ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – Proposed Final

Permit: AK0053686 – Furie Operating Alaska LLC
KLU Julius R. Platform

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

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

Furie Operating Alaska LLC

For wastewater discharges from

Julius R. Platform
Kitchen Lights Unit Oil and Gas Lease Area
(15 miles Northwest of Nikiski Bay)

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual permit **AK0053686 – Furie Operating Alaska LLC, KLU Julius R. Platform** (Permit). The Permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the Permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

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

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

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 20 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
P.O. Box 111800
Juneau AK, 99811-1800

Interested persons can review Chapter 15, Administrative Procedures, of Title 18 of the Alaska Administrative Code (AAC), Section 185 (18 AAC 15.185) for the procedures and substantive requirements regarding a request for an informal Department review. See http://dec.alaska.gov/commish/review-guidance/informal-reviews for information regarding informal reviews of Department decisions.

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

Commissioner
Alaska Department of Environmental Conservation
P.O. Box 111800
Juneau AK, 99811-1800.

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance/ for information regarding appeals of Department decisions.

Documents are Available

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

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
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Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
410 Willoughby Avenue
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(907) 465-5180

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1.0 INTRODUCTION

On March 4, 2019, the Alaska Department of Environmental Conservation (DEC or Department) received an application from Furie Operating Alaska LLC (Furie or, the applicant) for the reissuance of Alaska Pollutant Discharge Elimination System (APDES) Individual Permit AK0053686 – KLU Julius R. Platform (Permit). Furie subsequently submitted an amendment to the application in November 2019 to include an additional, new discharge of produced water. This Fact Sheet was developed based on the application and amendment, as well as supplemental information obtained through the permit application and development process.

1.1 Applicant

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

Permittee:	Furie Operating Alaska LLC
Name of Facility:	Kitchen Lights Unit Julius R. Gas Production Platform
APDES Permit Number:	AK0053686
Facility Location:	Latitude 60.936667°, Longitude -151.156389°
Mailing Address:	188 West Northern Lights Boulevard, Suite 620 Anchorage, AK 99503
Facility Contact:	Mr. Rick Dusenbery

1.2 Discharge Summary

The following lists the discharges authorized under the Permit. The discharge numbers (#) have been developed to be consistent with other oil and gas permits issued in Cook Inlet to facilitate direct comparisons.

Discharge #	Discharge Description	New or Existing
002A	Deck drainage from the Julius R. Platform	Existing
002B	Deck drainage from a Mobil Offshore Drilling Unit (MODU)	Existing
003A	Domestic wastewater from the Julius R. Platform	Existing
003B	Domestic wastewater from a MODU	Existing
004B	Graywater from a MODU	New
008A	Fire control system test water	Existing
009B	Non-contact cooling water	Existing
010B	Uncontaminated ballast water	Existing
015A	Produced water	New

Figure A-1 in Appendix A shows the location of the Julius R. platform.

1.3 Authority

The National Pollutant Discharge Elimination System (NPDES) Program regulates the discharge of wastewater to the waters of the United States (U.S.). For waters of the U.S. under jurisdiction of the State of Alaska, the NPDES Program is administered by DEC as the APDES Program. The APDES Program permit for discharges from the facility was originally issued by DEC in 2014 (2014 Permit). This is the second issuance of the Permit under the authority of the APDES Program.

Clean Water Act (CWA) Section 301(a) and 18 AAC 83.015 provide that the discharge of pollutants to waters of the U.S. is unlawful except in accordance with an APDES permit 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.

1.4 Permit History

1.4.1 Original Permit Issuance

Furie submitted an APDES permit application on January 24, 2013 to the Department for a gas development project located in state waters in Cook Inlet, Alaska. The production facility is classified as a new source per Code of Federal Regulations, Title 40, Part 435 (40 CFR 435), Oil and Gas Extraction Point Source Category, Subpart D – Coastal Subcategory, which means New Source Performance Standards apply to facility discharges. DEC issued an individual permit to Furie for the Kitchen Lights Unit Gas Production Platform A on May 18, 2014 (2014 Permit) for a five-year term. The 2014 Permit covered wastewater discharges associated with the construction of the offshore platform and a marine pipeline that included horizontal directional drilling as well as discharges resulting from operation of the platform and a MODU periodically stationed at the platform for development drilling activities.

1.4.2 Modifications to the 2014 Permit

Although a specific MODU had not been designated at the time of application, the MODU domestic wastewater data supplied with the application was based on the Spartan 151 MODU. In 2016, the applicant requested an amendment to the 2014 Permit to change the name of the platform from "Platform A" to "Julius R." and to include discharges associated with the use of the Randolph Yost as an alternative MODU; the modification to the 2014 Permit allows for alternative MODUs based on availability in Cook Inlet. The amendment added MODU discharges of deck drainage commingled with fire control test water and equipment wash-down water, non-contact cooling water, and uncontaminated ballast water that were not applicable to the originally planned use of the Spartan 151 MODU.

1.4.3 Facility Issues Affecting Application for Permit Reissuance

The 2014 Permit was based on production of gas from the Beluga formation and assumptions that the amount of produced water generated from the Beluga formation would be minimal, approximately 50 barrels per day (bbl/d), such that it could be transported via pipeline to the onshore Central Production Facility (CPF) for disposal. However, after completing wells and producing from the Sterling formation, the volume of produced water has significantly increased and includes gas hydrates that can cause pipeline freeze-ups that must now be considered.

