ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PRELIMINARY DRAFT

AK0043354 – ConocoPhillips Alaska, Inc. Kuparuk Seawater Treatment Plant

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

Public Comment Period Start Date: **TBD**
Public Comment Period Expiration Date: **TBD**
Alaska Online Public Notice System

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Alaska Department of Environmental Conservation
Division of Water; Wastewater Discharge Authorization Program
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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to:

CONOCOPHILLIPS ALASKA, INC.

For wastewater discharges from:

Kuparuk Seawater Treatment Plant
Oliktok Point
Beaufort Sea, Alaska

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual Permit AK0043354 – ConocoPhillips Alaska, Inc., Kuparuk Seawater Treatment Plant (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 Seawater Treatment Facility and the development of the Permit including:

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

Public Comment

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

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

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

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

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

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

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

Informal Review and Adjudicatory Hearing

A person authorized under a provision of 18 AAC 15 may request an informal review of a contested decision by the Division Director in accordance with 18 AAC 15.185 and/or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. See DEC's "Appeal a DEC Decision" web page https://dec.alaska.gov/commish/review-guidance/ for access to the required forms and guidance on the appeal process. Please provide a courtesy copy of the adjudicatory hearing request in an electronic format to the parties required to be served under 18 AAC 15.200. Requests must be submitted no later than the deadline specified in 18 AAC 15.

Documents are Available

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

- 555 Cordova Street; **Anchorage**, AK 99501; 907-269-6285
- 610 University Avenue; **Fairbanks**, AK 99709; 907-451-2100
- P.O. Box 1800; **Juneau**, AK 99811-1800
  Location: 410 Willoughby Street, Suite 303; **Juneau**, AK; 907-465-5300
- 43335 Kalifornsky Beach Road; **Soldotna**, AK 99615; 907-262-5210
- 1700 E Bogard Road #B, Suite #103; **Wasilla**, AK 99654; 907-376-1850

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1.0 INTRODUCTION.

On November 17, 2022, the Alaska Department of Environmental Conservation received an application from ConocoPhillips Alaska, Inc. (CPAI or permittee) for reissuance of Alaska Pollutant Discharge Elimination System Individual Permit AK0043354 – CPAI, Kuparuk Seawater Treatment Plant. Information contained in this fact sheet is based on information in the application and supplemental information provided by CPAI upon request by DEC. The Permit authorizes discharges to the Simpson Lagoon, Beaufort Sea from the Kuparuk Seawater Treatment Plant (STP or facility), located on the North Slope on Olitok Point, Beaufort Sea (See Appendix A. Figure 1 and Figure 2).

1.1 Applicant.

This fact sheet provides information on the APDES permit for the following entity:
Name of Facility: Kuparuk Seawater Treatment Plant

APDES Permit Number:	AK0043354
Facility Location:	Oliktok Point, Simpson Lagoon, Beaufort Sea
Mailing Address:	ConocoPhillips Alaska, Inc.; P.O. Box 100360; Anchorage, Alaska 99510
Facility Contact:	Ms. Jeanie Shifflet

The Permit authorizes the following discharges:

Outfall	Description	Receiving Water	Latitude	Longitude
001	Strainer/Filter Backwash	Simpson Lagoon	70.514152	-149.876430
002	Marine Life Return System	Simpson Lagoon	70.512991	-149.872902

See

Figure 2 for the location of the outfalls relative to the STP.

1.2 Authority.

The National Pollutant Discharge Elimination System (NPDES) Program regulates the discharge of wastewater to the waters of the United States (WOTUS). Transfer of the NPDES Program to Alaska from the Environmental Protection Agency (EPA) occurred in four phases with oil and gas facilities transferring as part Phase IV on October 31, 2012. The State NPDES program is known as the APDES Program and is administered by DEC. Accordingly, DEC is the permitting authority for regulating the discharges associated with the Permit. This is the second reissuance of the Permit under authority of the APDES Program.

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

1.3 Permit History.

CPAI is the permitted operator of the STP. The first NPDES permit for the facility was issued by the Environmental Protection Agency (EPA) in September 1985 and was subsequently reissued in November 1987, December 1994, April 2000, and March 2011. DEC reissued the permit effective June 1, 2018 (2018 Permit). CPAI submitted a timely and complete application for permit reissuance to DEC on November 17, 2022 and the existing Permit was administratively extended prior to expiration on May 31, 2023.

2.0 BACKGROUND

2.1 Facility Information. The STP is located on the mainland shoreline at Oliktok Point at the western end of Simpson Lagoon and the eastern side of Harrison Bay in the Beaufort Sea. (See Appendix A Figures, depicting various elements of the facility). The STP strains, filters, heats, bio-treats, and de-aerates seawater drawn from an intake bay located on the north side of the facility for waterflood and other industrial uses. Waterflood is injected into oil reservoirs to maintain formation pressures and enhance oil recovery from production wells. The STP currently discharges wastewater streams from two distinct outfalls: Outfall 001 - Strainer/Filter Backwash and Outfall 002 - Marine Life Return System (MLRS). The discharge line for Outfall 001 is a buried 12-inch diameter pipeline oriented in a northwest direction and terminates 869 feet offshore with a single port diffuser. Outfall 002 is a buried 14-inch diameter pipeline that runs parallel to Outfall 001 but terminates 607 feet closer to shore and expands to a 24-inch single-port diffuser at the terminus. Both outfalls are oriented perpendicular to prevailing currents at a depth of approximately 7 to 8 feet below sea surface (See Appendix A, Figure 2

Figure 2).

2.1.1 Outfall 001 – Strainer/Filter Backwash Description. The removal of suspended sediment in seawater must be performed prior to injection to prevent clogging of pore spaces in the formations. The straining and clarifying processes ultimately prevent the possibility of particulate matter blocking pore spaces in formations that could restrict the flow of oil of a producing well. Because seawater can have more suspended sediment during the open water season than in winter, there are two different modes of operation to account for seasonally different sediment loads. During the winter, strained seawater is typically treated to remove sediment using only sand filters and hypochlorite (to prevent biological growth on filters). Coagulants and/or other clarifying agents may also be included in the treatment during the open water season to enhance sediment removal. The use of coagulants and/or flocculants can begin at breakup during late May or early June when turbidity and total suspended solids (TSS) concentrations rise, and the use could extend until freeze-up, usually during October. When a coagulant and/or other clarifying agents are used, dosage is controlled via injection pump settings that are determined using a chemical-treating matrix developed by CPAI, which considers salinity, TSS concentration, and temperature.

While chemical use may be seasonal, heat is added to the seawater year-round to decrease viscosity and enhance sediment removal. During filter backwashing, the bed volume containing hypochlorite becomes mixed with the backwash water and is stored in a collection/treatment tank along with strainer backwash. Sodium metabisulfite is used to dechlorinate the backwash prior to being discharged in Outfall 001 – Strainer/Filter Backwash. Accordingly, total residual chlorine (TRC) from injection of hypochlorite and temperature are primary parameters of concern (POCs) during normal operations that excludes clarifying agents.

After the sediment removal steps that result in a discharge to Outfall 001, clarified seawater is treated further to produce waterflood appropriate for injection by adding biocides and removing oxygen. Glutaraldehyde is injected ahead of the de-aerating tank to ensure destruction of sulfate-reducing bacteria that can produce hydrogen sulfide and clog pore spaces in the oil producing formations. The de-aerating tank uses fuel gas as a stripping medium to remove oxygen, which reduces pipeline corrosion in the waterflood and drill site distribution system. Although these chemicals are used in the waterflood

treatment process, they cannot be discharged through Outfalls 001 or 002 unless treated waterflood in pipelines is drained back to the seawater intake system and reintroduced into the treatment process. (See Appendix A, Figure 4).

2.1.2 Outfall 002 - MLRS Description. Intake seawater passes through an initial intake screen followed by a primary and secondary diverter to remove debris and other materials and/or prevent marine animals from entering the seawater reservoir. Seawater that has had floating debris removed, and that may contain marine life, is then discharged through Outfall 002. Although seawater in the MLRS system is discharged prior to encountering any pumps, strainers, clarifiers, or filters the discharge picks up incidental heat while in the facility and from a heated recycle line that provides freeze protection at the intakes. Hence, the only POC in Outfall 002 - MLRS is temperature.

2.2 Discharge Descriptions and Effluent Characterization

2.2.1 Strainer/Filter Backwash (Outfall 001). Review of effluent data from June 2018 through August, 2022 included evaluation of flow, reported in million gallons per day (mgd), pH in standard units (SU), TRC in micrograms per liter (µg/L), chronic whole effluent toxicity (WET) in toxicity units (TU), and temperature differential in degrees Celsius (°C). Note that the marine water quality criteria for temperature is based on a 1°C increase over the ambient receiving water temperature. To provide a direct comparison with marine water quality criteria and limits from the 2018 Permit for temperature, DEC is using the temperature differential (ΔT) to represent the POC, which is the effluent temperature minus the simultaneous receiving water ambient temperature. Only positive ΔT values were analyzed in the reasonable potential analysis (RPA) because negative values do not result in lowering of water quality of the receiving water based on the established marine temperature water quality criteria. In addition, 120 µg/L, the highest value recorded for TRC in Table 1 below, was determined to not be representative of the effluent. The value of 120 µg/L was the 1st sample out of a double sampling event. The second sample was recorded as <1.2 µg/l, which was typical of the majority of the data. As a result, the 120 µg/L value was omitted from the RPA and the second highest value of 86 µg/L was used as the maximum observed effluent concentration. Table 1 compares available data to the 2018 Permit limits and applicable state water quality criteria.

Table 1: Effluent Characterization (June 2018 – August 2022) Outfall 001

Parameter (Units)	Data Set	Existing Limits		Marine Criteria		Observed Range (Low – High, Ave) [1]
		MDL	AML	Acute	Chronic	
Flow (mgd)	1526	2.2	---	---	---	0.0 - 1.68, 0.477
ΔT (°C) [2]	1526	22	----	---	1 [3]	0.28 – *16.39, 7.12*
pH (SU)	1553	6.0 < pH < 9.0		6.5 ≤ pH ≤ 8.5		6.53 – 8.2, 7.43 [4]
TRC (µg/L)	1513	98	29	13	7.5	1.2 – *86.0*, 4.5[5]
Chronic WET (TU_c)	0 [6]	Report		N/A	1.0	N/A

Notes:
1. Values that exceed water quality criteria are shown in italics. Values that exceed existing limits are presented in bold.
2. Δ T (°C) is effluent temperature minus ambient receiving water temperature. Only positive values were evaluated.
3. The marine water quality criteria is less than or equal to 1 °C above ambient temperature such that any ΔT greater than 1 °C, exceeds water quality criteria.
4. Median used in lieu of mean.
5. The results of 120 µg/L was deemed to be invalid and excluded from the data set.
6. No WET monitoring occurred during the permit term.

The comparison provided in Table 1 indicates temperature, ΔT, pH, and TRC are POCs for the mixing zone and RPA at Outfall 001. The 2018 Permit allowed for a reduction in chronic WET testing frequency if the first four samples did not demonstrate toxic effects. In 2015, DEC granted a reduction in monitoring frequency from quarterly to annual based on data available at that time. Given no WET testing occurred during the 2018 Permit term, the Department has retained the annual frequency of chronic WET monitoring conducted per Section 4.4.3.

2.2.2 Marine Life Return System (Outfall 002). Review of effluent data from June 2018 through August 2022 included flow and ΔT. Similar to Outfall 001, the marine water quality criteria for temperature is based on a 1°C increase over the ambient receiving water temperature and DEC uses ΔT as the parameter of concern where only positive ΔT values were analyzed. Table 2 compares available data to the 2018 Permit limits and applicable state water quality criteria.

