal blooms that increase TSS and pH. The control of pH by acid injection has become necessary to ensure compliance with Permit limits. The permittee must develop BMPs that address the seasonal control of TSS and pH including SOPs that help ensure these control measures themselves do not cause out of compliance discharges (e.g., over injection of acid).

7.2.3.3 SCA Discharges

The Permit allows the treatment and discharge of contaminated SCA water through the RWTS and the discharge of uncontaminated SCA water to drywells or surface areas adjacent to each SCA as storm water. The Permittee must develop specific BMPs to address procedures to ensure contaminated SCA

water is not mistakenly discharged to the storm water conveyance system. Because the storm water conveyance system is implicated, this BMP has a direct overlap with Section 7.4

7.3 Catalyst Regeneration Monitoring

Reformer catalyst regeneration occurs infrequently, typically during refinery turnaround, and is pretreated using filtration and carbon absorption prior to being treated and discharged through the RWTS. The Permit requires monitoring and reporting of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) as a means of ensuring adequate pretreatment occurs for this waste stream. The permittee must collect and analyze samples to the regeneration process and submit an annual letter report to DEC.

7.3.1 Reformer Catalyst Regeneration Monitoring and Reporting

The permittee must establish sampling and analytical procedures in the QAPP specifically for monitoring 2,3,7,8 TCDD in the catalyst regeneration effluent. At minimum, the QAPP must outline flow measurement (flow meter, measured volume, etc.), composite sampling methods, and data reporting procedures. Composite sample methods must include at least eight discrete aliquots of not less than 100 ml each collected in a manner that results in a flow-proportioned composite sample and generally follows the most recent edition of Standard Methods for the Examination of Water and Wastewater. Catalyst regeneration samples must be analyzed for dioxin/furan congeners using EPA Method 1613. Concentrations of all individual congeners analyzed using this method (tetra- through octa-chlorinated dioxins and furans) must be reported and if the result is below the method detection limit, the permittee must report the concentration as “less than” the method detection limit value and use the value in reporting calculations.

7.3.2 Reformer Catalyst Regeneration Reporting

The permittee must submit a letter report to DEC by January 31st of each year even if no regeneration occurred during the previous year (See Section 7.6). The applicant must also submit a monitoring summary for 2,3,7,8 TCDD with the next application for reissuance. The final discharge concentration of 2,3,7,8 TCDD must be determined and reported as follows:

Discharge = C*(Q1/Q2)

Where,

C = 2,3,7,8-TCDD concentration in composite sample from the regeneration waste stream;

Q1 = flow of the reformer catalyst in regeneration waste stream; and

Q2 = total flow of the refinery final effluent.

7.4 Storm Water Pollution Prevention Plan

While contaminated storm water (contaminated runoff per 40 CFR 419) is covered under the existing Permit, uncontaminated storm water is not as this has been covered through authorizations under APDES General Permit AKR060000 - Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activities (MSGP). The refinery operates under the Standard Industrial Code 2911 - Petroleum Refining which corresponds to Sector C under the

MSGP. The Permit includes coverage for uncontaminated (noncontract) storm water and allowable non-storm water discharges consistent with the MSGP and requires development of a SWPPP. The SWPPP must identify control measures and BMPs that best suit the refinery and activities to meet pollution control objectives for noncontact storm water. The SWPPP is a tool to help prevent contaminated runoff from entering uncontaminated storm water conveyances (See Section 7.2.3.3).

7.4.1 SWPPP Development and Implementation

The SWPPP must be developed by a qualified person and the permittee must provide a copy of the SWPPP to DEC for administrative records within 120 days of the effective date of the Permit. The SWPPP must be updated as necessary to reflect any revisions to the facility that affect the storm water controls implemented at the site (Section 7.4.6) including revisions that address applicable federal, state, tribal, or local requirements. The adaptation of the SWPPP for facility changes resulting from other program requirements is intended to account for overlapping or similar requirements, while complying with the Permit. The permittee must review the SWPPP annually, make revisions if necessary, and submit annual certifications to the Department. The SWPPP must be maintained at the facility per Section 7.4.4.1.

7.4.2 SWPPP Contents

A SWPPP shall be consistent with EPAs document, Developing Your Stormwater Pollution Prevention Plan – A Guide for Industrial Operators (February 2009, EPA 833-B-09-002) or any subsequent revision of the guidance document. For additional guidance, permittees may also consult the Alaska Storm Water Guide (December 2011) or the 2015 MSGP. The narrative of the SWPPP should include descriptions of the following items:

- Measures to cleanup reportable quantity releases (Contaminated storm water is storm water associated with a discharge of a reportable quantity for which notification is or was required per 40 CFR 117.21, 40 CFR 302.6, or 40 CFR 110.6 or any storm water that contributes to a violation of a water quality standard [40 CFR 122.26(c)(1)(iii)]);
- Vehicle and equipment storage, cleaning, and maintenance areas;
- Snow handling procedures and erosion controls; and
- Any provisions necessary to meet the BMP Plan requirements of the Permit.

7.4.3 SWPPP Documentation and Availability

Copies of the Permit and a log of SWPPP modifications must be included with the SWPPP. The Permit condition stresses the importance understanding interrelated permit requirements and responsibilities. In addition, the following documents must be kept with the SWPPP:

- Description, location, and sequence of activities, control measures, and stabilization measures;
- Documentation of maintenance and repairs of control measures, including date(s) of regular maintenance, date(s) of discovery of areas in need of repair/maintenance, and date(s) that the control measure(s) returned to full function;

- Manufacture Information (i.e. Safety Data Sheet, manufacturer and/or supplier test results, or installation instructions);
- Description of any corrective action taken at the facility, including the event that caused the need for corrective action and dates when problems were discovered and modifications occurred;
- Records of employee training, including the date(s) training was received; and
- Copies of biannual inspection reports, non-compliance notices, annual SWPPP certifications, monitoring reports, and annual reports.

A Permittee must make a copy of the SWPPP and documentation available to DEC upon request for review or copying during any on-site inspection per 18 AAC 83.405(j)(2). Electronic storage of documents can be used so long as they are accessible when a DEC inspector conducts an onsite inspection. A copy of the SWPPP must be kept at the facility at all times. The SWPPP must identify any alternative off-site location for available access if there is a seasonal shut down for a facility. The SWPPP must be returned to the facility once the shutdown is over.