The original assumptions based on the production of primarily dry gas from the Beluga formation was found to be inappropriate as the Sterling formation has significantly more produced water volumes, approximately 2,000 bbl/d. Further compounding produced water management difficulties, during the winter conditions of January 2019 while producing from the Sterling, gas hydrates formed in the produced fluids within the pipeline to the onshore facility causing a pipeline blockage substantial enough to completely halt gas production for 75 days. Hydrates, in general, are compounds that have absorbed water molecules from their

environment and have included the absorbed water molecules in their structure. Gas hydrates are ice-like crystalline solids that form when low molecular weight gas (such as methane, ethane, or carbon dioxide) combines with water and undergoes a phase change to due changes in temperature and/or pressure. To prevent future blockages due to gas hydrates, Furie proposes to inject methanol into the well; methanol is a common means to mitigate formation of gas hydrates. To ensure the hydrates do not form in the pipeline to the CPF, the water has to be removed at the platform before transfer onshore. This situation posed a design challenge to find a produced water treatment system that could adequately treat the produced water and be installed within the limited space available at the platform.

Prior to Furie submitting an application for reissuance, DEC and Furie discussed alternatives to treat and discharge process water at the platform that would allow for continuous gas production. A preliminary application, without produced water, was submitted to DEC on February 20, 2019 prior to the permit expiration date; DEC administratively extended the 2014 Permit based on this complete and timely application until Furie could conduct a pilot test for a produced water treatment system and submit a supplemental application allowing for permit reissuance. The applicant submitted a supplemental application on November 2, 2019 that contained information on produced water based on the successful completion of the pilot test. Per 18 AAC 72.600, engineering plans must be submitted to the Department for approval to construct a non-domestic wastewater treatment system, such as the produced water treatment system. Furie submitted engineering plans based on the pilot test and DEC approved those engineering plans for the produced water treatment system on February 4, 2020. However, Furie is waiting until the Permit becomes effective prior to starting construction.

2.0 BACKGROUND

2.1 Facility Information

Julius R. is a natural gas production platform located in water approximately 35 meters (100 feet) deep and 15 miles northwest of Nikiski Bay in the coastal zone of Cook Inlet, Alaska. From 2014 through 2015, Furie constructed the Julius R. platform with one production well in the Kitchen Lights Unit (KLU) of the Cook Inlet oil and gas lease area, an onshore CPF located near Nikiski, and a single connecting marine pipeline between the facilities (See Figure A-1).

In late 2015, Furie initiated natural gas production from a single production well into the Beluga formation at the platform. Today, there are four production wells completed into the Beluga and Sterling formations. There are currently no near-term plans to install additional production wells at the Julius R. platform or a second pipeline. However, the addition of a produced water treatment system and discharging from the platform represents a critical modification to infrastructure affecting the Permit.

2.2 Produced Water (Discharge 015) Pilot Test and Effluent Characterization

Variable amounts of water are co- produced from oil and gas wells during the routine production of hydrocarbons. The amount of produced water that is recovered from any well during an economic lifetime will often vary greatly depending on a variety of complex geological, commercial and natural hydrodynamic factors. Some wells will produce large amounts of

produced water throughout the entire production history, while other wells will produce little or no water at all.

Formation water is a complex mixture of paleo- seawater, fresh surface waters, and highly saline connate (or interstitial) water produced due to the pressure and thermal modification of sediments at depth. The physical and chemical properties of co-produced formation waters vary widely depending on the geologic age, regional hydrodynamic systems, depth, and geochemistry of the hydrocarbon-bearing formation. When a hydrocarbon reservoir is penetrated by a well, the produced fluids commonly contain formation water in addition to the oil, natural gas, and natural gas liquid hydrocarbons. Effective management and disposal of produced water impacts the economic life of a producing well. As a result, each source of produced water tends to have unique attributes that requires characterization in order to inform appropriate treatment requirements.

The Furie wells produce only natural gas in the form of non- associated biogenic methane with no associated liquid hydrocarbons or hydrogen sulfide. The Sterling and Beluga produced water is relatively fresh with measured salinities of less than 8500ppm chlorides .As a comparison, seawater has salinities typically in the 30,000 ppm range.

In order to evaluate a potential treatment system capable of meeting discharge requirements per the effluent limitation guidelines (ELGs) in 40 CFR 435 – Oil and Extraction Point Source Category, Furie collected a total of nine analytical samples from the onshore CPF facility downstream of a three-phase separator for representing both formations. In addition, Furie collected three samples downstream of three-phase separation at the platform (PF) for the Beluga formation (B) and two samples from the well into the Sterling formation (S) prior to separation in order to conduct a compare and contrast analysis of raw produced water characteristics. Table 1 provides a summary of preliminary raw water characteristics for comparison to acute, chronic and human health (HH) criteria that informed the selection of a treatment system.