Table 2: Effluent Characterization (June 2018 – August 2022) Outfall 002

Parameter (Units)	Data Set	Existing Limits		Marine Criteria		Observed Range (Low – High, Ave) [1]
		MDL	AML	Acute	Chronic	
Flow (mgd)	1481	---	---	---	---	0.0 – 1.302, 0.923
ΔT (°C) [2]	1481	19	---	---	1 [3]	0.0 – *7.9, 1.04*

Notes:
1. Values that exceed water quality criteria are shown in italics. Values that exceed existing limits are presented in bold.
2. Δ T (°C) is effluent temperature minus ambient receiving water temperature. Only positive values were evaluated.
3. The marine water quality criteria is less than or equal to 1 °C above ambient temperature such that any ΔT greater than 1 °C, exceeds water quality criteria.

The comparison provided in Table 2 indicates ΔT is the only POC for Outfall 002 for the mixing zone analysis and RPA.

2.3 Compliance History. Discharge Monitoring Reports (DMRs) from June 30, 2018 to October 31, 2022, were reviewed to determine the facility's compliance with effluent limits. The permittee did not have any limit exceedances during the current permit cycle (all bold values in Table 2 reflect exceedances of water quality criteria only). In addition, a review of EPA's Integrated Compliance Information System (ICIS) revealed no violations under the 2018 Permit in the previous five years.

3.0 RECEIVING WATERBODY

3.1 Water Quality Standards. CWA Section 301(b)(1)(C) requires the development of limitations in permits necessary to meet water quality standards by July 1, 1997. Per 18 AAC 83.435, APDES permits must include conditions to meet 18 AAC 70 – Alaska Water Quality Standards (WQS). The WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and the state's Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed in 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 discharge from the permitted facility into Simpson Lagoon. Accordingly, the Department has determined that all marine use classes must be protected. These marine 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.

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

Beaufort Sea is classified as Category 2 waterbody on *Alaska's Final 2024 Integrated Water Quality* Monitoring *and Assessment Report,* February 6, 2025. The Beaufort Sea is not listed as an impaired waterbody nor is the subject waterbody listed as a CWA Section 303(d) waterbody requiring a TMDL. Accordingly, no TMDL has been developed for the subject waterbody.

3.3 Mixing Zone Analysis. Per 18 AAC 70.240, excluding 18 AAC 240(g)(1), (2), and (4) as amended through March 23, 2006 the Department may authorize mixing zone(s) in an APDES permit. CPAI submitted a mixing zone application on November 17, 2022 requesting mixing zones of the same size as those authorized in the 2018 Permit for TRC for Outfall 001 and ΔT for Outfall 002 and an increased size for ΔT at Outfall 001. As in the 2018 Permit, DEC evaluated data sets that account for seasonal differences in temperature (i.e., ΔT) for both Outfalls. DEC elected to use the Cornell Mixing

Zone Expert System modeling program (CORMIX) version 12.0 and modified the analysis to result in authorized mixing zones that are as small as practicable.

Appendix D. Mixing Zone Analysis Checklist, outlines criteria per mixing zone regulations that must be considered when the Department reviews an application for mixing zones. These criteria include the size of the mixing zone, treatment technology, and existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's regulatory mixing zone analysis:

3.3.1 Size

3.3.1.1 Outfall 001 Chronic . The chronic mixing zone for Outfall 001 was modeled using the maximum expected ΔT (16.39° C). Evaluating temperature as the difference between effluent temperature and ambient temperature as paired data sets eliminates the need for seasonal mixing zones when critical effluent and receiving water conditions are modeled concurrently. For the chronic mixing zone, the critical receiving water conditions are represented by under ice, un-stratified low current of 0.03 m/s for the length and width. While the length is typically represented by the high current, in this case the low current represents critical conditions for both because the high effluent velocity combined with the low ambient currents results in entrainment near the outfall and upstream intrusion. This limits the initial mixing and dilution and far field mixing is also limited by the low current. It also results in a mixing zone that is wider than long, in part due to the plume travelling further from the outfall before turning to travel with the prevailing current and also due to spreading under ice.

This approach resulted in a rectangular chronic mixing zone with an authorized dilution factor of 16.3 extending from the seafloor to the top of the unfrozen water column that is 566 meters (m) long (283 m in each current direction) by 317 m wide centered on the single-port discharge. The length is perpendicular to the discharge orientation and parallel with the prevailing currents.

The increase in the mixing zone size is in part to accommodate the increased maximum expected concentration (MEC) for temperature when compared to the previous permit (16.39°C vs 15.9°C). It is also due to using the high effluent flow conditions to represent the worst-case scenario, which as discussed above, results in a larger mixing zone. The Department has determined that this conservative approach ensures dilution is achieved within the mixing zone and does not overlap with nearby mixing zones authorized in AK0055921.

3.3.1.2 Outfall 001 Acute. The acute mixing zone for Outfall 001 was modeled using the probable maximum concentration or TRC (100 µg/L) and the maximum flow of 2.2 mgd. The critical receiving water conditions are represented under ice, un-stratified, low current (0.03 m/s) for the length and width. The high effluent velocity and port configuration results in the plume traveling perpendicular to the currents before turning and moving with the currents, resulting in a larger actual width to account for the distance traveled prior to turning. Due to the port configuration and dilution being met in the nearfield, the mixing zone is off center. Similar to the chronic mixing zone, the high effluent velocity combined with the low ambient currents results in entrainment near the outfall and upstream intrusion. The increase in the mixing zone size to account for this was not previously considered. This approach resulted in a rectangular acute mixing zone with an authorized dilution factor of 7.5 extending from the seafloor to the top of the unfrozen water column that is 48 m long (24 m in each current direction) by 94

m wide centered on the single-port discharge. The length is perpendicular to the discharge orientation and parallel with the prevailing currents.

3.3.1.3 Outfall 002. The chronic mixing zone for Outfall 002 was modeled using the maximum expected ΔT of 7.9° C and the maximum observed flow during the last permit term of 1.3 mgd. The critical receiving water conditions are represented by under ice, initially un-stratified, 10th percentile low current (0.03 m/s) conditions. Based on CORMIX, the discharge plume is observed to rise and become trapped by the ice cover prior to receiving significant vertical mixing. These conditions result in a rectangular chronic mixing zone extending from the seafloor to the top of the unfrozen water column that is 289 m long (144.5 m in each current direction) by 120 m wide centered on the single-port discharge. The length is perpendicular to the discharge orientation and parallel with the prevailing currents. The increase in mixing zone size appears to be due to the effluent flow used for modelling. The maximum observed flow of 1.3 mgd is lower than the flow used in the previous permit. The lower flow results in a lower effluent velocity and in turn less jet and nearfield mixing accounting for the increase in mixing zone dimensions.

3.3.1.4 Discussion on Sizing. In accordance with 18 AAC 70.240(k), the Department determined that the size of the mixing zones for the wastewater discharge is appropriate and are as small as practicable. The sizes of the mixing zones are a small fraction of the area, or width of the Beaufort Sea. Using the 10th percentile current velocity of 0.03 m/s, it would take a drifting organism approximately 19 minutes to traverse the acute mixing zone associated with Outfall 001. DEC views results showing that organisms spend less than 15 minutes in the mixing zone as indicating no reasonable expectation of lethality while results of greater than 15 minutes exposure undergo additional evaluation before making a determination. For Outfall 001, the exposure time is calculated by dividing the length of the mixing zone (24 m of upstream intrusion and 10 m in the down-current direction) by the 10th percentile current (0.03 m/s).

There is no recent WET data for the Department to estimate acute toxicity from, however Roberts et al. (2011) documented that CORMIX under predicts dilutions at low and zero current speeds up to a factor of two. CORMIX is likely underestimating the dilution, and overestimating the length, therefore it is likely that the actual transit time of a drifting organism is less than 15 minutes. Given the low concentrations of pollutants, high chlorine demand in the marine environment, and the absence of sensitive aquatic resources within the vicinity, all the mixing zones are determined to be protective of aquatic life.

The comparative difference in chronic mixing zone sizes between Outfall 001 and Outfall 002 is due to the differences in exit velocities at the discharge ports and the resulting effects in the nearfield. The velocity exiting the 12-inch port for Outfall 001 is greater than that of the 24-inch port on Outfall 002. This difference translates to the discharge for Outfall 001 meeting chronic water quality criteria conditions much sooner than it does for Outfall 002. This in turn leads to assigning the width based on low current conditions and the length based on the high current. For Outfall 002, the controlling conditions for both the width and length is the low current condition due to less jet plume mixing in the nearfield associated with the low discharge velocity and dominance of impingement and spreading under the ice layer.

3.3.2 Technology. 18 AAC 70.240(c)(1) requires the Department to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are described in 18 AAC 70.240(c)(1)(A), (B), and (C) as follows:

- Any federal Technology-based effluent limitations (TBELs) identified in 40 Code of Federal Regulations (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 72.050; and
- Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

The first part of the definition includes all applicable federal technology-based effluent limit guidelines (ELGs) that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case Best Professional Judgment (BPJ). There are no ELGs that apply to the Permit. The Permit includes a TBEL for pH developed using case-by-case BPJ for Outfall 001. The Department determines that the first part of the definition has been met.

The second part of the definition per 18 AAC 72.050 refers to the minimum treatment requirements 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, 18 AAC 72, nor another state legal requirement that the Department is aware of impose more stringent treatment requirements than 18 AAC 70. Therefore, the third and final part of the definition has also been met.

3.3.3 Existing Use. Per 18 AAC 70.240(c)(2), the mixing zone has been appropriately sized to fully protect the existing uses of the Beaufort Sea. Water quality criteria are developed to ensure protection of all existing uses. The chronic mixing zones have been appropriately sized to ensure water quality criteria will be met at, and beyond, the boundary of the mixing zone and that regulatory waterbody mixing zone size requirements have been met. Accordingly, the mixing zones result in the protection of the existing uses of the waterbody as a whole.

3.3.4 Human Consumption. Per 18 AAC 70.240(d)(6), 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 per 18 AAC (c)(4)(C). The mixing zone is not at a location where aquatic resources are harvested or that could result in precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. In addition, there is no indication that the pollutants discharged could produce objectionable color, taste, or

odor in aquatic resources harvested for human consumption if such resources existing at the location of the mixing zone.

3.3.5 Spawning Areas. Per 18 AAC 70.240(e)(1) and (2), a mixing zone will not be authorized in lakes, streams, rivers, or other flowing freshwaters in spawning area of any of the five species of Pacific salmon found in the state or be allowed to adversely affect the present and future capability of an area to support spawning of these species. Per 18 AAC 70.240(f), a mixing zone will not be authorized in a spawning area for the following resident fish: spawning redds, Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), inconnu/sheefish (*Stenodus leucichthys*) and all other whitefish in Alaska belonging to genera *Prosopium* and *Coregonus*, Arctic char (*Salvelinus alpinus*), Dolly Varden (*S. malma*), brook trout (*S. fontinalis*), rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*O.clarkii*), burbot *Lota*, landlocked coho salmon (*O. kisutch*), Chinook salmon (*O. tshawytscha*), and sockeye salmon (*O. nerka*). The Permit does not authorize the discharge of effluent to open waters of a freshwater lake, river, or other flowing freshwater. Therefore, there are no associated discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

3.3.6 Human Health. Per 18 AAC 70.240(d)(1), the mixing zones must not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota, or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. The Department has reviewed available data provided by the applicant and has determined there are no bioaccumulating or bioconcentrating parameters associated with the discharge.