7.4.4 Inspection Requirements

Requirements for reporting results of storm water monitoring inspections are specified at 40 CFR 122.44(i)(4). Specifically the Permit requires:

- Bi-annual inspection of the facility site. One inspection should be conducted prior to breakup to assess whether there are any areas which may contribute to storm water discharges associated with the industrial facility or activity and could be addressed with BMPs to minimize contact with contamination sources. The second inspection should be conducted after the breakup period is over to assess whether there are any areas which contributed to storm water discharge associated with the industrial facility or activity that were unanticipated and unaddressed by the SWPPP. Based on findings during the inspections, the SWPPP should be modified to include the necessary practices to minimize future contact or contamination.
- Inspection reports and compliance certification must be maintained for a period of three years.
- Certifications that the bi-annual inspections have been conducted must be reported to the Department with other annual reporting requirements (Section 7.6). Certifications must be signed in accordance with established signatory authority (40 CFR 122.22).

7.4.5 SWPPP Modifications

The permittee must update the SWPPP, site maps, within seven calendar days in response to any following triggering conditions:

- Changes to control measures, good housekeeping measures, or other activities that render the exiting SWPPP obsolete,
- Changes made in response to corrective actions, or maintenance procedures, or
- An inspection or investigation reveal changes are necessary to comply with the Permit.

The permittee must revise its SWPPP to reflect the new maintenance procedures and include documentation of the corrective action to return to full compliance. The permittee must maintain a log showing the dates of all SWPPP modifications, including name of the person authorizing each change and a brief summary

7.5 Quality Assurance Project Plan

The permittee is required to develop a QAPP documenting procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The QAPP shall specify standard operating procedures the permittee must follow for collecting (e.g., composite sampling of reformer catalyst regeneration waste), 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 it to make sure it is up to date and all necessary revisions are made. The permittee must submit a current QAPP to the Department within 120 days of the effective date of the Permit for administrative records. The Department may also review the QAPP and provide recommendations to the permittee for improvement. The QAPP shall be retained onsite and made available to the Department upon request. Electronic copies are appropriate so long as they are available to inspectors upon request.

7.6 Receiving Water Sampling and Analysis Plan

During permit development, DEC realized there was a need for receiving water data to support the RPA and WQBEL development process and requested supplemental data from the applicant. Additional receiving water data is needed to support development of the next permit and could include additional parameters based on available information with the next permit application submittal in mind. Hence, the applicant should consider what data should be collected to support their future application.

The permittee is required to develop and implement a receiving water sampling and analysis plan (SAP) of selected parameters in the Outfall 001 effluent and receiving water in the vicinity of the discharge. The permittee must conduct four sampling events during the Permit cycle and submit the results with the next application for reissuance. The receiving water analysis must include temperature, salinity, pH and certain water quality POCs. The POCs to be sampled and analyzed include, but may not be limited to:

Ammonia	TAH
Arsenic	TAqH
Copper	Undissociated Hydrogen Sulfide
Manganese	Phenol
Mercury	

7.6.1 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 SAP shall specify appropriate sample collection procedures, sample preservation, and testing methods to ensure samples are accurate and represent the characteristics of the sampled waters.

7.6.2 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 of receiving water sample results and the effluent results collected on the same day must be provided to DEC with an application for reissuance within 180 days prior to Permit expiration.

7.7 Annual Reporting for Other Permit Conditions

Annual reports must be submitted by January 31st each year and include an annual certification of completion for SWPPP and BMP Plan reviews and storm water inspections; summary of Reformer Catalyst Regeneration monitoring; and an inventory of the types and amounts of biocides used at the refinery. Annual reports may be submitted as attachments to the December DMR.

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 the 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.

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 also voluntarily requested this information for the vicinity of the facility in March 26, 2014. On May 9, 2014 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

1. Alaska Department of Commerce, Community, and Economic Development. Division of Economic Development. 2009 Alaska Economic Performance Report. February 2011.
2. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
3. Alaska Department of Environmental Conservation. Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report.
4. Alaska Department of Environmental Conservation. Interim Antidegradation Implementation Methods. Retrieved from http://www.dec.state.ak.us/water/wqsar/Antidegradation/docs/P&P-Interim_Antidegradation_Implemenation_Methods.pdf
5. Alaska Department of Environmental Conservation. 18 ACC 70. Water Quality Standards, as amended through June 26, 2003.
6. Alaska Department of Environmental Conservation. 18 ACC 70. Water Quality Standards, as amended through July 1, 2008.
7. Alaska Department of Environmental Conservation. 18 ACC 70. Water Quality Standards, as amended through April 8, 2012.
8. Alaska Department of Environmental Conservation. 18 AAC 83. Alaska Pollutant Discharge Elimination System Program. As amended Through October 23, 2008.
9. Alaska Department of Environmental Conservation. 18 ACC 72. Wastewater Disposal, as amended through December 23, 2009.
10. Alaska Department of Environmental Conservation. Interim Antidegradation Implementation Methods. Division of Water. Policy and Procedure No. 05.03.103. July 14, 2010.
11. 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, Nanwalek, 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*.
13. Long et al. *Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments.* U.S. National Oceanic and Atmospheric Administration, 1993.
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.
15. U.S. EPA, Interim Guidance for Performance-Based Reduction of NPDES Monitoring Frequencies. Office of Water, EPA 833-B-96-001, Washington D.C., April 1998.
16. U.S. Code of Federal Regulations, Title 40 – Protection of the Environment, Part 435, Subpart A, Appendix 1 to Subpart A of Part 435 – Static Sheen Test (EPA Method 1617), EPA, Washington D.C., July, 2012.