Table 1: Preliminary Raw Produced Water Characterization Data

Parameter (Units)	Water Quality Criteria			Results Range (Min – Max, Average) [1]			
	Acute	Chronic	HH	B+S @ CPF	S @ PF	B @ PF	All
Arsenic (micrograms per liter (µg/L))	69	36	---	4.8 – 32.3, 12.8	9.5 – 12.5, 11	25 – **56.9**, **43.6**	4.8 – **56.9**, 19.2
Copper (µg/L)	5.78	3.73	1,300	2.45 – **83.7**, **22.5**	**34.3 – 68.8, 51.6**	**6.6 – 34.7, 17.6**	2.45 – **83.7**, **25.6**
Lead (µg/L)	217.2	8.47	---	0.4 – **119**, **27.2**	**10.9 – 16.4, 13.7**	6.5 – **160**, **58.5**	0.4 – **160**, **32.0**
Manganese (µg/L)	---	---	50	**90.9 – 270, 145.7**	**217 – 468, 342.5**	**136 – 1,370, 547.7**	**90.9 – 1,370, 260.0**
Nickel (µg/L)	74.6	8.29	610	1.58 – **104, 25.7**	**18.6 – 51.1, 34.9**	6.5 – **170, 76.8**	1.58 – **170, 34.7**
Selenium (µg/L)	293.8	71.1	170	13.8 – **98.6**, 34.9	12.5 all	24.2 – 42.3, 30.5	12.5 – **98.6**, 30.7
Silver (µg/L)	2.3	---	---	0.5 – 0.88, 0.54	2.5 all	0.5 – **5.0**, 2.0	0.5 – **5.0**, 1.1
Zinc (µg/L)	95.1	86.1	9,100	3.8 – **96.6, 27.2**	**381 – 445, 413**	66.7 – **3,250, 1,129**	3.8 – **3,250, 318**
Mercury (nanograms per liter (ηg/L))	2,100	1,100	50	2.7 – **97.1**, 26.4	36.7 – **61**, 48.9	**66 – 186, 142**	2.7 – **186, 54**
Total Aromatic Hydrocarbons (TAH) (µg/L)	---	10	---	**34.5 – 68.5, 48.0**	**61.2 – 76.1, 68.6**	**572 – 751, 637.5**	**34.5 – 751, 177.2**
Total Aqueous Hydrocarbons (TAqH) (µg/L)	---	15	---	**38.6 – 87.1, 56.6**	**67.1 – 82.6, 74.8**	**634 – 757, 676.3**	**38.6 – 757, 192**
Oil and Grease (milligrams per liter (mg/L)) [2]	42	29	---	**84.9 – 363, 165.7**	**80.9 – 150, 115.5**	**42.2 – 274, 140.7**	**42.2 – 363, 153.2**

Notes:

1. Results exceeding criteria are shown as **bold**.
2. The values of 42 and 29 mg/L shown in the acute and chronic criteria represent the maximum daily and average monthly limits in the ELGs, respectively.

2.2.1 Discussion on Raw Produced Water Results and Available Treatment Technologies

Initial sample results used a full suite of metals on the raw produced water to screen for pollutants of concern (POC) that would be analyzed going forward. If the metal parameter was below detection, it was discontinued in the characterization effort; the parameters listed in Table 1 are those above criteria that inform appropriate treatment technologies. Total suspended solids (TSS), associated with particulate metals, and oil and grease can be effectively removed using physical separation treatment such as three-phase separators for oil and grease and filtration for TSS. Whereas, removal of dissolved hydrocarbons TAH and TAqH as well as certain dissolved metals can be accomplished via absorption technologies (e.g., carbon filtration).

As discussed in Section 1.4.3, Furie also plans, at least initially, to use methanol injection into producing wells to mitigate formation of hydrates at the wellhead, which is a common approach in gas fields. Neither three-phase separation, filtration, nor absorption provide treatment for methanol. Although methanol is known to biodegrade readily, biological treatment requires considerable space that is not available on the platform. Therefore, a treatment system to remove methanol prior to discharge is not feasible and transporting the produced water onshore

where space is available to treat it prior to discharge is also not appropriate. There is insufficient pipeline volume for the amount of water to be treated and the potential for hydrate formation is too risky. Removing the hydrate-forming produced water from the gas at the platform is essential to ensure uninterrupted production. Although methanol will not be removed prior to discharge, the environmental effects are known to be minor due to rapid degradation in the marine environment (See Section 2.2.4 for more information). In addition, substitution of more environmentally friendly chemicals to mitigate hydrate formation may be possible but would require research and development; methanol is a proven method whereas substitutes would require a demonstration.

2.2.2 Pilot Test Configuration and Execution

Given space and logistics, the preferred location to conduct the pilot test is at the CPF although the treatment system would ultimate be installed at the platform. Prior to conducting the pilot test at the CPF, Furie compared the pretreatment sample results from the CPF to those from the platform to evaluate whether the three-phase separator at the CPF would replicate results from the separator at the platform. Based on this comparison, Furie was comfortable moving forward with a pilot test at the CPF (See Figures A-2 and A-3 for Pilot Test Process Flow Diagrams).

Given the space constraints at the platform, Furie worked with an equipment vendor, Siemens, to obtain a full-scale system capable of treating up to 5,000 bbl/d to pilot test at the CPF (Figure A-2). Based on the data from Table 1, the selected pilot test system included:

- Cartridge Filters: MAJ-4610/4620 including 5-micron or 25-micron cartridges for comparison during the pilot test; and
- Carbon Filters: MAJ-4670/4680 to remove dissolved hydrocarbons and some metals.