Per 18 AAC 70.240(d)(2), pollutants discharged must not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic or other effects as determined using a risk assessment method approved by the Department and consistent with 18 AAC 70.025 which indicates the lifetime incremental cancer risk level is 1 in 100,000 for exposed individuals. There are no known cancer-causing pollutants being discharged at concentrations that present unacceptable risks.

Given the characteristics of the effluent discharged through Outfalls 001 and 002, there are no indications that the discharges include pollutants that could bioaccumulate, bioconcentrate, or persist above natural levels in sediments, the receiving water, or biota. The Department determines that the discharges are protective of human health.

3.3.7 Aquatic Life and Wildlife. Per 18 AAC 70.240(c)(3), the Department will approve a mixing zone if there is available evidence that reasonably demonstrates the overall biological integrity of the waterbody will not be impaired and per 18 AAC (c)(4)(A), (D), (E), and (G) the mixing zone will not result in acute or chronic toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone(s); a reduction in fish or shellfish population levels; permanent or irreparable displacement of indigenous organisms; or a barrier to migratory species or fish passage. In addition, the mixing zone must not result in undesirable or nuisance aquatic life per 18 AAC 70.240(d)(5).

Based on the characteristics of the effluent in Outfalls 001 and 002 and size of the acute mixing zone for TRC in Outfall 001, there is no anticipation of lethality to drifting organisms (See Section 3.3.1), nor do the effluent characteristics indicate there will be undesirable nuisance aquatic life effects or displacement, or reduction, of existing aquatic life outside the mixing zones. Because all criteria are met at the respective acute and chronic mixing zone boundaries, toxic effects in the water column,

sediments, or biota will not occur outside these boundaries; existing water quality criteria are protective from these occurrences. The Department therefore concludes that aquatic life and wildlife will be maintained and protected.

3.3.8 Endangered Species. Per 18 AAC 70.240(c)(4)(F), the mixing zones may not cause an adverse effect on threatened or endangered species. Based on the available information regarding threatened and endangered species in the vicinity of the discharge and the size of the mixing zones, authorized mixing zones are not likely to adversely affect threatened or endangered species. Based on the limited time that threatened or endangered species may migrate though this area, the discharge is not likely to cause an adverse effect. Species with potential to be in the vicinity of Outfall 001 and are listed under the Endangered Species Act (ESA) are discussed in Section 8.1.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits. Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to WOTUS unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of AS 46.03 and is in accordance with the 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 –WQS, and (3) comply with other state requirements that may be more stringent. In establishing permit limits, DEC first determines which, if any, ELGs must be incorporated into the Permit and whether other TBELs using case-by-case BPJ should be adopted. DEC then evaluates the effluent characteristics to determine if the discharge could result in, or contribute to, instream excursions above the water quality criteria in the receiving water beyond the boundary of the authorized mixing zones. If instream excursions could occur, water quality based effluent limits (WQBELs) must be included in the Permit. The CWA requires that the limits for a particular pollutant be the more stringent of either TBELs or WQBELs.

The Permit includes numeric WQBELs and Best Management Practices (BMPs) for temperature for both Outfalls 001 and 002, as well as a WQBEL for TRC for Outfall 001. In addition, a TBEL for pH developed using case-by-case BPJ is included for Outfall 001 (See Appendix C. Effluent Limitations for additional details).

4.2 Technology Based Effluent Limits. As discussed in Appendix C. Effluent Limitations, TBELs are either established using case-by-case BPJ or set via EPA rule makings in the form of ELGs, adopted by reference in 18 AAC 83, that correspond to the level of treatment achievable in selected industries using available treatment technology. There are no established ELGs applicable to the discharges authorized by the Permit. The 2018 Permit, however, did establish a TBEL through BPJ for pH based on the high buffering capacity of marine waters. DEC has evaluated effluent characteristics and available treatment technologies and has concluded that the TBEL limitation of $6.0 < pH < 9.0$ SU at all times is still appropriate and is retaining the limitation.

4.3 Water Quality Based Effluent Limits

4.3.1 Strainer/Filter Backwash (Outfall 001). Based on available evidence, the Department has determined there is reasonable potential for the discharge of strainer backwash to exceed numeric water quality criteria for temperature, pH, and TRC at the point of discharge. However, as discussed in Section

2.1.1, only temperature and TRC are evaluated in the RPA for limit derivation purposes as the driving parameters for the chronic and/or acute mixing zones, respectively.

4.3.1.1 Reasonable Potential Analysis (Outfall 001). As the driving parameters for the acute and chronic mixing zones, the Department determined there is reasonable potential for TRC and ΔT to exceed, or contribute to an exceedance, of water quality criteria at the respective mixing zone boundaries. In APPENDIX C., the Department developed the following WQBELs for ΔT and TRC.

4.3.1.2 WQBEL Derivation (Outfall 001). The following summarizes the derivation of WQBELs (see Appendix C. for calculations).

TRC: The WQBEL derivation resulted in an MDL of 86 µg/L and an AML of 23 µg/L, both of which are slightly more stringent than what is cited in the 2018 Permit. Both limits are below what is quantifiable using EPA-approved methods in 40 CFR 136. DEC establishes the minimum level (ML) for TRC of 100 µg/L as the compliance limit for these WQBELs. Because the facility uses continuous TRC monitoring equipment calibrated to 12 µg/L, rules for reporting and averaging are necessary (See Section 4.4.1.3).

Temperature Differential (ΔT): The WQBEL derivation resulted in an MDL of 22°C for ΔT, which is equivalent to the limit in the 2018 Permit. The permittee shall continue to monitor the receiving water temperature as represented by the seawater intake bay simultaneously with the effluent to demonstrate compliance with the temperature limit. Temperature monitoring is only applicable when there is a discharge occurring. Hence, the permittee is not required to monitor and report temperature differential if there is no discharge occurring.

4.3.2 Marine Life Return System (Outfall 002). Based on available evidence, the Department has determined there is reasonable potential for the discharge of the MLRS discharge to exceed numeric water quality criteria for temperature at the point of discharge. The permittee has applied for a mixing zone for Outfall 002 and as discussed in Section 2.2.2, temperature is the sole parameter evaluated in the RPA for the chronic mixing zone.

4.3.2.1 Reasonable Potential Analysis (Outfall 002). Temperature is the driving parameter for the chronic mixing zone for Outfall 002. The Department determined there is reasonable potential for ΔT to cause or contribute to an excursion above water quality criteria (See Appendix B. Reasonable Potential Determination). In Appendix C., the Department developed the following WQBEL for ΔT.

4.3.2.2 WQBEL Derivation (Outfall 002). Temperature Differential (ΔT): The WQBEL derivation resulted in an MDL of 13°C for ΔT, which is more stringent than the limit in the 2018 Permit. The permittee shall continue to monitor the receiving water temperature as represented by the seawater intake bay simultaneously with the effluent to demonstrate compliance with the temperature limit. Temperature monitoring is only applicable when there is a discharge occurring. Hence, the permittee is not required to monitor and report temperature differential if there is no discharge occurring.

4.4 Effluent Limits and Monitoring Requirements. Per AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. The following sections provide the effluent limits and monitoring requirements for each outfall.

4.4.1 Outfall 001 Strainer Backwash. The Permit requires the limitations and monitoring requirements per Table 3.

Table 3: Outfall 001 Strainer Backwash Limits and Monitoring Requirements

Parameter	Effluent Limits			Monitoring Requirements	
	Units	MDL	AML	Frequency	Type
Flow	mgd	2.2	Report	Continuous	Meter
pH [4.4.1.1]	SU	6.0 < pH < 9.0		Weekly	Meter or Grab
ΔT [4.4.1.2]	°C	22	N/A	Weekly	Meter or Grab
TRC [4.4.1.3]	µg/L	100	100	Weekly	Meter or Grab
Chronic WET [4.4.3]	TU_c	Report		Annual	Grab
Note: Table notes refer to the Sections below this table.					

4.4.1.1 pH Conditions. The pH shall be maintained at values greater than 6.0 and less than 9.0 SU (6.0 < pH < 9.0). The permittee must report the monthly maximum and monthly minimum on the DMR.

4.4.1.2 ΔT Conditions. Temperature differential is the effluent temperature minus the receiving water temperature as represented by the seawater intake bay. The permittee shall monitor the receiving water intake simultaneously with the effluent on a weekly basis while discharging to demonstrate compliance with the temperature limit. In addition to submitting monthly DMRs, the permittee must record the weekly maximum ΔT for the month on the DMR and submit all data with the next application for reissuance representing the actual readings from the equipment and not DMR entries.

4.4.1.3 TRC Conditions. The permittee must monitor TRC daily and report the maximum weekly value for the month on the DMR. The application for reissuance must include the daily TRC monitoring data. The TRC compliance level for the MDL and AML are set at 100 µg/L. Because the facility currently uses continuous TRC monitoring equipment calibrated to detect down to 12 µg/L the following rules for reporting and averaging apply. If equipment modifications result in different calibrations, the new detectable value may be used instead of 12 µg/L as long as the compliance level of 100 µg/L is achieved.

If the facility equipment is calibrated to 12 µg/L (lowest achievable detection), then:

- Report < 12 on the DMR when the equipment reads < 12:
- Report < 100 on the DMR when the equipment reading is between 12 and 100;
- Report on the DMR the actual value when the equipment reports ≥ 100.
- For averaging, use 0 for < 12; use 12 for readings between 12 and 100; and use the actual value when ≥ 100.

Data submitted to DEC for the next permit application must represent the actual readings from the equipment and not DMR entries.

4.4.2 Outfall 002 Marine Life Return System. The Permit requires the limitations and monitoring requirements per Table 4.

Table 4: Outfall 002 Marine Life Return System Limits and Monitoring Requirements

Parameter	Effluent Limits			Monitoring Requirements	
	Units	MDL	AML	Frequency	Type
Flow	mgd	Report	Report	Continuous	Meter
ΔT [4.4.1.2]	°C	13	N/A	Weekly	Meter or Grab

4.4.3 Chronic WET Monitoring. If chemical additives are used in the clarifying process, excluding TRC that goes through a dichlorination process before discharge the permittee must conduct chronic WET monitoring per the following requirements.

4.4.3.1 Test Species and Methods. When chronic WET monitoring is required by the Permit, the permittee must conduct chronic WET testing on one vertebrate and one invertebrate species. The permittee must conduct the WET testing to screen for the most sensitive invertebrate species below. Upon identification of the most sensitive test species, the permittee may submit a written request to eliminate the less sensitive species in subsequent WET analysis for DEC approval. DEC can also approve written requests to substitute the less sensitive species during periods when the more sensitive species is unavailable. The permittee shall not make any changes to the selection of test species or dilution series without prior written approval by DEC except as provide below.

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

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

4.4.3.2 Monitoring Frequency. The Permit specifies annual chronic WET testing of both vertebrate and invertebrate species. If the Permittee plans to use chemical additives in the clarifying process, the Permittee must also plan to collect chronic WET samples immediately once effective dosing rates are established for injection. Hence, the sample should be collected as soon as the initial sample is representative of continuous operation.

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

Methods and Endpoints: For the mysid shrimp and the alternate fish species (inland silverside) the presence of chronic toxicity must be estimated as specified in *Environmental Protection Agency* (*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) or the most recently updated version must be used.

For the bivalve species (Pacific Oyster and mussel) and the primary fish species (topsmelt) chronic toxicity must be estimated as specified in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to West Coast Marine and Estuarine Organisms (EPA/600/R-95/136).

The WET testing will determine the 25 percent (%) effect concentration (EC25) endpoint estimate of the effluent concentration that would cause a 25 % reduction in normal embryo development for the bivalves or in survival for fish and/or mysid shrimp. The WET testing will also determine the inhibition concentration (IC25) point estimate of the effluent concentration that would cause a 25 % reduction in the growth of the fish and/or mysid shrimp.