APPENDIX A. **FACILITY INFORMATION**

Figure 1: Tesoro Alaska LLC, Kenai Refinery Facility Location Map

Figure 2: Wastewater Line Diagram

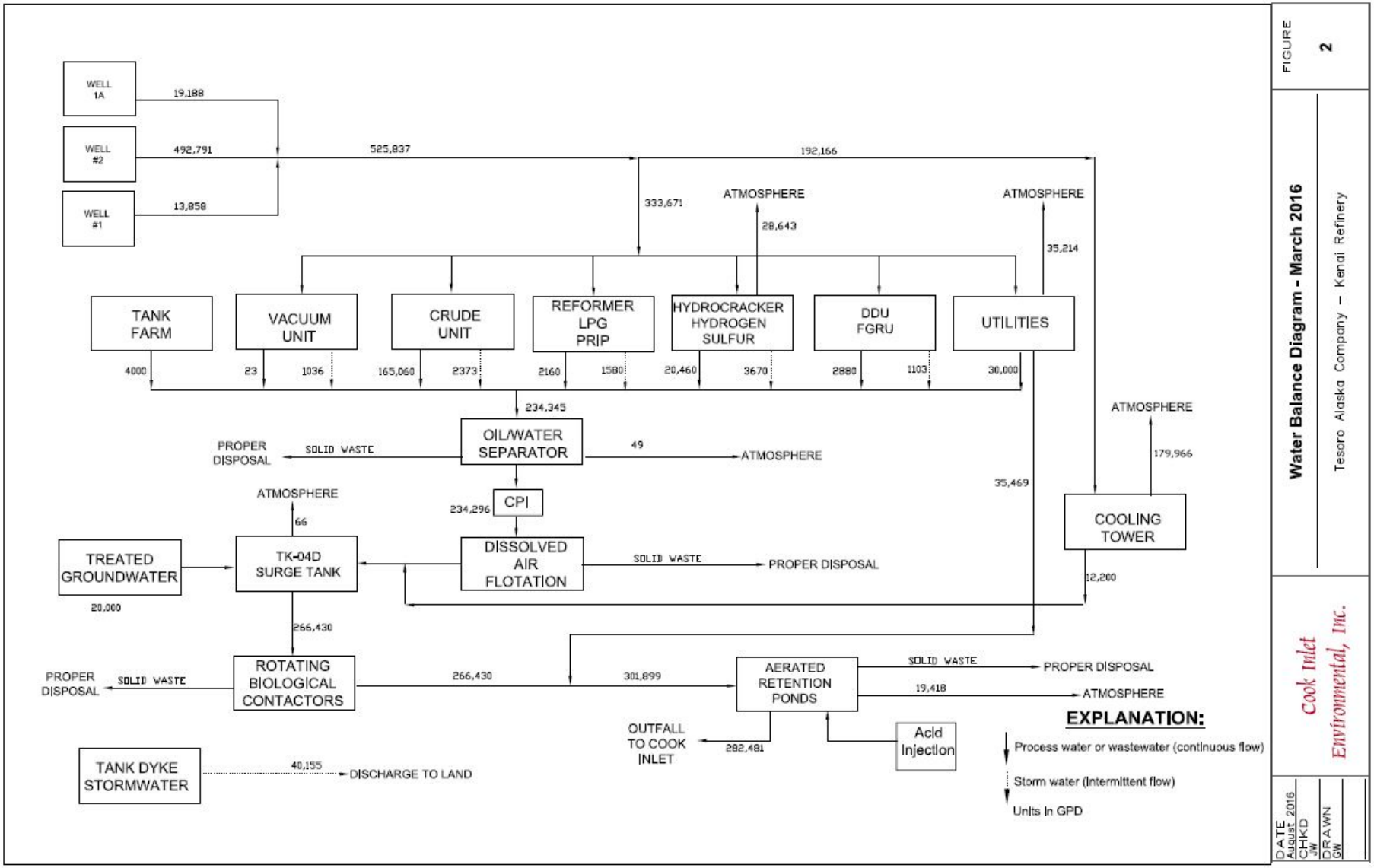


Figure 3: Secondary Containment Areas

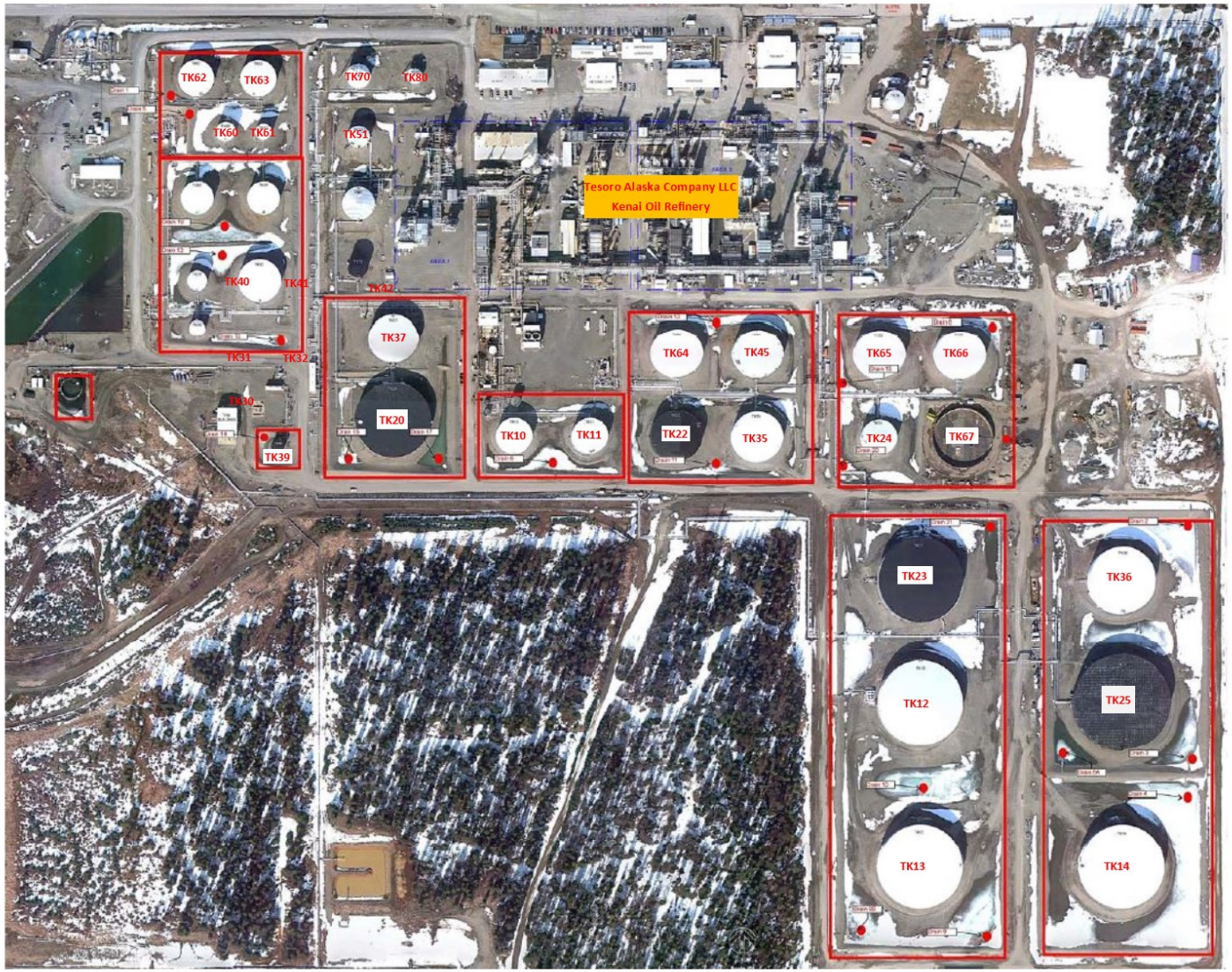
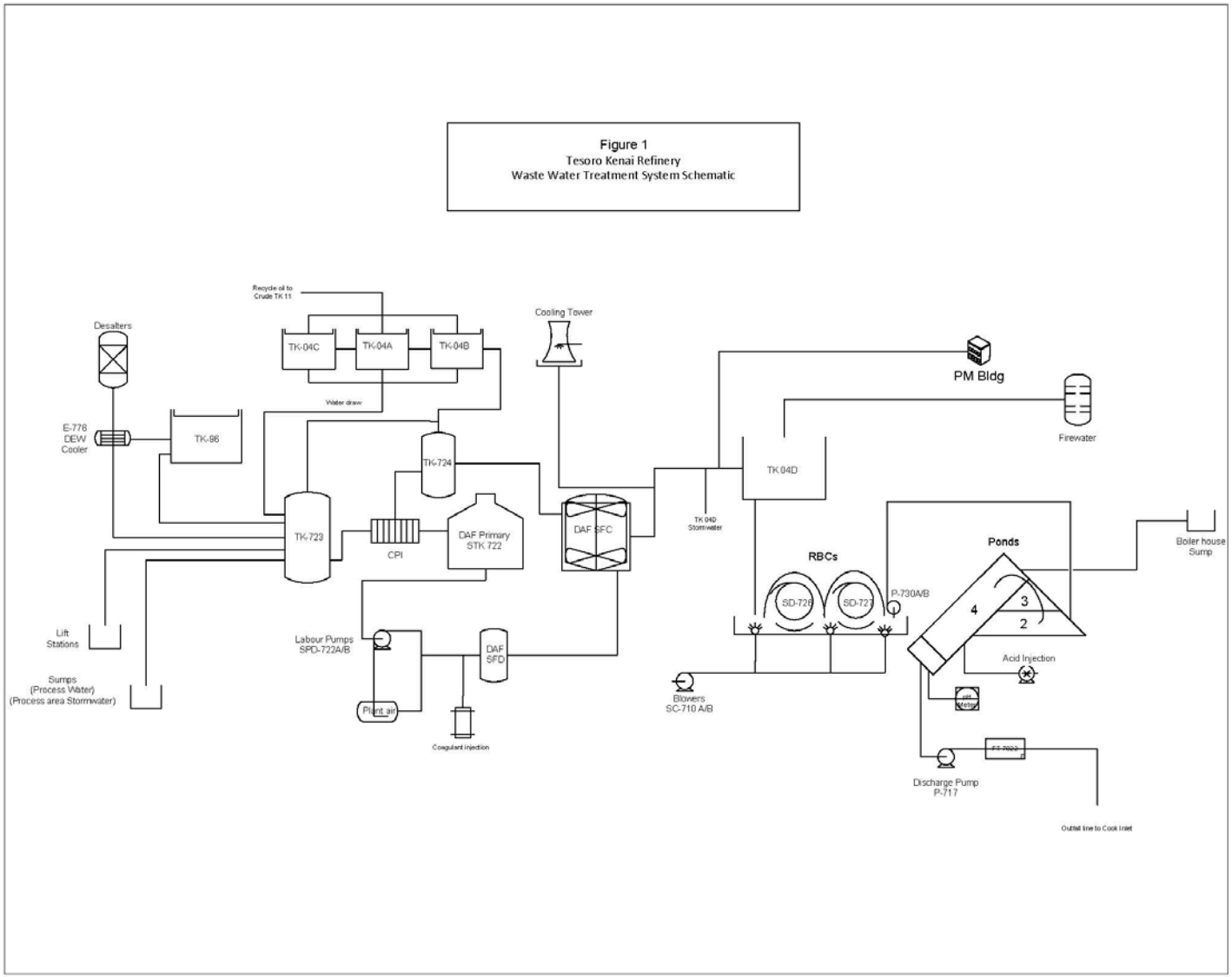