Per the application, the anticipated produced water average daily flow rate will be 63,630 gallons per day (gpd), while the maximum will be 210,000 gpd (5,000 bbl/d). Per the manufacturer, the two-stage filters can be configured in series or parallel so that the system is capable of treating up to 5,000 bbl/d of produced water to concentrations below the applicable TBELs and water quality criteria. Per the produced water process flow diagram (See Figure A-3), the treatment system includes a total of four filtration units: with two parallel sets of cartridge filters and two parallel sets of carbon filters with piping allowing for series or parallel operation. Series operation makes it possible for stepwise filtration using 25-micron filtration cartridges followed by 5-micron. Parallel operation allows change-out of filter cartridges or carbon media without shutting down

In September 2019, Furie conducted the pilot test to determine the efficacy of the treatment system at removing oil and grease (O&G), TAH, TAqH, and the following metals: copper, lead, manganese, nickel, selenium, silver, zinc and mercury. The evaluation of hydrocarbons and metals requires a comparisons of treatment results to human health and acute aquatic life criteria. Because methanol is being used and there is no parameter-specific criterion established in 18 AAC 70 – Alaska Water Quality Standards (WQS) for methanol, effluent was also evaluated using whole effluent toxicity (WET) testing as discussed in Section 2.2.4.

Influent and effluent samples were collected and analyzed to determine treatment efficiency for pollutants. The pilot test (PT) effluent results can be used to characterize the produced water effluent and compare results against TBELs for O&G per ELGs and applicable water quality

criteria to inform the need for mixing zones and water quality-based effluent limits (WQBELs) through the reasonable potential analysis (RPA). Some data was determined to be invalid due to the effluent concentration being higher than the influent and have been excluded in the analysis. Table 2 provides a summary of the pilot test treatment performance.

Table 2: Pilot Test Treatment Performance Data

Parameter (Units)	PT Influent Results		PT Effluent Results		Average Efficiency (%)
	Results Range (Min – Max; Avg.) [1]	Detect Ratio [2]	Results Range (Min – Max; Avg.) [1]	Detect Ratio[2]	
Oil & Grease (mg/L)	**83.8 – 325; 235.4**	7/7	4.23 – 27.9; 14. 9	7/7	93.7
Copper (µg/L)	5.35 – **174; 71.6**	7/7	1.73 – **5.85**; 3.23	6/7	95.4
Nickel (µg/L) [3]	< 5 – < 31; 13.4	2/6	< 6.2 – 7.78; 6.58	2/6	26.8
Manganese (µg/L) [3, 4]	**128 – 235; 192.7**	3/3	**124 – 154; 141.0**	3/3	51.0
TAH (µg/L)	90.5 – 257.8; 150.2	7/7	< 3.03 – < 3.34; < 3.3	0/7	97.8
TAqH (µg/L)	95.1 – 238.2; 160	7/7	< 3.5 – < 8.11; < 5.8	0/7	96.4
Arsenic (µg/L)	43 – 46.3; 45.1	3/3 [4]	17.9 – 21.2; 19.0	3/3 [5]	57.9
Lead (µg/L) [3]	1.57 – 6.61; 4.27	5/6	0.219 - < 0.7; 0.535	3/6	87.5
Selenium (µg/L)	< **75 – 252; 154.9**	6/7	< 15 – 67.1; 38.4	6/7	75.2
Silver (µg/L)	< 1.55 - < **15.5; 5.5**	0/7	< 0.31 - < **3.1**; < 1.9	0/7	65.5
Zinc (µg/L)	< 15.5 – **595; 162.4**	3/7	< 3.1 - < 31; 16.8	0/7	89.7
Mercury (ηg/L) [5]	< 2.5 – 21.9; 8.1	2/7	< 0.5 - < 5; 1.8	0/7	77.8

Notes:

1. Results exceeding TBELs or acute criteria provided in Table 1are shown as **bold**.
2. The "Detect Ratio" is the number of results above detection out of the total "valid data set."
3. Nickel and lead results had one influent and effluent data pairs removed due to the effluent being higher than the influent. Manganese had four data pairs removed.
4. Arsenic sample collection was discontinued based on the first three results indicating arsenic does not require further analysis.
5. Exceedance of human health criteria for manganese and mercury are based on average conditions.

2.2.3 Produced Water Treatment System Discussion

Per Section 2.2.1, the treatment system does not remove methanol and chronic WET results of the treated effluent with methanol indicate the chronic mixing zone and RPA places chronic WET as the driving parameter, requiring a chronic WET limit per 18 AAC 70.030. Therefore, the evaluation of the treatment system for hydrocarbons and metals is focused on meeting the ELGs in 40 CFR 435 for oil and grease and which of the metals is the driving parameter for the acute mixing zone. Based on the quality of the treated effluent, only copper exceeded acute criteria after treatment indicating it is the driving parameter for the acute mixing zone and through the RPA will require a limit. Note that manganese results exceed human health criteria and must be evaluated in the mixing zone analysis to ensure human health criteria is not exceeded beyond the boundary of the chronic mixing zone. Average receiving water critical conditions and effluent average effluent concentrations are used in this analysis given that human life criteria are based on an exposure period of 35 years or more.