Reporting Results: Results must be reported on the DMR using TUc, where TUc = $100/EC_{25}$ or $100/IC_{25}$. The reported EC_{25} or IC_{25} must be the lowest point estimate calculated for the applicable survival, growth or normal embryo development endpoints. If the endpoint is estimated to be above the highest dilution, the permittee must indicate this on the DMR by reporting a less than value for TUc based on the highest dilution.

The permittee must report the no observed effect concentrations (NOECs) in the full WET test report. DEC may compare this information with the IC_{25} during reissuance of this Permit.

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

Dilution Series: A series of at least five dilutions and a control must be tested. The recommended initial dilution series is 6.25, 12.5, 25, 50, and 75% (or maximum hypersaline dilution per test method) and a control dilution water control (0% effluent). In subsequent tests, the dilution series should be modified to bracket toxicity endpoints observed during previous tests. DEC may provide written direction to modify the previous dilution series or the permittee may request written approval from DEC to modify the dilution series based on previous test results.

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

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

- If organisms are not cultured by the testing laboratory, concurrent testing with reference toxicants must be conducted, unless the test organism supplier provides control chart data from at least the previous five months of reference toxicant testing. Where organisms are cultured by the testing laboratory, monthly reference toxicant testing is sufficient.
- If either of the reference toxicant tests or the effluent tests does not meet all test acceptability criteria as specified in the test methods manual, then the permittee shall re-sample and re-test within the following month.
- Control and dilution water must be receiving water, or salinity adjusted lab water. If the dilution water used is different from the culture water, a second control, using culture water must also be used.

4.4.3.4 WET Reporting, The following details WET reporting requirements.

DMRs and Full Report Deliverables: The permittee shall submit chronic WET test results on next month's DMR following the month of sample collection. The permittee must also submit the full WET Toxicity Report with the next application for reissuance or upon Department request per Section 4.4.5.2.

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

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

- The date and time of sample collection and initiation of each test,
- The discharge flow rate at the time of sample collection, and
- A list of any chemical additives being used by facility that could potentially be in the effluent during the 30-day period preceding sampling including the following three components:
    - type of each chemical (product name) injected upstream of the strainers and/or in waterflood drain-back,
    - estimated concentrations listed in item 1) that are injected upstream of the strainers and/or contained in waterflood drain-back, and
    - estimated volume of chemically treated strainer backwash and/or volume of STP or waterflood drain-back.

Note: The use of any clarifying agent triggers chronic WET monitoring per Section 4.4.3 to provide characterization data based on whichever chemical is used. In addition, the permittee must develop and implement a chemical-dosing matrix to optimize the use of coagulants and other clarifying agents as a BMP specific to discharge 001 (See Section 7.3). The inclusion of chemical information in the Full WET Report fulfills the previous requirement of submitting a chemical inventory annually. Failure to include this information may result in a permit violation.

4.4.4 Notifications

Chemical Use Notification: The injection of treatment chemicals other than NALCO 7768 and CHEMLINK 4835 ahead of the strainers without prior notification to the Department is prohibited. This requirement does not pertain to use of hypochlorite during routine operations, followed by de-chlorination prior to discharge. Nor does it pertain to chemicals injected into the finished waterflood downstream of the strainer (e.g., corrosion inhibitors, deaeration chemicals, or biocides) that are not routinely discharged. Drain-back of waterflood containing chemicals is prohibited. However, the Permittee may apply BMPs to cease chemical injection and then allow drain-back of waterflood with minimal residual chemicals.

Drain-Back Notification: Discharge of waterflood drain-back with chemical additions is prohibited. However, the discharge of drain-back water that has only residual chemicals may be approved as a contingency discharge for emergency repairs. The permittee must develop and implement specific BMPs that ensure that only minor residual chemicals are in the waterflood (e.g., replacing chemical laden waterflood with only filtered seawater) at the time of drain-back. The permittee must notify DEC of the intent to implement the BMP in preparation to discharge drain-back waterflood a minimum of 7-

days prior to the proposed discharge. Notification shall include information on the anticipated volume, duration of discharge, and certification that the discharge will have only minor residual chemicals. DEC will coordinate with the Permittee and provide written approval, if appropriate. Approval will be based on demonstration/certification that the waterflood does not have residual chemical concentrations using conservative BMPs to cease chemical injection and purge the pipeline of chemical laden seawater. The written approval will include reporting requirements and may include requirements for additional BMPs.

For situations where halting chemical injection is not possible prior to drain-back, DEC recommends that the permittee consider developing a Regional Response Plan that can be implemented quickly. DEC also suggests that the Regional Response Plan includes instructions for establishing an Incident Command that has the appropriate authority over the situation.

Non-Compliance Notification (NCN): The Oil and Gas Section has updated the NCN for this Permit to be interactive and accompanied by a flowchart. The permittee must report certain violations of MDLs and AMLs, per Appendix A, Standard Conditions, Section 3.4 – 24-Hour Reporting. For this permit, a 24-hour notice is not required for any MDL unless related to an upset condition or unanticipated bypass. Violations of all other effluent limitations not described in Section 3.4 are to be reported per Appendix A, Standard Conditions, Section 3.5 – Other Noncompliance Reporting. The Department has developed a flow chart to assist permittees with determining when 24-hour reporting is required (See Appendix E. Noncompliance Notification Flow Chart).

Redirecting Spill Notifications: The DEC Oil and Gas Section has eliminated spill reporting from the NCN Form. Unless there is a sheen notification requirement in the Permit or a spill causes in an effluent limit exceedance or violation of a permit condition, the Department is no longer requiring spill notifications to be reported to the Division of Water. Reporting spills only need to be directed to the DEC Spill Prevention and Recovery (SPAR) Program. While a spill to receiving water is a water quality concern under 18 AAC 70, there are no spill provisions in 18 AAC 83 that directly link it to the Permit. DEC SPAR is appropriate contact for spills; SPAR or an Incident Commander may coordinate with DEC WDAP on water quality issues during the response and closure process. To report a spill to SPAR, go to https://dec.alaska.gov/spar/ppr/spill-information/reporting/.

4.4.5 Monitoring and Reporting Requirements

4.4.5.1 Reporting Requirements . DEC has developed the Environmental Data Management System (EDMS) as the application portal and portal for submitting documents required for compliance, except for DMRs. Although DEC intends to eventually consolidate all reporting into EDMS, this is not currently possible. Therefore, permittees must use NetDMR to submit DMRs and EDMS for all other reporting needs. Once DEC makes EDMS fully functional and retires NetDMR, the Standard Conditions will be updated to reflect the new submittal process and put it out for a 30-day public notice before being formally adopted. Until that time, the Reporting Requirements stated in the Permit supersede any temporary inconsistencies in the transitional Standard Conditions. Permittees will be notified if this transition occurs during the Permit term.

4.4.5.2 Discharge Monitoring Report Submittals. The permittee must submit a DMR for each month by the 28th day of the following month. DMRs shall be submitted electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127). Authorized persons may access permit information by logging into the NetDMR Portal (https://cdx.epa.gov/). Any DMR data required by the

Permit that cannot be reported in a NetDMR field (e.g., WET reports, etc.), must be submitted with the next application for reissuance or upon Department request. Note that EDMS may be used to upload such items as "other reports".

4.4.5.3 Other Reports and e-Reporting Phase II Implementation. The Department is integrating electronic reporting in EDMS for other reports required by the Permit per Phase II of the E-Reporting Rule (e.g., Certifications and Noncompliance Notifications).Once reports are established in EDMS, the Department does not intend to allow submittals by alternative means to EDMS (e.g., hard copy, emails, etc.), except temporarily with written approval from the Department on a case-by-case basis depicting extenuating circumstances. DEC recommends using EDMS for all submittals, with the exception of DMRs, until further notice. If any questions or uncertainties arise, DEC advises permittees to contact the Department for assistance.

4.4.5.4 Additional Information on EDMS Upgrades. DEC intends to make EDMS the sole reporting portal at some indefinity time in the future. DEC will keep permittees apprise as this transition nears. DEC has established an e-Reporting Information website at https://dec.alaska.gov/water/compliance/electronic-reporting-rule/ that contains general information about this new reporting format. Support for EDMS and training materials and webinars for NetDMR can be found at Electronic Reporting (alaska.gov).

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

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

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

- The method minimum level (ML) is at or below the level of the applicable water quality criterion for the measured parameter, or
- The method ML is above the applicable water quality criterion, but the amount of the pollutant or pollutant parameter in the discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge (e.g., not applicable to effluent or receiving water monitored for characterization), or

- The method has the lowest ML of the analytical methods approved under 40 CFR 136 for the measured pollutant or pollutant parameter (e.g., the receiving water concentration or the criteria for a given pollutant or pollutant parameter is at or near the method with the lowest ML).

5.0 ANTIBACKSLIDING

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

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

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

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

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

Discharge data collected during the previous permit term for Outfalls 001 and 002 was evaluated by the Department using the *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL Guidance)*, which resulted in WQBELs for temperature and TRC that are at least as stringent as those in the 2018 Permit. Chronic WET monitoring was not conducted during the previous permit term and WET monitoring conditions for Outfall 001 are retained. WQBELs in the Permit either equal to or slightly more stringent than those in the existing permit and therefore comply with the antibacksliding requirements.

6.0 ANTIDEGRADATION

6.1 Legal Basis. Antidegradation is implicit in CWA Section 101(a) goals, explicitly referenced in CWA Section 303(d)(4)(B) and implemented through 40 CFR 131.12. Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the

waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy and implementation methods. Alaska's current antidegradation policy and implementation methods are presented in 18 AAC 70.015 *Antidegradation policy* (policy) and in 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act* (implementation methods). For these state regulations to apply under the CWA, they must be previously approved by EPA per CWA Section 303(c)(3). The policy and implementation methods have been amended through April 6, 2018; are consistent with the CWA and 40 CFR 131.12; and were approved by EPA on July 26, 2018.

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

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

The Beaufort Sea is described as attaining water quality standards in *Alaska's Final 2024 Integrated Water Quality Monitoring and Assessment Report,* February 6, 2025. The Beaufort Sea is not listed as an impaired waterbody nor is the subject waterbody listed as a CWA Section 303(d) waterbody requiring a Total Maximum Daily Load (TMDL). Accordingly, no TMDL has been developed for the subject waterbody. Therefore, no parameters have been identified where only the Tier 1 protection level applies. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

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

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

(A) existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;

The Department reviewed water quality data, environmental monitoring studies, and information on existing uses in the vicinity of Discharge 001 and 002 submitted by the applicant. The Department finds the information reviewed as sufficient to identify existing uses and water quality necessary for Tier 1 protection.

(B) existing uses will be maintained and protected*;*

Per 18 AAC 70.020 and 18 AAC 70.050, marine waters are protected for all uses. Hence, if criteria are met, then the uses of the waterbody are being protected. When developing limitations and permit

conditions, DEC applies the most stringent criteria based on all applicable uses of the receiving waterbody. Therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (DEC 2008) apply and are applied to ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected.

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

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

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

6.4 Tier 2 Analysis. Per 18 AAC 70.016(c)(2), an antidegradation analysis is only required for those waterbodies needing Tier 2 protection and which have any new or existing discharges that are being expanded based on permitted increases in loading, concentration, or other changes in effluent characteristics that could result in comparative lower water quality or pose new adverse environmental impacts. Per 18 AAC 70.016(c)(2)(A), the analysis will only be conducted for the portion of the discharge that represents a new discharge or an increase from the existing authorized discharge. Additionally, per 18 AAC 70.016(c)(3), DEC is not required to conduct an antidegradation analysis for a discharge that is not new or not expanding. The discharge is neither new nor expanded because the existing effluent limitations are not less stringent. Adjusting the TRC limit to reflect the compliance level is for clarity only and does not change how the TRC limit was implemented from the previous Permit (See Section 5.0). Therefore, the Tier 1 Antidegradation Analysis satisfies the requirements of 18 AAC 70.015 and 0.016.