Figure 4: Refinery Wastewater Treatment System



APPENDIX B. BASIS FOR EFFLUENT LIMITATIONS

The Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) per Alaska Administrative Code (AAC) 18 AAC 83.015 unless first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402. Per these statutory and regulatory requirements, individual permit AK0000841 – Tesoro, Kenai Refinery (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), (3) and comply with other state requirements that may be more stringent.

The CWA requires that the limits for a particular parameter be the more stringent of either technology-based effluent limits (TBEL) or water quality-based effluent limits (WQBEL). TBELs are set via rule makings by the Environmental Protection Agency (EPA) in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment that is achievable using available technology. In situations where ELGs have not been developed or have not considered specific discharges or pollutants, a regulatory agency can develop TBELs using best professional judgment (BPJ) on a case-by-case basis. A WQBEL is designed to ensure that WQS are maintained and the waterbody as a whole is protected. 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. Per the *Technical Support Document for Water Quality-based Toxics Control* (TSD), once a specific type of limit has been decided, the permitting authority has some discretion in specific permit limit derivation procedures. When using this discretion, the procedure should be fully enforceable, account for effluent variability, consider available receiving water dilution, protect against acute and chronic impacts, account for compliance monitoring frequencies, and protect wasteload allocation (WLA) and ultimately WQS. An example of implementing such discretion is adopting limits from the existing Permit that are found to be more stringent than those developed for the Permit using typical procedures but are attainable based on review of historic effluent performance data.

B.1 TECHNOLOGY BASED EFFLUENT LIMITS

B.1.1 Effluent Limitation Guidelines

ELGs for petroleum refineries are presented in 40 CFR Part 419 - Petroleum Refining Point Source Category and have been adopted by reference per 18 AAC 83.010(g)(3). The Tesoro Alaska Petroleum Company Kenai Refinery falls under 40 CFR 419 Subpart –B Cracking Subcategory because it uses topping and cracking processes to produce petroleum products. The facility was originally constructed in 1969, but has been sufficiently expanded and modified since original construction to be subject to the ELGs specified in 419.26 Standards of Performance for New Sources (NSPS). The ELGs in 40 CFR 419.26 requires mass-based TBEL limits for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), chemical oxygen demand (COD), oil and grease, phenolic compounds, ammonia as nitrogen (N), sulfide, total chromium, and hexavalent chromium calculated based on the level of production at the facility. In addition, the ELGs require limits for pH in standard units (SU).

The Department calculated TBELs, in accordance with 40 CFR 419.26, based on a production of 69,634 barrels per day (bbl/day) and the treatment process information provided by the applicant. DEC used three years of recent production data from March 2013 through February 2016 to calculate the mass-based TBELs to account for recent increases in throughput.

B.1.2 Summary of TBEL Analysis Process

The TBEL analysis evaluated discharges associated with the refinery process flows, and cooling tower discharges for the determination of TBELS for maximum daily limit (MDL) and average monthly limit (AML) for the constituents shown in Tables B-2 thru B-4. The TBEL analysis starts with determining the process configuration factor, size factor, and process factor as summarized in Table B-1.