2.2.4 Methanol Additives in Produced Water

Methanol is the simplest of all alcohols, having only one carbon atom, and is capable of being completely mixed in water. Methanol can be toxic to most plants and animals at high

concentrations but it is significantly less toxic to marine life than petroleum fuels; and most of the effects of short-term exposure are temporary and reversible (*Evaluation of the Fate and Transport of Methanol in the Environment*, January 1999). Methanol can cause toxicity when initially discharged at high concentrations, but it is rapidly dissipated in marine water through various mechanisms, resulting in a short half-life of one to seven days. Methanol dissipation mechanisms include advection, diffusion, dispersion, volatilization, chemical reactions and biodegradation.

Based on a high solubility, polarity, and low partitioning coefficient, methanol does not easily adsorb onto particulate organic or inorganic matter, which effectively eliminates risk of bioconcentration or bioaccumulation. Unfortunately, the chemical and physical nature of methanol also makes it difficult to reduce through conventional abiotic treatment (e.g., carbon absorption) prior to discharge. Methanol's high solubility and low Henry's Law constant are expected to result in minimal methanol removal by volatilization (i.e. air stripping). Although effective, biological treatment is not feasible on the platform due to large space requirements. However, natural biodegradation does occur in the marine environment, and it is expected to be the dominant process controlling the fate of methanol in the marine surface water environment. Biodegradation of methanol can occur under both aerobic and anaerobic conditions by indigenous microorganisms that can use methanol as their carbon/energy source. The by-products from methanol biodegradation can include methane, acetate, butyrate, and hydrogen sulfide, depending on the metabolic pathways of the microorganisms specifically present in the receiving water.

The suppression of hydrate formation using methanol, given an existing temperature and pressure, is dependent on attaining a threshold concentration of methanol in the produced water. Therefore, if the temperature and pressure are unchanged, methanol injection rates generally must increase as the rate of water production increases. The applicant estimates the maximum volumes of produced water from the Sterling formation is 2,000 bbl/d), while the Beluga formation can produce approximately 50 bbl/d. However, the methanol needed to suppress hydrate formation is not significantly different between the two as the heat capacity of the water in the Sterling produced water provides heat that keeps the well fluid warmer to the surface than the fluids from the Beluga. As noted in Section 1.4.3, there are logistical issues and storage constraints that limit the amount of methanol at the platform. According to the applicant, to prevent another hydrate blockage the volume of produced water should not exceed 50 bbl/d. During the pilot test, daily methanol injection rates were approximately 300 gallons of methanol per 2,100 gallons (50 bbl) of produced water, or 14 percent (%) by volume but is anticipated to less than 5 % by volume once optimization efforts have been employed during full scale operation.

Currently there is no water quality criterion for methanol; however, there is a water quality criterion for chronic toxicity, which is one chronic toxicity unit (TU_c) per 18 AAC 70.030. The applicant postulates that since methanol is not removed by the treatment system, methanol is expected to dominate the overall toxicity of the treated effluent because the measured concentrations of the other POCs are close to, or less than, their respective chronic water quality criteria. Therefore, chronic WET results would be expected to correlate with methanol concentration; thus, a concentration–response relationship could be developed to optimize hydrate formation management using methanol, while remaining within the chronic toxicity limits of the Permit. Unfortunately, a correlation could not be evaluated from the pilot test

because neither the pre- nor post-treatment samples were analyzed for methanol. Consequently, to obtain the data to determine a correlation, the monitoring of methanol concentrations and the chronic toxicity of the treated produced water may be beneficial during the permit term.

In an attempt to characterize the chronic toxicity of the treated produced water, WET tests were performed in addition to the analytical tests performed for specific POCs. The bioassay laboratory performed a total of 10 tests using *Mytilus edulis* (common mussel, for embryonic development), *Americamysis bahia* (mysid shrimp, for survival and growth), and *Menidia beryllina* (inland silverside fish, for survival and growth). The first three tests using each of the listed organisms were performed in November of 2018 on samples of untreated produced water to determine a baseline response and to inform appropriate dilution series for subsequent WET testing on treated effluent. The remaining three tests were performed in September of 2019 on produced water samples collected during the pilot test, after treatment.

Table 3 summarizes the ten results of the WET tests on all six samples based on no-observed-effect concentration (NOEC) and 25 % Inhibition Concentration (IC_{25}) reported as TUc.

Table 3: Pilot Test Chronic WET Testing Results

Species (Endpoint)	Untreated November 2018		Treated September 2019	
	NOEC (TU_c)	**IC_{25} (TU_c)**	**NOEC (TU_c)**	**IC_{25} (TU_c)**
M. edulis (embryonic development)	100	28.74	100	< 100
A. bahia (survival)	> 100	N/A	100	< 100
A. bahia (growth)	> 100	N/A	100	< 100
M. beryllina (survival)	100	N/A	100	< 100
M. beryllina (growth)	100	N/A	100	< 100

The WET bioassays performed on untreated produced water samples collected in November 2018 resulted in toxicity values of either 100 TU_c or greater than 100 TU_c based on NOEC for the survival and growth tests and 28.74 TU_c based on the IC_{25} for the embryonic development test using *M. edulis.* In contrast, the treated produced water tested during the pilot test in September of 2019 had no observed endpoints for any of the species tested within the dilution series; all IC_{25} results were less than 100 TUc and all NOEC results were 100 TU_c. Hence, the dilution series did not bracket actual chronic WET of the treated produced water.