7.0 OTHER PERMIT CONDITIONS

7.1 Standard Conditions. Appendix A of the Permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on regulations and cannot be challenged in the context of an individual APDES permit action. However, the standard conditions also cover requirements based on regulations that may be in transition (e.g., Phase II eReporting) or conditions not based on regulation (e.g., DMR submittal deadlines). While DEC is transitioning to some new regulations, some of the Standard Conditions in Appendix A are being superseded by the Permit until such time revised Standard Conditions can be drafted, public noticed, and implemented holistically in the future

7.2 Quality Assurance Project Plan. The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the Quality Assurance Project Plan (QAPP) within 90 days of the effective date of the final Permit. Additionally, the permittee must certify in writing that the plan has

been implemented within the required time frame and retain the certification onsite with the QAPP and made available to DEC upon request. Hence, the date of the certification determines compliance with this requirement. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing, and shipping samples; laboratory analysis; and data reporting

7.3 Best Management Practices Plan. A BMP Plan is a collection of pollution control methods and housekeeping measures which are intended to minimize or prevent the generation and the potential release of pollutants from a facility to WOTUS 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 Section 402(a)(1) authorizes DEC to include miscellaneous requirements that are deemed necessary to carry out the provision of the CWA in permits on a case-by-case basis. The BMP Plan must be developed and maintained 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 (See Section 7.3.3).

7.3.1 Implementation and Maintenance. The permittee must develop a BMP Plan that achieves the broad objectives outlined in Section 7.3. The BMP Plan 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 facility or in the operation of the facility 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 changes to the BMP Plan. Permittees must conduct an annual review and a certification statement must be submitted to the Department annually. Within 90 days after the effective date of the Permit, the permittee must review, revise as necessary to be consistent with the reissued Permit, and certify in writing these tasks have been completed within the required time frame prior to implementing. In subsequent years of the Permit, the permittee must establish a review committee to review and revise the BMP Plan at least annually to include any modifications deemed to be necessary or appropriate since the previous revision to meet the objectives and specific requirements in the Permit. Hence, the date of the certification determines compliance with this requirement. This initial and all subsequent certifications shall be retained onsite with the BMP Plan and made available to DEC upon request. The BMP Plan must include the standard components per Section 7.3.2 and specific requirements in Section 7.3.3.

7.3.2 Standard BMP Plan Components. The BMP Plan is to 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 all annual BMP Plan Certification Statements for the current permit term.
- 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 facility, 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.
- An identification and assessment of risks associated with accidental pollutant releases.
- Standard Operating Procedures that 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 on BMP requirements 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.

7.3.3 Specific BMP Requirements. If applicable, in addition to the generic BMPs listed in Permit Section 3.2.4, DEC requires that specific BMPs be included in the BMP Plan for minimizing coagulant/flocculant dosages by way of the chemical-treating developed by CPAI. When applicable, DEC also requires that specific BMPs be included in the BMP Plan for preventing treatment chemicals in waterflood that could be drained back to the seawater intake reservoirs, or other locations in marine water, to facilitate pipeline maintenance and repairs. Successful implementation of this specific BMP nullifies the requirement to conduct chronic WET monitoring per Section 4.4.3 when the pipeline is drained back.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act. Per Section 7 of the ESA, federal agencies are required to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fishery Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies Section 7 regarding permitting actions. However, this does not absolve DEC from

complying with sections 9 and 10 of the ESA. DEC addresses this by requiring the permittee to be responsible for complying with the ESA for discharges under the Permit.

The Department voluntarily requested this information from these services on April 12, 2024 to inform permit development. The USFWS directed the department to the Information for Planning and Consultation (IPaC) tool. The Department did not receive a response from NOAA and also reviewed the Marine Mammal Protection Map (MMPA) - interactive map for habitat ranges. Based on the information provided by the MMPA and the IPaC tool that the following threatened and endangered species may occur in the Beaufort Sea at the vicinity of one of the discharges: Steller's Eider (*Polysticta stelleri*), Spectacled Eider (*Somateria fischeri*), Polar Bear (*Ursus maritimus*), Bowhead Whale (*Balaena mysticetus*), Humpback Whale (*Megaptera novaeangliae*), Bearded Seal (*Erignathuse barbatus nauticus*), and Ringed Seal (*Phoca hispida hispida*).

8.2 Essential Fish Habitat. Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. Although DEC, as a state agency, is not required to consult with the National Marine Fisheries Service (NMFS) regarding permitting activities, the Department voluntarily requested this information April 12, 2024 from these services to inform permit development. The Department did not receive a response and inspected the NMFS interactive map of EFH and found the area in the vicinity of the discharges is EFH for Arctic Cod (*Arctogadus glacialis*) and Snow Crab (*Chionoecetes opilio*).

No other North Pacific marine fish species were listed on the NMFS interactive website as having EFH in the general area of the discharges.

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

9.0 References

1. 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.
2. Alaska Department of Environmental Conservation, 2022. *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, May 17, 2021.
3. Alaska Department of Environmental Conservation, 2003, 2009, and 2012. Alaska Water Quality Standards.
4. Alaska Department of Environmental Conservation. Antidegradation Implementation Methods. Division of Water. April 6, 2018.
5. Alaska Department of Natural Resources – Division of Oil and Gas, *Annual Report*, 2014.
6. Alaska Department of Natural Resources – Division of Oil and Gas, North Slope Borough and Beaufort Sea Oil and Gas Lease Inventory, July 16, 2017.
7. Alaska Oil and Gas Association. *Economic Impact Report – The Role of the Oil and Gas Industry in Alaska's Economy*, May 2017.
8. Alaska Pollution Discharge Elimination System Discharge and Monitoring Report, 2011 – 2015.
9. National Oceanic and Atmospheric Administration, 2024 *EFH Mapper. N.p.,n.d.* Web April 12, 2024.
10. National Oceanic and Atmospheric Administration, 2024 *MMPA Mapper. N.p.,n.d.* Web April 12, 2024.
11. U.S. Fish and Wildlife Service, 2024 *IPaC. N.p.,n.d.* Web April 12, 2024.

Appendix A. Figures

Figure 1: Vicinity Map Location of Kuparuk Seawater Treatment Plant

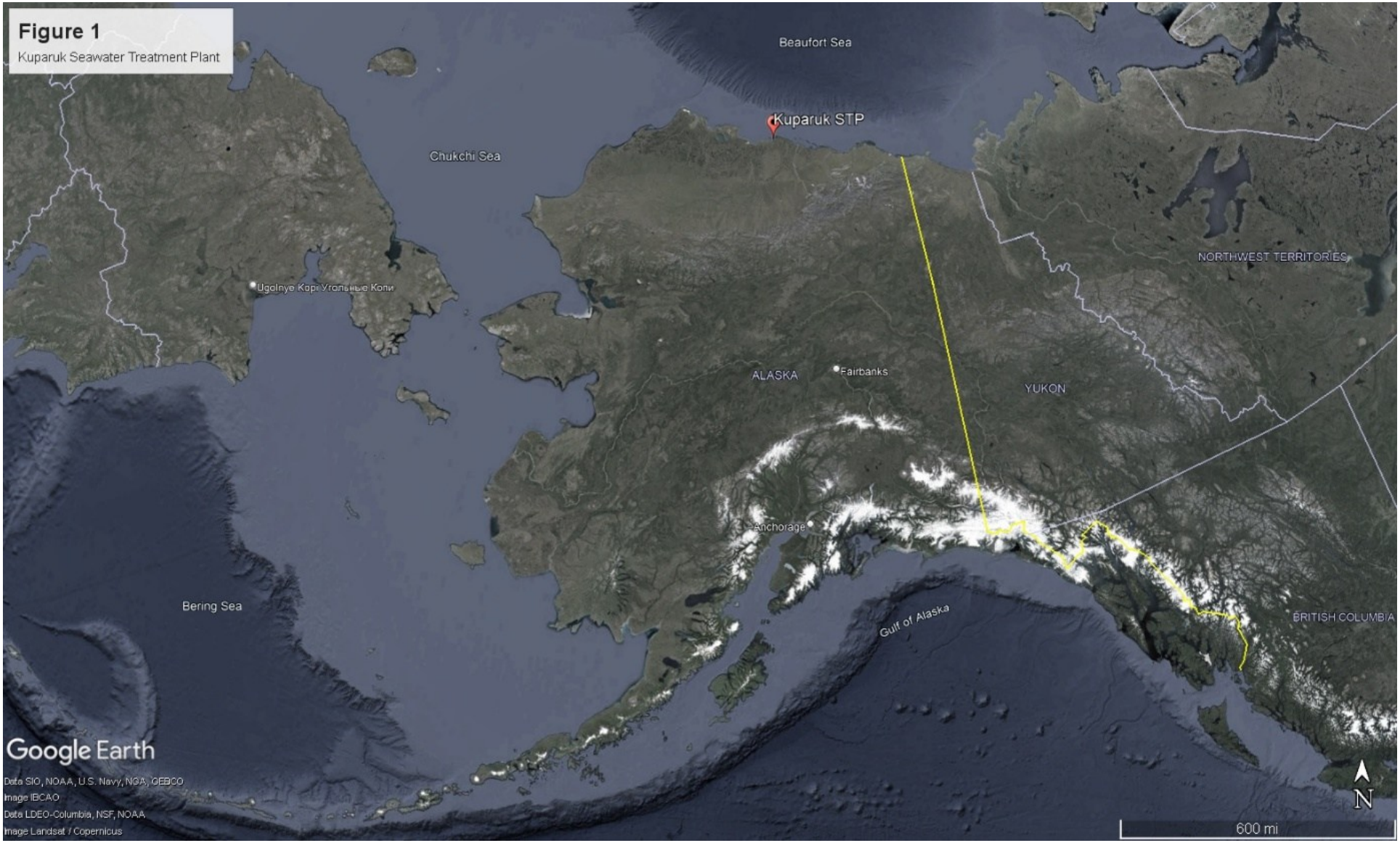


Figure 2: CPAI Kuparuk Seawater Treatment Plant – Beaufort Sea – Outfalls 001 and 002