Table B. 1 - Process Configuration Factor (PCF), Size Factor, and Process Factor

Process [1]	**Process Feedstock Rate (1,000 bbl/day)**	**Process Feedstock Rate Relative to Refinery Feedstock Rate**	**Weight Factor** [2]	**PCF**
CRUDE				
Atm Crude Distillation	61.833	1.00		
Vacuum Distillation	20.943	0.34		
Desalting	64.263	1.04		
		2.38	x 1	2.38
CRACKING				
Hydrocracking	12.016	0.19		
Hydrotreating (DDU)	6.538	0.11		
		0.30	x 6	1.80
ASPHALT				
Asphalt Production	0.783	0.01	x 12	0.15
Process Configuration factor =				4.33
Size Factor:				
Input of maximum unit production rate of 69.634 (1,000 bbl/day) 419.26 Size Factor table produces **Size Factor = 1.04**				
Process Factor:				
Input of total process configuration factor of 4.33 419.26 Process Factor table produces **Process Factor = 0.88**				
Notes:				
1. Source of process feedstock rates is applicant's Technical and Regulatory Analysis of Effluent Limitations, Anti-degradation, and Ambient Mixing Tesoro Kenai Refinery Wastewater Discharge, Revision 2 by Cook Inlet Environmental, Inc., May 28, 2015.				
2. Process weighting factors from EPA Development Document for Effluent Limitations Guidelines and Standards for Petroleum Refining – Point Source Category, Table I-1.				

Process TBELs were calculated by multiplying the applicable effluent limit for each POC by the refinery throughput, the process factor, and the size factor as summarized in Table B-2.

Table B. 2 - Process TBEL Calculations

Parameter	Part 419.26(a) Applicable NSPS Effluent Limit Units		TBEL Limits [1]	
	MDL per 1,000 bbl feedstock	AML per 1,000 bbl feedstock	Calculated MDL (lb/day)	Calculated AML (lb/day)
BOD_5	5.8	3.1	311	166
TSS	4.0	2.5	214	134
COD	41.5	21.0	2,224	1,125
Oil & grease	1.70	0.93	91	50
Phenolic compounds	0.042	0.020	2.25	1.07
Ammonia (as N)	6.6	3.0	354	161
Sulfide	0.037	0.017	1.98	0.91
Total chromium	0.084	0.049	4.50	2.63
Hexavalent chromium	0.0072	0.0032	0.39	0.17

Notes:

1. TBEL Limit = Unit effluent limit * refinery throughput * process factor *size factor

   Where:

   Refinery. throughput from Rev. App. Tech. Memo, Table 3 (1,000 bbl/day) = 69.634
   Process Factor = 0.74
   Size Factor = 1.04

Methods for calculating pollutant loadings for contaminated runoff is not currently provided in 40 CFR 419.26(e). Therefore, DEC calculated the BPT, BAT, and BCT loadings per 40 CFR 419.22, 419.23, and 419.24, respectively. Table B-3 summarizes the calculations and comparison whereby DEC adopts the most stringent TBEL among BPT, BAT, or BCT.

Noncontact cooling water accounts for approximately four percent (%) of the total volume discharged at the refinery. Per 40 CFR 419.26(d), the quantity and quality of once through noncontact cooling water is not included in the calculations presented in Table B-2.

Table B. 3 - Contaminated Runoff TBEL Calculations

Parameter	Effluent Limit Units per 40 CFR 419.26 (e) - Reserved						Effluent Limit						Selected Limits	
	BPT[1]		BAT[2]		BCT[3]		BPT		BAT		BCT			
	MDL	AML	MDL	AML	MDL	AML	MDL	AML	MDL	AML	MDL	AML	MDL	AML
	Pounds per 1,000 gallons (lb/1,000 gal)						(lb/day)						(lb/day)	
BOD_5	0.40	0.22	n/a	n/a	0.40	0.22	3.9	2.1	n/a	n/a	3.9	2.1	3.9	2.10
TSS	0.28	0.18	n/a	n/a	0.28	0.18	2.7	1.8	n/a	n/a	2.7	1.8	2.7	1.8
COD	3.0	1.5	3.0	1.5	n/a	n/a	29.3	14.6	29.3	14.6	n/a	n/a	29.3	14.6
Oil & grease	0.13	0.067	n/a	n/a	0.13	0.067	1.27	0.65	n/a	n/a	1.27	0.65	1.27	0.65
Phenolic Compounds	0.0029	0.0014	0.0029	0.0014	n/a	n/a	0.028	0.014	0.028	0.014	n/a	n/a	0.028	0.014
Sulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ammonia (as N)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Chromium	0.0060	0.0035	0.00500	0.00180	n/a	n/a	0.059	0.034	0.049	0.018	n/a	n/a	0.049	0.018
Hexavalent Chromium	0.00052	0.0002	0.00052	0.00023	n/a	n/a	0.005	0.002	0.005	0.002	n/a	n/a	0.005	0.002

Contaminated runoff TBEL calculations based on
Total Facility Discharge from Figure 2; Water Balance Diagram (GPD) = 282,481
Summation of storm water flows from Fig 2: Water Bal. Diagram (GPD) = 9,672
Percentage of overall discharge (%) = 3.46

Limits Source Notes:
1. BPT inputs source is 419.22(e)(2), pg 364
2. BAT inputs source is 419.23(f)(2), pg. 366
3. BCT inputs source is 419.24(e)(2), pg 367

Final TBELs are derived from the sum of the effluent limits for process wastewater and contaminated runoff wastewater. Pollutant loadings from cooling towers and utility drains were assumed to be negligible. Table B-4 presents a summary of these calculated TBEL and compares them to the TBELs from the existing Permit.

Table B-4 - Comparison of Newly Calculated and Existing Permit TBELs

Parameter	Individual NSPS Limits (lb/day)				Calculated Total TBELs (lb/day)		Existing Permit Total TBELs (lb/day)	
	Process Units		Runoff					
	MDL	AML	MDL	AML	MDL	AML	MDL	AML
BOD_5	311	166	3.9	2.1	315	**168**	**314**	173
TSS	214	134	2.7	1.8	**217**	**136**	223	141
TSS - June through September [1]	N/A	N/A	N/A	N/A	N/A	N/A	**349**	**223**
COD	2,224	1,125	29	15	2,253	1,140	**2,002**	**1,084**
Oil & grease	91	50	1.3	0.7	92	50	**67**	**38**
Phenolic compounds	2.25	1.07	0.028	0.014	2.28	1.09	**1.34**	**0.62**
Ammonia (as N)	354	161	n/a	n/a	354	161	**143**	**65**
Sulfide	1.98	0.91	n/a	n/a	**1.98**	**0.91**	2.05	0.91
Total chromium	4.50	2.63	0.049	0.017	4.55	2.64	**2.43**	**1.29**
Hexavalent chromium	0.39	0.17	0.005	0.002	0.39	0.19	**0.19**	**0.10**

Note:

1. EPA developed the existing Permit TBELs for parameter TSS - June through September based on BPJ to account for algae growth during long daylight hours during summer (up to 19 hours) that was not considered during the development of the ELGs.
2. The most stringent TBELs are shown as bold.