Based on the WET test results, the applicant chose a chronic toxicity value of 100 TU_c to evaluate the potential for the toxicity of the produced water to exceed the water quality criterion of 1 TUc. To account for variability and uncertainty, the applicant used a multiplier of 2.5 to derive a maximum expected chronic toxicity of approximately 250 TU_c. Before accepting this estimate, DEC evaluated several reported studies to render whether 250 TUc is appropriate, DEC conducted a review of the U.S. Environmental Protection Agency (EPA) Ecotoxicology Database (ECOTOX) to validate this estimate. Table 4 lists median lethal concentrations (LC_{50}) for a variety of marine test organisms to illustrate the concentrations of methanol that are necessary to cause acute effects over typical 1 to 5-day acute test periods.

Table 4: Summary of Reported Acute WET Data for Methanol

Species Common Name (# of tests)	Species Group	Year(s)	LC_{50} (mg/L)
Brine Shrimp (3)[1]	Crustacean	1992, 1998, 2004	43,577 – 48,063
Tibet Brine Shrimp (2)[1]	Crustacean	2004	35,120 – 51,494
South Asia Brine shrimp	Crustacean	2004	39,313
San Francisco Brine Shrimp	Crustacean	2004	44,692
Kuruma Shrimp	Crustacean	2004	13,052
Harpacticoid Copepod (2)[1]	Crustacean	1979, 1984	12,000
Chinese Mitten Crab	Crustacean	2004	13,052
Florida Pompano	Fish	2005	10,156
Bleak (2)[1]	Fish	1979, 1984	28,000 – >28,000
Rainbow Trout	Fish	1992	21,500
Rotifer (2)[1,2]	Invertebrate	1992, 2004	32,273 – 51,908
Common Bay Mussel (2) [1, 2]	Mollusk	1996	15,200 – 16,700

Notes:

1. Represents multiple tests.
2. Common Bay Mussel test was Flow-Through, all other tests were static.

Based on methanol that is 95 % pure by volume, the percentage of methanol in the effluent was estimated to be 14 % during the ten tests performed by the contract laboratory. The highest dilution series used in the ten WET tests referenced above in Table 1 was 1%. Therefore, the concentration of methanol in the 1% test dilution is estimated to be approximately 1,050 mg/L. In order to compare the chronic WET test results from the pilot test to the acute WET test results from literature, an acute to chronic ratio (ACR) of 10 was used per the *Technical Support Document for Water Quality-based Toxics Control* (TSD).

In order to compare acute toxicity tests results in Table 4 with the chronic test results from the pilot test in Table 3, DEC assumed the flow-through acute tests performed on the Common Bay Mussel in 1996 are the most representative results within the literature review as it would better represent hypothetical conditions in the mixing zone. ECOTOX LC_{50} data ranges from 15,200 to 16,700 mg/L, with an average of approximately 15,950 mg/L. Using an ACR of 10 would suggest chronic toxicity should occur at approximately 1,600 mg/L. Meanwhile, the maximum dilution concentration used in the chronic WET tests on treated effluent was approximately 1,050 mg/L and not likely high enough to invoke a statistically significant chronic response although there were indications of impending chronic toxicity. The September 2019 chronic test results for *M. beryllina* and *M. edulis* show that, while not statistically significant, there are slight but noticeable reductions for growth, survival and development shown in the 1 % effluent dilutions when compared to the 0.5 % dilution. For example, survival observations for *M. edulis* and *M. beryllina* went from 94 % to 90 % and from 95 % to 92 %, respectively. Hence, in these tests, chronic toxicity would have likely been observed around 1.5 % dilution to 2.0 % dilution. DEC proposes to use these estimates to inform chronic toxicity variability in the treated effluent for authorizing an appropriate size mixing zone.

As stated earlier in this section, the applicant proposed a variability factor of 2.5 to account for unknown variability and derive a maximum expected toxicity of 250 TU_c. Assuming the same conditions as those in the chronic WET tests results, a TU_c of 250 would relate to a WET test

critical dilution of 0.4% with and an approximate concentration of methanol of 420 mg/L. The 0.4 % critical dilution represents the instream waste concentration based on a maximum expected chronic toxicity of 250 TU_c. While the methanol concentration of 420 mg/L is lower than concentrations of methanol expected to cause chronic toxicity, establishing a mixing zone based on 250 TU_c provides a level of assurance that water quality criteria for chronic toxicity is not exceeded and is attainable until additional data can be obtained to better correlate chronic toxicity with methanol concentrations or synergistic impacts from other POCs present. Given the low concentrations of other POCs in the treated effluent that are not likely to pose synergistic results, establishing a correlation between methanol and chronic toxicity may be possible. Given the logistical life safety concerns associated with methanol, DEC encourages evaluation of substitute chemicals that may effectively prevent hydrate formations while resulting in less chronic toxicity in the discharge and relief from difficult logistics and life safety concerns currently associated with methanol use at the platform. To support these objectives, the permittee may be required to develop best management practices (BMPs) to support the correlation with methanol or substitution practices.

2.3 Other Wastewater Treatment and Characterization

Section 1.2 provides a summary of the wastewater discharges authorized by the Permit, which have been renumbered from the 2014 Permit to be consistent with the general permits for oil and gas exploration, development, and production in Cook Inlet. When appropriate, the wastewater discharges are characterized in the following subsections using monitoring data from June 2015 through May 2020 during the term of the 2014 Permit. See Figure A-4 Platform Water Flow Diagram and Figure A-5 for MODU Water Flow Diagram.