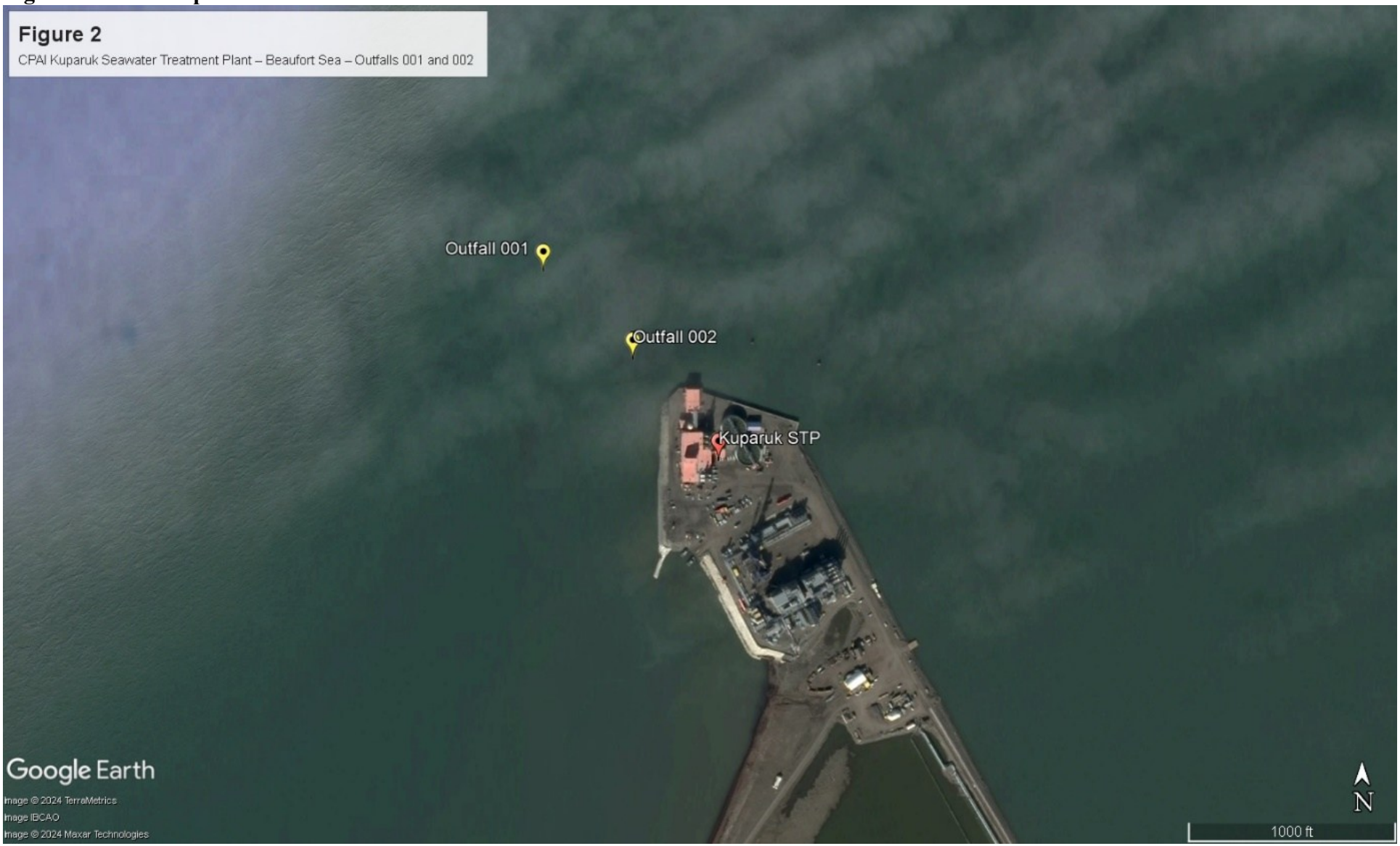


Figure 3: Kuparuk Seawater Treatment Plant

Figure 4: Seawater Treatment Plant Simplified Process Flow Diagram

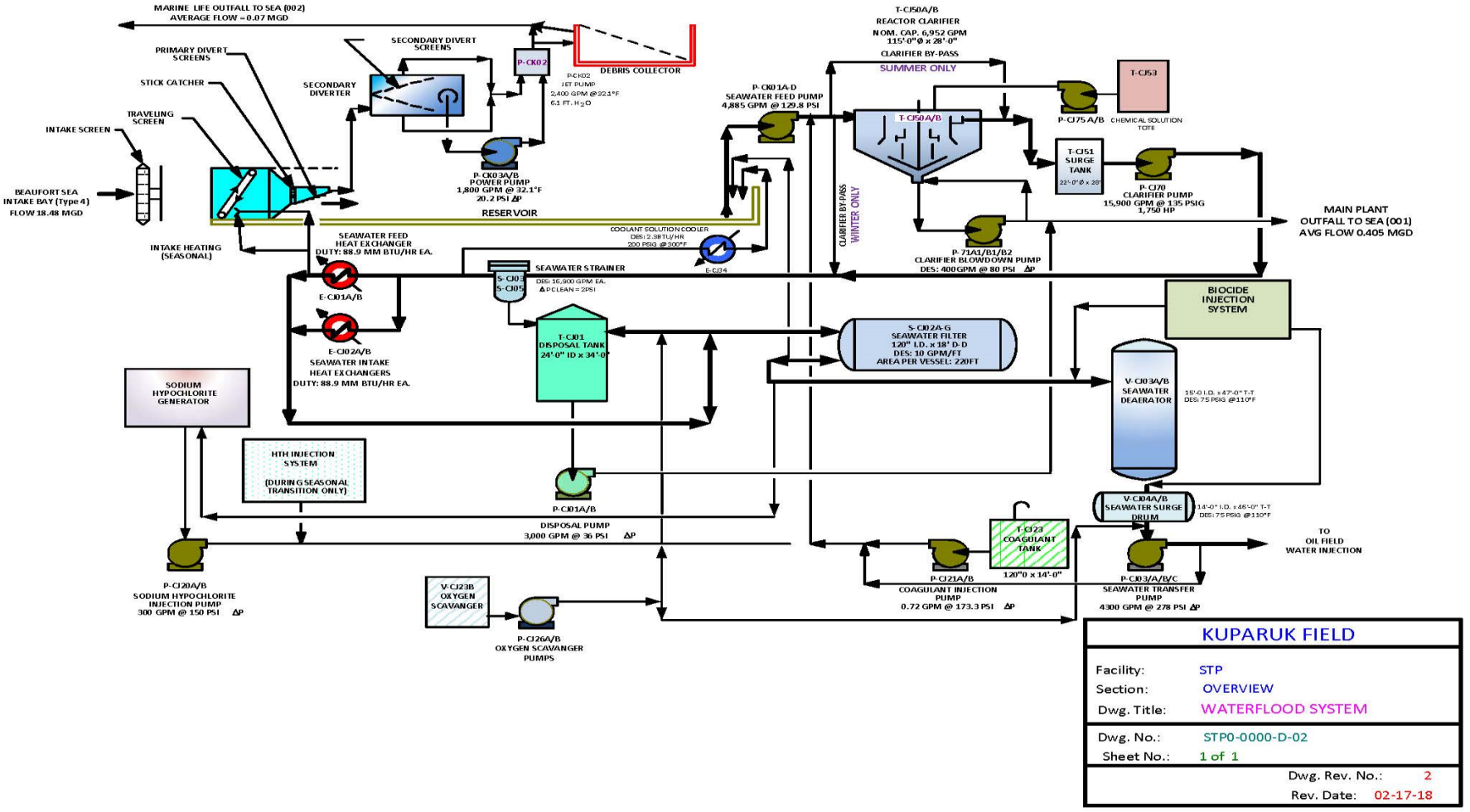
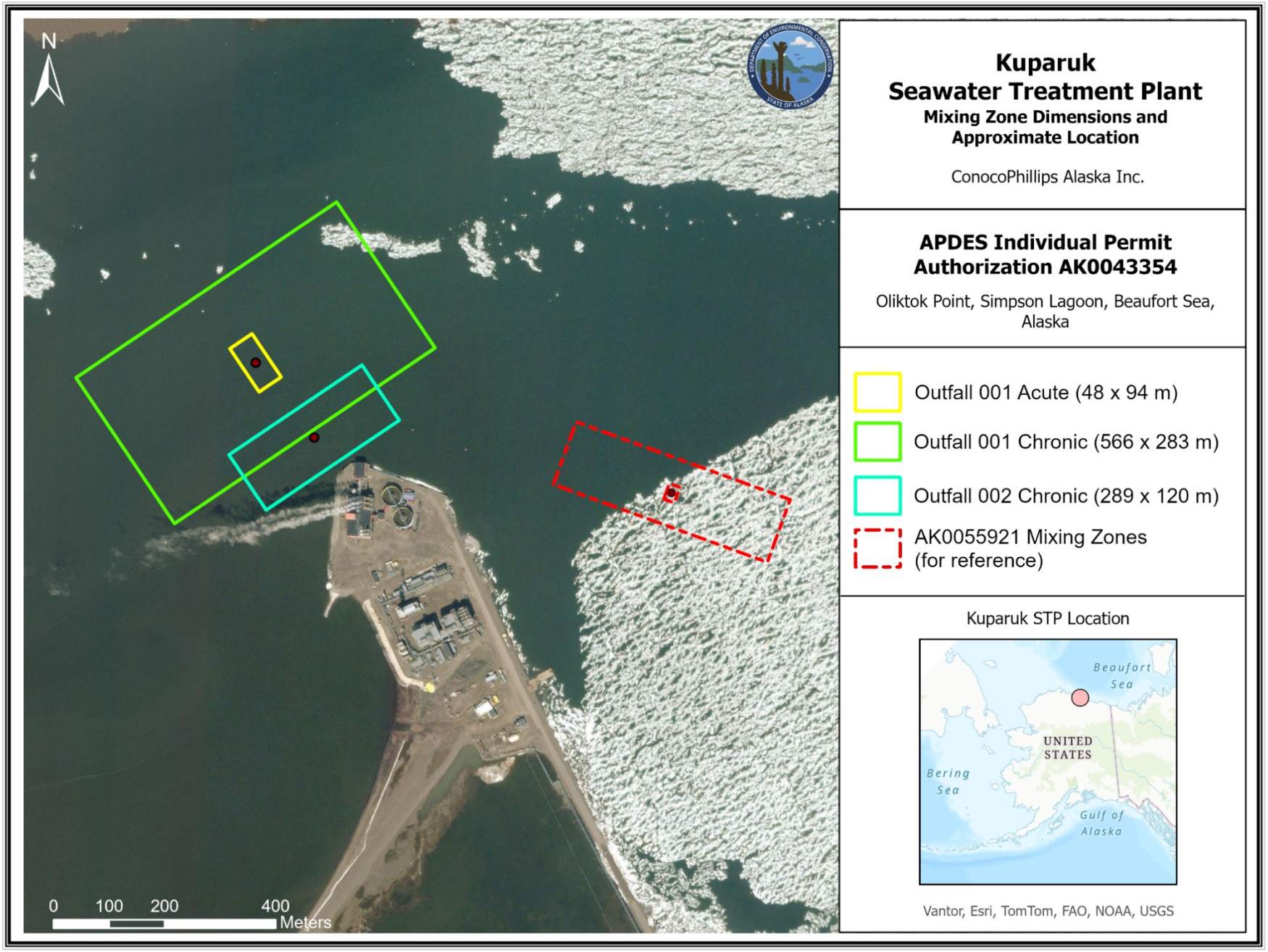


Figure 5: Kuparuk STP Mixing Zones



Appendix B. Reasonable Potential Determination

The Alaska Department of Environmental Conservation (Department or DEC) determined if the permitted discharge has reasonable potential (RP) to cause or contribute to an excursion of water quality criteria. If the discharge violates theAlaska Water Quality Standards (WQS) in this manner, then a Water Quality-Based Effluent Limit (WQBEL) may be derived per the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991 (Technical Support Document)* and the *DEC Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL Guidance).*

The Department determines RP by comparing the maximum projected receiving water concentration at the acute or chronic mixing zone boundary to the water quality criteria for each pollutant of concern (POC). A POC is determined prior to conducting an RPA by characterizing the effluent based on raw data that demonstrates that the parameter does not meet either the acute or chronic criterion and requires significant dilution to meet it. Hence, a POC is not determined by using a reasonable potential multiplier (RPM) because a small sample size can elevate a parameter arbitrarily to be a POC. This practice eliminates the possibility that a monitored parameter has a small dataset because the past characterization has led to a reduced frequency of monitoring.

RP to cause or contribute to an excursion above Water Quality Criteria (WQC) exists if the projected receiving waterbody concentration at the boundary of the respective mixing zone exceeds the applicable criteria for the POC. Such RP indicates a WQBEL must be included in the permit per 18 AAC 83.435. By procedure, DEC does not authorize more dilution than that required to meet water quality criteria for the POC(s) requiring the most dilution in the mixing zone (driving parameters). Hence, the driving parameters for mixing zones will have RP and, subsequently, a WQBEL.