Review of Table B-4 indicates that, with the exception of BOD_5, TSS, and sulfide the calculated MDL and AML are less stringent than the corresponding limits in the existing Permit. Review of DMR data indicates that all of the most stringent limits, whether from the existing Permit or calculated for the reissued Permit, are attainable by the facility. Therefore, DEC adopts the most stringent TBELs from the existing or reissued Permit to compare with WQBELs.

B.2 Water Quality – Based Effluent Limitations

B.2.1 Statutory and Regulatory Basis

Per 18 AAC 70.010, a person may not conduct an operation that causes, or contributes to, a violation of the WQS. Per 18 AAC 83.435(a), an APDES permit must include conditions (e.g., WQBELs) in addition to, or more stringent than, promulgated ELGs (e.g., TBELs). When evaluating if WQBELs are needed in addition to the TBELs, the permitting authority conducts a reasonable potential analysis (RPA) based on pertinent water quality parameters. Pertinent water quality parameters are those that the authority consider as having a possibility to exceed water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the authority must consider the dilution available in the authorized mixing zone in the analysis. Per 18 AAC 435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected effluent concentrations and coefficient of variation)

and existing controls on point source (e.g., treatment systems) and nonpoint sources of pollution (e.g., ambient receiving water concentrations).

The RPA procedures use statistical methods to estimate maximum effluent concentrations (MEC) and projects the receiving water concentration using mass balance. Because DEC has authorized acute and chronic mixing zones, the mass balance procedure evaluates if the effluent exceeds, or contributes to an exceedance, of water quality criteria at the boundary of either the acute or the chronic mixing zone. Based on the RPA conducted in Appendix C, the Department has determined copper has a reasonable potential to exceed criteria at both the acute and chronic mixing zone boundaries. Accordingly, WQBELs for copper are established per 18 AAC 83.435 to be consistent with the calculated available wasteload allocation (WLA) and stringent enough to ensure compliance with WQS. No other parameters were determined to have reasonable potential. However, several parameters require development of WQBELs to compare to TBELs despite not have reasonable potential. The following lists the parameters used in the RPA and those requiring TBEL comparisons per 18 AAC 83.435(a).

RPA Parameters	**TBEL Comparisons**
Copper	Ammonia as Nitrogen
Arsenic	Chromium VI
Total Residual Chlorine (TRC)	Phenol
Weak Acid Dissociable (WAD) Cyanide	
Manganese	
Total Aromatic Hydrocarbons (TAH)	
Total Aqueous Hydrocarbons (TAqH)	

B.2.2 Water Quality-Based Effluent Limits

B.2.2.1 Reasonable Potential Analysis

Per Appendix C, copper was found to be the parameter requiring the most dilution in the receiving water to meet applicable acute and chronic criteria at the boundary of the acute and chronic mixing zones. Hence, the MEC for copper resulted in copper being the driving parameter for both the acute and chronic criteria. Based on an estimated MEC of 219 micrograms per liter (μg/L), an ambient concentration of 1.45 μg/L, and the results of the mixing zone modeling, DEC authorized an acute mixing zone with a dilution factor of 50 and a chronic mixing zone with a dilution factor of 95. Given the RPA indicated copper exceeded, or contributed to an exceedance, of water quality criteria for copper at the boundary of the acute and chronic mixing zone, WQBEL for copper has been developed as discussed in the following section.

B.2.2.2 Copper

The MDL and AML for copper were calculated in accordance with procedures presented in the DEC *Reasonable Potential Analysis and Water Quality-based Effluent Limits Development Guide, June 30, 2014 (RPA&WQBEL Guidance).* Calculations for determination of the MDL and AML are shown below.

Input Parameters for copper analysis

- The acute and chronic wasteload allocation ($WLA_{a,c}$) for copper is the Maximum Effluent Concentration (MEC) = 219 µg/L
- Coefficient of Variation (CV) = 1.786
- Sampling Interval = 4 samples/month
- z statistic for 99th percentile probability basis (Z_{99}) = 2.326
- z statistic for 95th percentile probability basis (Z_{95}) = 1.645

Calculations

- Determine long-term averages (LTAs):

$LTA_a = WLA * \exp[0.5\sigma^2 - Z_{99}\sigma]$,

where: $\sigma^2 = \ln(CV^2 + 1) = 1.433$ and $\sigma = 1.197$

LTA_a = 27.7 µg/L

$LTA_c = WLA * \exp[0.5\sigma_4^2 - Z_{99}\sigma_4]$,
where: $\sigma_4^2 = \ln(CV^2/4 + 1) = 0.586$ and $\sigma_4 = 0.766$

LTA_c = 49.4 µg/L

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

Most limiting is LTA_a= 27.7 µg/L

- **Calculate the MDL and AML**

$MDL = LTA_a [\exp(Z_{99}\sigma - 0.5\sigma^2)]$

MDL = 219 µg/L

$AML = LTA * \exp[(Z_{95}\sigma_4 - 0.5 * \sigma_4^2)]$

AML = 72.85 µg/L
Use 73 µg/L

B.2.3 Specific Water Quality-Based Effluent Limits and Monitoring

B.2.3.1 Monitoring of Water Quality Parameters

As discussed in Fact Sheet Section 4, the Department conducted an RPA for ammonia, arsenic, chlorine, copper, cyanide – WAD, manganese, mercury, total aqueous hydrocarbons (TAqH), and total aromatic hydrocarbons (TAH) because the MEC of these parameters exceeded criteria at the point of discharge. Reasonable potential was found only for copper at the boundary of the mixing zone. The remaining parameters were included in the mixing zone authorizations and monitoring has been determined to be appropriate for cyanide, mercury, TAH, and TAqH. DEC will also require monitoring for temperature and chronic whole effluent toxicity during the Permit term. This monitoring data may be used to inform Department decisions during the next Permit reissuance.

B.2.3.2 pH

The criteria for pH is no less than 6.5 standard units (SU) and not greater than 8.5 SU. The permittee has experienced difficulties in meeting pH criteria at the point of discharge due to seasonal influences from algal blooms. Therefore, DEC includes pH in the authorization of the chronic mixing zone to allow for minor exceedance of pH at the point of discharge. Hence, the water quality criteria for pH can be exceeded within the mixing zone but not beyond the TBEL for pH (i.e., 6.0 to 9.0 SU) (See Section B.2.4.2). DEC has assessed the impacts of authorizing these limits and determined that these limits would not result in exceeding water quality criteria at the boundary of the chronic mixing zone; the criteria will be reached in close proximity of the discharge due to available dilution and buffering capacity of the receiving water.