2.3.1 Deck Drainage (Discharge 002A/002B)

Deck drainage refers to any wastewater generated from platform washing, deck washing, spillage, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. This type of drainage could include pollutants such as detergents used in platform and equipment washing, as well as oil and grease. When water from rainfall, snowmelt, or from equipment cleaning comes in contact with oil-coated surfaces, the water becomes contaminated (as evidenced by a visible sheen) and must be treated. Oil and grease is the primary POC identified in the deck drainage waste stream. EPA determined that the model technology available for treatment of deck drainage is a sump and skim pile system (EPA 1993). However, there are many processes or equipment that can be used to accomplish physical separation of oil from the wastewater. According to the application, deck drainage on the Julius R. platform (Figure A-4) and the MODU (Figure A-5) will be treated by an oil-water separator (OWS) prior to discharge.

Although no drilling operations are planned during the term of the Permit, the applicant has requested to retain the authorization for deck drainage discharge from a MODU in addition to that from the platform. During drilling operations, in addition to oil, various other chemicals could be present in deck drainage. These chemicals include drilling fluids additives, ethylene glycol, lubricants, fuels, biocides, surfactants, detergents, corrosion inhibitors, cleaners, solvents, paint cleaners, bleach, dispersants, coagulants, and any other chemical used in the daily operations of the facility. Effective BMPs are typically used to prevent or minimize the inclusion of these chemicals in deck drainage discharges as well as ensuring that drainage that

has had contact with pollutants are treated by an OWS. Whole effluent toxicity was monitored during the term of the 2014 Permit to evaluate the effectiveness of BMP implementation.

Table 5 provides a summary of the monitoring data collected from the platform and the MODU during the 2014 Permit term for the most recent five-year period from June 2015 through May 2020. Because the discharge of deck drainage is intermittent and largely dependent on precipitation, daily volumes can vary widely.

Table 5: Effluent Characteristics for Deck Drainage (Discharge 002A/002B)

Facility (Discharge #)	Pollutant (Units)	Data Set	Range (Min – Max, Avg.)
Julius R. Platform (Discharge 002A)	Flow Rate (gpd)	57	31 – 45,444; 1,859
	Chronic Toxicity (TUc)	4	0 – 69.45; 24
MODU (Discharge 002B)	Flow Rate (gpd)	7	880 – 5,526; 2,702
	Chronic Toxicity (TUc)	1	2

2.3.2 Domestic Wastewater (Discharge 003A/003B) and Graywater (Discharge 004B)

Graywater is a subset of domestic wastewater; it only includes wastewater from kitchens, showers, and laundry facilities and does not include the black water waste from urinals and toilets (black water). Domestic wastewater (graywater and black water) is subject to both 18 AAC 72 – Wastewater Disposal and 18 AAC 83 – APDES Program. Prior to discharging domestic wastewater, engineering plans for domestic wastewater treatment systems must be submitted and approved by the Department per 18 AAC 72.200. The Permit requires that any domestic wastewater discharged from a MODU (Discharge 003B) selected for seasonal drilling will have adequate domestic wastewater treatment to meet minimum treatment per 18 AAC 72.050 as reflected in the maximum daily limit (MDL) and average monthly limit (AML) for TSS and five-day biochemical oxygen demand (BOD_5) for domestic wastewater in the 2014 Permit. Graywater may be discharged without meeting secondary treatment requirements if primary treatment is provided and a waiver per 18 AAC 72.060 is granted by DEC.

2.3.2.1 Domestic Wastewater from MODUs (Discharge 003B versus Discharge 004B)

Although the application is based on the Spartan 151 MODU, another MODU may be approved through the plan review process and discharge under the Permit. Currently, the Spartan 151 has not obtained approval to discharge through the plan review process for Discharge 003B, because the onboard marine sanitation devices (MSDs) are unable to treat the black water to minimum requirements (secondary standards) per 18 AAC 72.050. Therefore, the Spartan 151 has historically containerized black water and hauled it to shore for disposal. However, graywater from the Spartan 151 MODU is segregated from the black water and is treated using an MSD to satisfy primary treatment requirements. Although graywater is considered domestic wastewater and is held to the same minimum treatment requirements per 18 AAC 72.050, a waiver for secondary treatment can be requested and approved by DEC per 18 AAC 70.060 if at least primary treatment is provided prior to discharge and no environmental impacts are expected. Primary treatment is defined per 18 AAC 72.990(50) as attaining 30 % reduction in BOD_5 and TSS. The treatment of graywater using the MSDs on the Spartan 151 has been demonstrated to exceed primary treatment requirements and that no adverse impacts are expected to occur if discharged. On

February 20, 2018 the operator successfully obtained a waiver to secondary treatment standards from DEC, thereby obtaining approval to discharge treated graywater (004B) under the Permit. The waiver for the minimum level of treatment is valid only for graywater and specifically for the use of the system identified in the waiver request. If the MSDs on the Spartan 151 MODU are modified, or another MODU is substituted for the Spartan 151, engineering plans for the domestic wastewater treatment system(s) of the MODU must be submitted to the Department for review and approval prior to being used under the Permit.