This Appendix discusses how the maximum projected receiving waterbody concentrations were determined for these discharges to marine waters and summarizes the calculations. To illustrate the procedures, calculations for TRC and temperature for Outfall 001, and temperature for Outfall 002 follow.

B.1 MASS BALANCE

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

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

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum projected effluent concentration (or MEΔT)

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:

$$\text{Dilution Factor (DF), } DF = \frac{V_{MEC}+V_{AWC}}{V_M} \qquad \text{(Equation B-2)}$$

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

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

The preceding equation provides the dilution factor achieved at the boundary of the mixing zone if based on the MEC. To determine the dilution factor required to meet water quality criteria at the boundary, the water quality criteria (WQC) is substituted for RWC in Equation B-3a. However, for temperature Equation B-3a is not directly applicable in the same manner because the marine water quality criteria for temperature is in reference to the instantaneous ambient receiving water temperature; the increase above ambient cannot be more than 1°C (i.e., WQC = AWC +1). By making substitutions and using the descriptor "ΔT" for maximum expected temperature minus the ambient water temperature (MET – AWT = MEΔT) instead of "C" for concentration, Equation B-3a can be rewritten to:

$$DF = \frac{(ME\Delta T)}{[(AWT + 1) - AWT]}$$

Simplifying…

$$DF = ME\Delta T \qquad \text{(Equation B-3b)}$$

Where:

$$ME\Delta T = \text{Maximum Effluent Temperature} - \text{Ambient Receiving Water Temperature}$$

Rearranging Equation B-3a to solve for RWC yields:

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

In the case of temperature, Equation B-4 simplifies to the following equation:

$$RWC = \frac{ME\Delta T}{DF} + 1 \qquad \text{(Equation B-4b)}$$

B.2 MAXIMUM PROJECTED EFFLUENT CONCENTRATION

To calculate the MEC (or MEΔT) per the *RPA/WQBEL Guidance*, the Department uses modified procedures from the *Technical Support Document* Section 3.3. Specifically, DEC uses a 95th confidence interval with a 99th percentile to determine an RPM. In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 5.2 (ProUCL)* rather than assuming a lognormal distribution as

described in portions of the *Technical Support Document* for calculating and applying the coefficient of variation (CV) in derivation equations. The possible statistical distributions include lognormal, normal, gamma, or non-parametric. In addition, ProUCL has the ability to impute data below detection levels to improve statistical analysis of the underlying distribution and statistical parameters used in the RPA/WQBEL Guidance.

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 Guidance* assumes the CV = 0.6, a conservative estimate that assumes a relatively high variability. The CV is defined as the ratio of the sample standard deviation of the data set to the sample mean.

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

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

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

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

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

$k = number\ of\ samples$

For data sets with a lognormal or log-ROS distribution, the CV is transformed to a lognormal standard deviation per the following:

$$\sigma^2 = \ln(CV^2 + 1) \qquad \text{(Equation B-6a)}$$

$$\sigma = \sqrt{\sigma^2} \qquad \text{(Equation B-6b)}$$

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) or maximum observed temperature differential (MOΔT), at the 95% confidence level. The general equation (B-7) is expanded using equations B-8 and B-9 or B-10 and B-11 for data with a lognormal distribution or normal distribution as follows:

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

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

$$C_{pn} = \exp\left[\left(Z_{p_n} * \hat{\sigma}_y\right) - \left(0.5 * \hat{\sigma}_y^2\right)\right] \qquad \text{(Equation B-9)}$$

In the case of data displaying Normal, Gamma, or Non-parametric (Kaplan-Meier) distributions, equations for C_{99} and C_{Pn} become:

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

$$C_{p_n} = \hat{\mu}_n + Z_{pn} * \hat{\sigma} \quad \text{(Equation B-11)}$$

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

$$p_n = (1 - confidence)^{1/n} \quad \text{(Equation B-12)}$$

Where:

$$p_n = the\ percentile\ represented\ by\ the\ MOC\ (or\ MO\Delta T)$$

$$n = the\ number\ of\ samples$$

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

Once the Pn is determined, ZPn can be looked up in standard statistical tables or calculated using a spreadsheet equation (ZPn = normsinv(Pn) and used in calculating the RPM. In the event that a calculated RPM is less than one (1), the current Department policy is to default to a value of one (1). The MEC is determined by multiplying the MOC by the RPM to derive the MEC:

$$MEC = (RPM) * (MOC) \quad \text{(Equation B-13a)}$$

Or for Temperature Differential: $ME\Delta T = (RPM) * (MO\Delta T)$ (Equation B-13b)

If the RWC (acute or chronic) or RWT calculated by Equation B-4a or B-4b is found to exceed the respective criteria for the POC, then RP is confirmed and a WQBEL must be developed for that POC.

B.3 RPA CALCULATIONS FOR TOTAL RESIDUAL CHLORINE – OUTFALL 001

The mixing zone analysis identified total residual chlorine (TRC) as the driving parameter for the acute mixing zone in Outfall 001. The Department authorizes an acute mixing zone with a DF of 7.5 and a chronic mixing zone with a DF of 16.3. The following calculations demonstrate TRC has reasonable potential to cause or contribute to an excursion above WQC at the boundary of the acute mixing zone.

Number of effluent data (n) = 1527
MOC = 86 µg/L

The data was found to have a Lognormal (Log-ROS) distribution, therefore the following equation was used for the RPM calculation per the *RPA/WQBEL Guidance.*

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

Where:

Z_{99} = 2.326 for the 99 percentile (Calculated with Excel Spreadsheet);

Z_{Pn}= 2.878 (Calculated with Excel Spreadsheet);

$$p_n = p_{1527} = (1 - 0.95)^{1/1527} = 0.998$$

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

CV =8.2

Substituting the values becomes:

$$RPM = \frac{\exp((2.326\ x\ 2.055) - (0.5\ x\ 2.055^2))}{\exp((2.878\ x\ 2.055) - (0.5\ x\ 2.055^2))} = 0.3216$$

Use the minimum RPM value = 1.0 per the *RPA/WQBEL Guide***.**

Using Equation C-13a for acute TRC,

$MEC = \left(1.0 * 86.0 \frac{\mu g}{L}\right) = 86\ \mu g/L$ $(maximum\ projected\ effluent\ concentration)$.

However, recall that the compliance level for TRC is 100 µg/L and was used in the mixing zone, the applicable MEC is also 100 µg/L, and

$AWC = 0$

$For\ DF_{acute} = 7.5$

$$RWC_{acute} = \frac{100\ \mu g/L - 0\ \mu g/L}{7.5} + 0\ \mu g/L = 13.33\ \mu g/L$$

The RWC for TRC at the boundary of the acute mixing zone is above the acute water quality criteria of 13 µg/L. Therefore, TRC must have a WQBEL in the Permit.

B.4 RPA CALCULATIONS FOR TEMPERATURE DIFFERENTIAL (ΔT) OUTFALL 001

The mixing zone analysis identified ΔT as the driving parameter for the chronic mixing zone resulting in the Department authorizing a chronic mixing zone with DF of 16.3. The following calculations demonstrate that ΔT has reasonable potential to cause or contribute to an excursion above the temperature criteria at the boundary of the chronic mixing zone. Note that there is no acute temperature criteria and because the temperature differential is being evaluated, the applicable chronic criteria at the boundary of the chronic mixing zone is 1 degree Celsius (°C).

Number of effluent data (n) = 1545
MOΔT = 16.39°C

The data was found to have a normal distribution, therefore the following equation was used for the RPM calculation per the *RPA/WQBEL Guidance.*

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

Where:

Z_{99} = 2.326 for the 99 percentile (Calculated with Excel Spreadsheet);

Z_{Pn}= 2.878 (Calculated with Excel Spreadsheet);

$$p_n = p_{1545} = (1 - 0.95)^{1/1545} = 0.998$$

$\hat{\mu_n}$ = 7.123, and

$\hat{\sigma}$ = 1.962

Substituting the values becomes:

$$RPM = \frac{[7.123+(2.326*1.962)]}{[7.123+(2.878*1.962)]} = 0.915$$

Use the minimum RPM value = 1.0 per the *RPA/WQBEL Guide***.**

Using Equation B-13b for MEΔT,

$ME\Delta T = (1.0)(16.39°C) = 16.39°C$ *(maximum projected effluent concentration),*

$For\ DF_{chronic} = 16.3$

$$RWC_{chronic} = \frac{16.39°C}{16.3} = 1.01°C$$

Because the RWC for ΔT at the boundary of the chronic mixing zone is above 1°C, the Permit must have a WQBEL for ΔT for Outfall 001.

B.5 RPA CALCULATIONS FOR TEMPERATURE DIFFERENTIAL (ΔT) OUTFALL 002)

The mixing zone analysis identified ΔT as the driving parameter for the chronic mixing zone resulting in the Department authorizing a chronic mixing zone with DF of 7.75. The following calculations demonstrate that ΔT has reasonable potential to cause or contribute to an excursion above the temperature criteria at the boundary of the chronic mixing zone. Note that there is no acute temperature criteria and because the temperature differential is being evaluated, the applicable chronic criteria at the boundary of the chronic mixing zone is 1°C.

Number of effluent data (n) = 1472
MOΔT = 7.9°C

The data was found to have Lognormal distribution, therefore the following equation was used for the RPM calculation per the *RPA/WQBEL Guidance.*

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

Where:

Z_{99} = 2.326 for the 99 percentile (Calculated with Excel Spreadsheet);

Z_{Pn}= 2.878 (Calculated with Excel Spreadsheet);

$$p_n = p_{1472} = (1 - 0.95)^{1/1472} = 0.998$$

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

CV =0.6362

Substituting the values becomes:

$$RPM = \frac{\exp[(2.326\ x\ 0.583) - (0.5\ x\ 0.583^2)]}{\exp[(2.878\ x\ 0.583) - (0.5\ x\ 0.583^2)]} = 0.7248$$

Use the minimum RPM value = 1.0 per the *RPA/WQBEL Guide***.**

Using Equation B-13b for MEΔT,

$ME\Delta T = (1.0)(7.9°C) = 7.9°C$ $(maximum\ projected\ effluent\ concentration)$,

$For\ DF_{chronic} = 7.75$:

$$RWC_{chronic} = \frac{7.9°C}{7.75} = 1.02°C$$

Because the RWC for ΔT at the boundary of the chronic mixing zone is above 1°C, the Permit must have a WQBEL for ΔT for Outfall 002.

Appendix C. Effluent Limitations

The Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (WOTUS) 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 AK0043354 – ConocoPhillips Alaska, Inc. Kuparuk Seawater Treatment Plant (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), and (3) comply with other state requirements that may be more stringent. The CWA requires that the limits for 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 codified in 18 AAC 70 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.

C.1 TECHNOLOGY BASED EFFLUENT LIMITS

EPA has not established national ELGs for seawater treatment facilities for waterflood production. However, the Department previously established a TBEL developed using case-by-case BPJ for pH. The Permit requires pH to be maintained at values greater than 6.0 and less than 9.0 standard units (SU)($6.0 < pH < 9.0$). This TBEL was also included in the existing Permit and is being retained in the proposed Permit.

C.2 WATER QUALITY BASED EFFLUENT LIMITS

C.2.1 Statutory and Regulatory Basis.