B.2.3.3 Phenolic Compounds

A WQBEL for phenol was developed to compare to the TBEL for phenolic compounds. There are no aquatic life criteria for phenol but the human health criteria (water plus aquatic organisms) is 21 mg/L (21,000 μg/L). The calculated MDL is 5.17 mg/L and the AML is 2.0 mg/L. The converted WQBELs are compared to the TBEL in Table B-5.

B.2.3.4 Ammonia as Nitrogen

A WQBEL for ammonia was developed to compare to the TBEL for ammonia. Criteria for ammonia is dependent on pH, temperature and salinity. The Department determined ammonia as N criteria based upon a temperature of 15°C, pH of 8.5, and salinity at 20 g/kg to represent reasonable worst case conditions per the *RPA&WQBEL Guidance*. These inputs resulted in an acute criteria of 8.10 mg/L and a chronic criteria 1.20 mg/L for this parameter. The calculated MDL is 144 mg/L and the AML is 84.3 mg/L. The WQBELs are converted to mass-based limits and compared to the TBEL in Table B-5.

B.2.3.5 Hexavalent Chromium

A WQBEL for hexavalent chromium was developed to compare to the TBEL. The acute criteria for chromium VI is 1.1 mg/L (1,100 μg/L) and for chronic is 0.05 mg/L (50 μg/L). The calculated MDL is 8.75 mg/L and the AML is 3.34 mg/L.

B.2.3.6 Comparison of WQBELs to TBELs

The converted WQBELs are compared to the TBEL in Table B-5.

Table B-5: TBEL and WQBEL Comparison

Parameter	TBELs (lb/day)		WQBEL (lb/day) [1]	
	MDL	AML	MDL	AML
Phenolic compounds	**1.34**	**0.62**	16.4	6.3
Ammonia (as N)	**143**	**65**	456	267
Hexavalent chromium	**0.19**	**0.10**	27.7	10.6

Notes:
1. WQBELs have been converted to mass-based using the maximum monthly average flow of 0.380 mgd reported over the last five year period from March 2012 through February 2016.
2. The most stringent limits are shown in bold.

B.2.3.7 Narrative WQBELs

Petroleum Hydrocarbons, Oils, and Grease: Per 18 AAC 70.020(b)(17)(A)(ii), petroleum hydrocarbons, oil, and grease, may not cause a visible sheen upon the surface of the water. Surface waters must be virtually free from floating oil. Because monitoring of the receiving water surface is not practicable for Outfall 001, the permittee must monitor for presence of a sheen after the last treatment unit using EPA Method 1617. For discharges from SCAs, compliance with this narrative is by observation for visible sheen on the SCA water surface prior to discharging. If a sheen is observed, the SCA water must be conveyed to the RWTS for treatment prior to discharge.

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

B.2.4 Selection of Most Stringent Limits

B.2.4.1 BOD_5, COD, TSS, and Oil and Grease

There are no water quality criteria for BOD_5, COD, TSS or Oil and Grease. Therefore, DEC adopts these TBELs without any comparison with WQBELs.

B.2.4.2 pH

The most restrictive existing State water quality criteria for pH specifies a range of between 6.5 and 8.5 SU for water supply, aquaculture, water contact recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife. The Permit establishes a pH limit based on the TBEL, between 6.0 and 9.0 SU at end-of-pipe based on an understanding that the more stringent water quality criteria will be met at the authorized mixing zone boundaries.

The Permit requires continuous monitoring of pH. Per 40 CFR 401.17 the permittee must maintain the pH within this range, except that excursions are permitted subject to the following conditions:

> **(1)** The total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month; and
> **(2)** No individual excursion from the range of pH values shall exceed 60 minutes.

B.2.4.3 Attainability of Most Stringent Limits

The summary presented in Table B-5: TBEL and WQBEL Comparison, indicates the TBELs are the most stringent for each parameter shown.

B.2.5 Selected Limits.

Table B-6 provides a summary of the selected limits and their basis.

Table B-6: Limit and Basis Summary

Parameter (Units)	MDL	AML	Basis
BOD_5 (lb/day)	314	168	ELG/BPJ
TSS (lb/day)	217	136	ELG
TSS – June through September (lb/day)	349	223	BPJ
COD (lb/day)	2,002	1,084	BPJ
Oil and Grease (lb/day)	67	38	BPJ
Phenolic compounds (lb/day)	1.34	0.62	BPJ
Ammonia (as N) (lb/day)	143	65	BPJ
Sulfide (lb/day)	1.98	0.91	BPJ
Total chromium (lb/day)	2.43	1.29	BPJ
Hexavalent chromium (lb/day)	0.19	0.10	BPJ
Copper (µg/L)	219	73	WQBEL

APPENDIX C. REASONABLE POTENTIAL ANALYSIS DETERMINATION

This Appendix summarizes the reasonable potential analysis (RPA) process used by the Alaska Department of Environmental Conservation (Department or DEC) to determine and develop effluent limits for individual permit AK0000841 - Tesoro Alaska Company Kenai Oil Refinery (Permit).

Per Alaska Administrative Code (AAC) 18 AAC 83 - Alaska Pollutant Discharge Elimination System (APDES) Program requires limits in APDES permits to achieve water quality standards established under 33 U.S.C. 1313, including state narrative criteria for water quality. Alaska water quality standards are found in 18 AAC 70 – Water Quality Standards (WQS) and the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, May 15, 2003 (Toxics Manual).*

Per 18 AAC 83.435(b), "Effluent limits in a permit must control all pollutants or pollutant parameters, either conventional, non-conventional, or toxic pollutants, that the department determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard (i.e., criteria), including state narrative criteria for water quality."

DEC analyzes pollutant concentrations in the discharge to determine if it will cause, or contribute to, an exceedance of water quality criteria per the reasonable potential analysis (RPA) procedures described in the *RPA and Water Quality-based Effluent Limits (WQBEL) Development Guide, June 30, 2014 (RPA&WQBEL Guide).* The *RPA&WQBEL Guide* is based partly on procedures in the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991 (TSD)* that were modified by the Department.

The Department determines reasonable potential of a discharge of effluent containing a maximum expected concentration (MEC) of a parameter by comparing the projected receiving water concentration at the boundary of the authorized acute or chronic mixing zones to the applicable water quality criteria for that parameter. Reasonable potential exists if the projected receiving waterbody concentration (RWC) at the boundary of the respective mixing zone exceeds the applicable criteria for that parameter and a WQBEL must be included in the Permit per 18 AAC 83.435. The RPA of the refinery discharge considered the following parameters (See Fact Sheet Section 2.2.2):

- Ammonia as Nitrogen (N),
- Arsenic,
- Copper,
- Cyanide – Weak Acid Dissociable (WAD),
- Manganese,
- Mercury,
- Total Aromatic Hydrocarbons (TAH),
- Total Aqueous Hydrocarbons (TAqH), and
- Total Residual Chlorine (TRC)

The RPA determined copper as the only parameter resulting in reasonable potential at the boundaries of both the acute and chronic mixing zones. The procedures and calculations associated with the RPA follows.