Per 18 AAC 70.010, a person may not conduct an operation that causes, or contributes to, an excursion violation above 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 established TBELs as necessary to protect WQS. When evaluating if WQBELs are needed in addition to TBELs, the permitting authority conducts a reasonable potential analysis (RPA) based on pertinent pollutants of concern (POCs). Pertinent POCs are those that the Department considers as having the potential to exceed water quality criteria (WQC) at the point of discharge without a mixing zone or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the Department may consider the dilution available in the receiving water in the analysis. Per 18 AAC 83.435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected effluent concentrations [MEC] and coefficient of variation), existing controls on point sources (e.g., treatment systems), and nonpoint sources of pollution (e.g., ambient receiving water concentrations). Often, it is necessary for DEC to consider the history of the permit limitations to avoid situations where a pollutant has demonstrated no reasonable potential in past issuance and there has been a frequency reduction granted. DEC does not apply a reasonable potential multiplier (RPM) to such data as it creates a limit where one is not warranted. The Department developed and implemented a *Reasonable Potential*

Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA/WQBEL Guidance) and associated spreadsheet tool that were used in development of the WQBELs in the Permit.

C.2.2 Reasonable Potential Analysis

The RPA procedures use statistical methods to estimate MECs or, in the case of temperature in this permit, maximum expected temperature difference between the effluent and ambient receiving water (MEΔT). Using a mass balance approach, the RPA projects the concentration, or temperature, at the boundary of a mixing zone if authorized. Because DEC has authorized acute and chronic mixing zones, the mass balance procedure evaluates if the effluent causes or contributes to an excursion above water quality criteria at the boundary of either the acute or the chronic mixing zone. Based on the RPA summarized in Appendix C, the Department has determined temperature has a reasonable potential to cause or contribute to an excursion above chronic marine criteria the boundary of the chronic mixing zone and TRC at the boundary of the acute mixing zone for Outfall 001, and temperature at the boundary of the chronic mixing zone for Outfall 002. Accordingly, WQBELs for temperature (ΔT) and total residual chlorine (TRC) are established per 18 AAC 83.435 to be consistent with the calculated available wasteload allocation (WLA) and are stringent enough to ensure compliance with WQS. No other parameters were determined to have reasonable potential.

C.2.3 Wasteload Allocations

In the context of this section, a WLA is the concentration of a pollutant that can be discharged to the receiving water and comply with the acute (a) or chronic (c) water quality criteria ($WQC_{a,c}$), accounting for ambient concentrations and authorized acute or chronic dilution factors ($DF_{a,c}$) in the mixing zones, if applicable. The Department has authorized a chronic dilution factor of 16.3 based on temperature and an acute dilution factor of 7.5 based on TRC. Specifically, the compliance level of 100 µg/L was used for TRC given there has been no observed concentrations higher for some time. Furthermore, no ambient concentrations of TRC are assumed due to the natural chlorine demand in marine waters. The WLA for TRC is calculated by rearranging Equation C-3a in Appendix C and substituting WQC for receiving water concentration and WLA for the maximum expected concentration. The resulting mass balance equation is:

$$WLA_{TRC} = DF_{a,c} \times WQC_{a,c}$$

Per the derivation of Equation B-3b in Appendix B, ΔT is the limited parameter and internally accounts for ambient temperatures of the receiving water. This requires the chronic WQC for temperature to be 1 °C and the WLA equation for temperature simplifies to:

$$WLA_{\Delta T} = DF_c \times 1$$

C.2.4 WQBELs for Outfall 001

Per Section B.2.2, the effluent characteristics for Outfall 001 demonstrated reasonable potential for ΔT at the boundary of the chronic mixing zone and TRC at the boundary of the acute mixing zone. Therefore, Outfall 001 requires limits for ΔT and TRC as described in Sections C.2.4.1 and C.2.4.2, respectively.

C.1.1.1 Temperature Difference (ΔT)

The RPA revealed that ΔT at Outfall 001 has reasonable potential to cause or contribute to an excursion above the chronic water quality criterion for temperature at the boundary of the chronic mixing zone requiring development of WQBELs. The maximum daily limit (MDL) and average monthly limit (AML), if applicable, for ΔT are based on MEΔT equaling 16.39 degrees Celsius (°C), a calculated coefficient of

variation (CV) of 0.2754, and an assumed four samples per month. The WLA is used to determine whether the acute long-term average (LTA_a) or the chronic long-term average (LTA_c) is the most stringent for developing the WQBELs. For ΔT, LTA_c is the most limiting and is used in the derivation because the LTA_a is not applicable given there is no acute criteria for temperature in the WQS. Consistent with the 2018Permit, DEC is establishing an MDL but not an AML. The resulting MDL is 22.0°C. The following steps were conducted for calculation of the MDL per Part 5.4 (Permit Limit Derivation) of the EPA Technical Support Document and the DEC *RPA/WQBEL Guidance.*

- **Determine $\boldsymbol{LTA_s}$**: the LTAs are calculated as follows:

$$LTA_{chronic} = WLA * [\exp(0.5\hat{\sigma}_4^2 - Z_{99}\hat{\sigma}_4)], where\ \sigma_4^2 = \ln(CV^2/4 + 1)$$

$$WLA = 16.39°C, CV = 0.2754, Z_{99} = 2.326, \sigma_4 = 0.137\ and\ \sigma_4^2 = 0.0188$$

$$\boldsymbol{LTA_{chronic}} = 11.96$$

- **Calculate the $\boldsymbol{MDL}$**:

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

$$CV = 0.2754,\ Z_{99} = 2.326, \sigma = 0.2704, and\ \sigma^2 = 0.0731$$

$$\boldsymbol{MDL = 21.63°C}$$

$$\boldsymbol{Round\ up\ to\ 22.0°C}$$

C.1.1.2 Total Residual Chlorine

The RPA revealed that only TRC has reasonable potential to cause or contribute to an excursion above the water quality criteria at the boundary of the acute mixing zone requiring development of WQBELs. The TRC MDL and AML are based on maximum expected effluent concentration equaling 86 micrograms per liter (µg/L), a calculated CV of 8.2, and an assumed four samples per month. The resulting MDL is 86 µg/L and AML is 27 µg/L. Note that because the mixing zone is sized based on 100 µg/L with a dilution factor of 7.5, the derivation of the limits must ensure the same WLA is applied even if the maximum observed TRC concentration are lower than the compliance level. The following steps were conducted for calculation of the MDL and AML per Section 5.4 (Permit Limit Derivation) of the EPA Technical Support Document and DEC's *RPA/WQBEL Guidance.*

- **Determine $\boldsymbol{LTA_s}$**: the LTAs are calculated as follows:

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

$$WLA = 85.80\frac{\mu g}{L}, CV = 8.2, Z_{99} = 2.326, \sigma = 2.0550\ and\ \sigma^2 = 4.2230$$

$$\boldsymbol{LTA_a} = 5.95\ \mu g/L$$

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

$$WLA = 85.80\ \mu g/L, CV = 8.2, Z_{99} = 2.326, \sigma_4 = 1.6970, and\ \sigma_4^2 = 2.8798$$

$$\boldsymbol{LTA_c} = 9.96\ \mu g/L$$

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

$$\boldsymbol{LTA_a}\ is\ the\ most\ limiting = 5.95\ \mu g/L$$

- **Calculate the MDL and AML**

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

$$CV = 8.2, Z_{99} = 2.326, \sigma = 2.0550\ and\ \sigma^2 = 4.2230$$

$$\boldsymbol{MDL = 85.8\ \mu g/L}$$

$$\boldsymbol{Round\ up\ to\ 86.0\ \mu g/L}$$

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

$$CV = 8.2\ , Z_{95} = 1.645, \sigma_4 = 1.6907, and\ \sigma_4^2 = 2.8798$$

$$\boldsymbol{AML = 22.99\ \mu g/L}$$

$$\boldsymbol{Round\ up\ to\ 23.0\ \mu g/L}$$

Applying the TRC Compliance Level:

As stated previously, the maximum limit(s) for TRC is based on the compliance level of 100 µg/L. Hence, both the MDL and AML for TRC is 100 µg/L. The compliance level accounts for the highest reporting limit for TRC allowed for various methods available in 40 CFR 136 that could legally be used.

C.1.1.3 Temperature Difference (ΔT) Outfall 002

The RPA revealed that ΔT at Outfall 002 has reasonable potential to cause or contribute to an excursion above the water quality criteria at the boundary of the chronic mixing zone requiring development of WQBELs. Similar to Outfall 001, only an MDL will be developed based on the LTAc. In addition, an MEC of 7.9°C, a calculated CV of 0.6362 and an assumed four samples per month are used in the WQBEL derivation. The following steps were conducted per Section 5.4 (Permit Limit Derivation) of the EPA *Technical Support Document* and the DEC *RPA/WQBEL Guidance* resulting in an MDL of 13.0°C.

- **Determine $\boldsymbol{LTA_c}$**: the LTA_c was calculated as follows:

$$LTA_c = WLA * [\exp(0.5\hat{\sigma}_4^2) - Z_{99}\hat{\sigma}_4)], where\ \sigma_4^2 = \ln(CV^2/4 + 1)$$

$$WLA = 7.9°C, CV = 0.6362, Z_{99} = 2.3260, \sigma_4 = 0.3105\ and\ \sigma_4^2 = 0.0964$$

$$\boldsymbol{LTA_c = 3.95°C}$$

- **Calculate the MDL**:

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

$$CV = 0.6362, Z_{99} = 2.326, \sigma = 0.5830, and\ \sigma^2 = 0.3398$$

$$\boldsymbol{MDL = 13.18°C}$$

$$\boldsymbol{Round\ down\ to\ 13.0°C}$$

C.2.5 Other Numeric or Narrative Water Quality-Based Effluent Limits and Monitoring

In addition to the parameters evaluated in the RPA, the limited monitoring parameters in the existing Permit were reviewed to confirm they are appropriate for inclusion, should be modified, or removed from the reissued Permit as summarized below.

C.1.2.1 pH

The water quality criteria for pH is no less than 6.5 SU and not greater than 8.5 SU. Outfall 001 has a TBEL developed using case-by-case BPJ per Section C.1. DEC is retaining the TBEL limit on Outfall 001. The water quality criteria for pH can be exceeded within the mixing zone but at the end of pipe the TBEL for pH remains at (6.0 < pH < 9.0). The receiving water also has significant buffer capacity such that upon mixing in the mixing zone, pH will rapidly be buffered such that there is no possible excursion of pH at the boundary of either mixing zone.

C.1.2.2 Narrative Requirements

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." This narrative requirement is recognized as a goal for water quality protection as a whole but cannot be a point of compliance given recent court cases.

Appendix D. Mixing Zone Analysis Checklist

Mixing Zone Authorization Checklist
based on Alaska Water Quality Standards (2003)

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

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Section 3.3	18 AAC 70.240 (k)	Y
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet at Section 3.3. Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 3.3.2	18 AAC 70.240 (c)(1)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or	N/A – Marine Discharge	18 AAC 70.240(1)	

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	documentation for the applicable parameters. Justify in Fact Sheet			
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.240(c)(2)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.240(c)(3)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**	Yes Fact Sheet Section 3.3.3	18 AAC 70.240(b)(1)	Y
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.240(m)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.240(d)(6)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.240(c)(4)(C)	Y
Spawning Areas	Does the mixing zone…			

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5	18 AAC 70.240(e) and (f)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(d)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(d)(2)	Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(c)(4)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 3.3.6	18 AAC 70.240(c)(4)(B)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240(c)(4)(B)	Y
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(e) and (f)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(c)(4)(G	Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(d)(5)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(c)(4)(E)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(c)(4)(D)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(d)(7)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.240(c)(4)(A)	Y
Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the permit to avoid adverse effects?	Fact Sheet Section 3.3.8 and Section 8.0	Program Description, 6.4.1 #5 18 AAC 70.240(c)(4)(F)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.			

Appendix E. Noncompliance Notification Flow Chart