C.1 Mass Balance

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

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

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:

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

Rearranging Equation C-3 to solve for RWC yields:

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

For known MEC and AWC, Equation C-3 can be used to determine the required DF for a constituent by substituting water quality criteria for RWC. For cases where a DF and mixing zone have been authorized, Equation C-4 is 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&WQBEL 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 (ProUCL)* rather than assuming a lognormal distribution as described in the TSD in calculating the coefficient of variation (CV). The possible statistical distributions include lognormal, normal, 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 *RPA&WQBEL Guide* assumes the CV = 0.6, 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.

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

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 = $\Sigma[x_i] / k$, $1 \leq i \leq k$
σ^2 = estimated variance = $\Sigma[(x_i - \mu)^2] / (k - 1)$, $1 \leq i \leq k$
$\hat{\sigma}$ = 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 observed concentration (MOC) 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:

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

For the lognormal distribution, Equation C-7 becomes:

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

In both Equations C-8 and C-9, the percentile represented by the 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 Department's policy is to 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 projected RWC at the boundary of an authorized mixing can be determined using the MEC calculated in Equation 11 in Equation 4.The projected RWC at the boundary 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:

$\text{RWC}_{\text{acute, chronic}}$ = receiving 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 exceed the respective criteria for the pollutant of concern, then reasonable potential exists for that parameter and a WQBEL must be developed for that parameter.

Example Calculations for Copper

The mixing zone analysis identified copper as the driving parameter for both the acute and chronic mixing zones and the Department authorizes an acute mixing zone with a DF_{acute} of 50 and a chronic mixing zone with a $\text{DF}_{\text{chronic}}$ of 95. An RPA was conducted to determine which POCs may require WQBELs. Some of these POCs were evaluated in the RPA and WQBEL merely to develop QWBELs to compare to TBELS although RP was not anticipated. The mixing zone analysis and RPA considered facility discharge data collected from May 2008 through February 2015 and identified copper as the only parameter to have RP and the boundary of either mixing zone. The RP calculations for copper are summarized below:

Number of effluent data (n) = 11

MOC = 31.7 µg/L Total Recoverable (Conversion factor for dissolved is 0.83)

The Department calculated the CV based on the mean and standard deviation of raw data values obtained from EPA's ProUCL-Version 4.1 Statistical Analysis Program as shown below:

Mean of Raw Data ($\hat{\mu_n}$) = 5.0, and

Standard Deviation of Raw Data (σ) = 8.95

Assuming a normal distribution and per equation C-5, CV = 1.786

For a data set containing 11 copper samples:

$$\text{Percentile represented by MOC } (p_n) = p_{11} = (1 - 0.95)^{1/11}$$

$p_{11} = 0.762$ and $Zp_{11} = 0.713$

By calculating the log-transformed standard deviation and variance using CV = 1.786 in Equation C-6 and inputting values into Equation C-9 results in an RPM = 6.9

The MEC is then calculated as the product of the RPM x MOC

MEC = (6.9)(31.7 μg/L) = 218.7μg/L

The acute and chronic receiving water concentrations are then calculated based on the following input parameters:

AWC = 1.45mg/L

DF_{acute} = 50

$DF_{chronic}$ = 95

Resulting in:

$$RWC_{acute} = \frac{218.7\ ug/L\ -1.45ug/L}{50} + 1.45\ ug/L\ =\ 5.80\ \mu g/L$$

For $DF_{chronic}$ = x:

$$RWC_{chronic} = \frac{218.7\ ug/L_e - 1.45\ ug/L}{95} + 1.45\ ug/L\ =\ 3.74\ \mu g/L$$

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.

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

Acute	5.80 μg/L > 5.78 μg/L (acute criteria)	**YES**, there is a reasonable potential to violate
Chronic:	3.74 μg/L > 3.73 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 copper is required. See Appendix B for development of this limit.

C.3 Reasonable Potential Analysis Summary

An RPA was conducted for each of the nine pollutants of concern identified in Fact Sheet Section 2.2.2 using the acute and chronic dilution factors authorized in the mixing zones and the respective acute, chronic, and human health criteria for the parameter. Of the nine parameters, ammonia was found to be normally distributed; copper, cyanide, and mercury had a lognormal distribution; arsenic, TRC, manganese, and TAH had too few detectable data and were evaluated as lognormal using a default CV = 0.6; and TAqH had no discernable distribution and was evaluated as normal. Table C-1 summarizes the results of the RPA.

Table C. 1 - Reasonable Potential Summary

Parameter	Units	MOC	n	AWC	CV	RPM	MEC	Water Quality Criteria			RWC		RP
								Acute	Chronic	Human Health	Acute	Chronic	
Ammonia - N	mg/L	23.43	210	0.18	0.419	1.0	24	8.1	1.2	--	0.66	0.43	No
Arsenic	µg/L	157	5	5.4	0.6	3.4	532	69	36	--	15.95	10.95	No
Chromium VI [1]	µg/L	30	49	0	1.108	1.3	39.32	1100	50	--	0.79	0.41	No
Copper	µg/L	31.7	11	1.45	1.786	6.9	219	**5.78**	**3.73**	--	**5.800**	**3.74**	**Yes**
Cyanide, WAD	µg/L	15	11	0	0.578	2.4	35.7	1.0	1.0	220,000	0.71	0.38	No
Manganese	µg/L	231	5	15	0.6	3.4	783	--	--	100	--	23.09	No
Mercury [2]	µg/L	0.12	14	0.02	0.393	1.7	0.21	2.1	1.1	0.51	0.03	0.03	No
Phenol [1]	µg/L	130	49	0	1.074	1.3	170	--	--	21,000	--	1.789	No
TAH	µg/L	487.1	211	0	0.6	1.1	533	--	10	--	--	5.52	No
TAqH	µg/L	487.3	210	0	12.9	1.1	542	--	15	--	--	5.43	No
TRC	µg/L	60	5	0	0.6	3.4	203	13.0	7.5	--	4.07	2.14	No

Notes:

1. These parameters were evaluated only to derive WQBELs for comparison to TBELs.
2. Mercury criteria and reported results are presented as total mercury.
3. Criteria and reported results for all metals other than mercury are presented as total recoverable units.

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 Alaska Department of Environmental Conservation (Department or DEC) permit writers 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 • U.S. Environmental Protection Agency (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

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 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

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(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
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