2.3.2.2 Domestic Wastewater from the Julius R. Platform

Graywater at the Julius R. platform is not segregated from the black water wastes prior to treatment; instead the combined streams constitute the domestic wastewater from the platform. The State-approved domestic wastewater treatment system on the Julius R. platform is a Redfox Environmental Services Inc., Biological Sewage Treatment Unit, Model RF-2000-M(55) which has a maximum design flow of 2,000 gpd. The system includes a chlorination step to destroy disease-causing organisms in the wastewater, followed by a dechlorination step to reduce toxicity to the receiving water. Using a standard of 50 gpd per capita (gpd-c) and a personnel capacity is 24 people results in an anticipated demand of 1,200 gpd. The treated domestic wastewater from the platform meets secondary treatment standards and is approved for discharge in compliance with the requirements and limitations established in the Permit.

When attached to the platform, the treated domestic wastewater (Discharge 003B) or graywater (Discharge 004B) from the MODU can be combined with the domestic wastewater discharge from the Julius R. platform (Discharge 003A) as approved by the Department. As a result, there is a single discharge port and a common mixing zone based on the combined maximum discharges. However, the compliance point for each discharge will be prior to the point where the discharges are combined.

The POCs in domestic wastewater include BOD_5, TSS, total residual chlorine (TRC), and both fecal coliform (FC) and enterococci (EC) bacteria measured in most probable number per 100 milliliters (MPN/100 ml) and colony-forming units per 100 ml (CFU/100 ml), respectively. The ELGs per 40 CFR 435 establish a minimum TRC concentration of 1.0 mg/L at the point of chlorination that serves as a surrogate to FC and EC bacteria destruction. The Permit also requires dechlorination prior to discharge to result in a maximum concentration of 1.0 mg/L TRC in the discharge.

Table 6 provides a summary of the monitoring data from the domestic wastewater system for the most recent five-year period from June 2015 through May 2020 for the Julius R platform.

Table 6: **Effluent Characteristics for Domestic Wastewater (Discharge 003A)**

Parameter (Units)	Data Set	Effluent Limits		Range (Min – Max; Avg.) [1]
		MDL	AML	
Flow (gpd)	56	Report		83 – 868; 378.7
pH (standard units (su)) [2]	56	6.5 ≤ pH ≤ 8.5		**5.5** – 7.5; 6.54
BOD_5 (mg/L)	53	60	30	2.79 – **62.9**; 14.7
TSS (mg/L)	53	60	30	1.09 – **72.**0; 11.4
TRC Minimum (mg/L)	56	1.0 Minimum		0.8 – **2.9**; 1.3
TRC Maximum (mg/L)	56	1.0 Maximum		0.1 – **1.7**; 0.84
FC Bacteria (MPN/100 ml) [3, 4]	51	Report		0.91 – **8,610**; 3.48
EC Bacteria (CFU/100 ml) [3, 4]	52	Report		1.0 – **2,400**; 4.55

Notes:
1. Results exceeding effluent limits provided in Table are shown as bold.
2. The median pH is used in lieu of average.
3. Average for FC and EC bacteria is based on a geometric mean.
4. The maximum criteria for FC bacteria is 43 MPN/100 ml and for EC bacteria is 130 CFU/100 ml. Bacteria results exceeding these criteria are shown as bold in the Table.

2.3.2.3 Graywater (Discharge 004B)

The parameters of concern for graywater are BOD_5, TSS, TRC, and floating materials including solids, foam, garbage, and oily sheens. Because the MSDs include chlorination and then dechlorination to achieve at least primary treatment, the primary POC is TRC and is included in the mixing zone analysis in Section 3.3.1

Because the discharge of graywater at the MODU, segregated from black water, was not part of the 2014 Permit, there were no discharges monitored to characterize the effluent. However, the operator of the Spartan 151 submitted graywater data in order to obtain a waiver from DEC to discharge graywater in February 2018. Table 7 provides a summary of the data supporting the use of the MSDs for primary treatment and the waiver to minimum treatment standards granted by DEC.

Table 7: **Effluent Characteristics for Graywater from the Spartan 151 MODU (Discharge 004B)**

Parameter (Units)	Range (Min – Max; Avg.)
Flow (gpd)	1,782 – 3,565; 2,794
pH (su) [1]	6.67 – 7.67; 7.01
BOD_5 Removal (%)	40.2 – 71.9; 58.9
TSS Removal (%)	71.7 – 98.9; 86.2
TRC after dechlorination (mg/L)	< 0.1 – 1.1; 0.39

Notes:
1. The median pH is used in lieu of average.

Specific to MODUs like the Spartan 151 that uses an MSD for primary treatment of graywater, the requirement to dechlorinate prior to discharge and a TBEL of 1.0 mg/L TRC is necessary to ensure the concentration of TRC is adequately controlled. Accordingly, mixing zones for TRC in graywater (Discharge 004B) is necessary just like the discharge of Domestic Wastewater (Discharge 003A/003B). Because the domestic wastewater and graywater are equivalently limited to 1.0 mg/L TRC, the graywater discharge from the

Spartan 151 can be commingled with the domestic wastewater from the Julius R. platform because graywater is considered domestic wastewater and the TRC limitations are the same. Alternatively, the Spartan 151 could also discharge the treated graywater overboard under the Permit using a mixing zone developed solely for the graywater discharge. See Fact Sheet Section 3.3.1.2.

2.3.3 Fire Control System Water (Discharge 008A)

Fire control system water is typically seawater discharged during training events, during the testing and maintenance of the fire protection equipment on a platform, or in response to a fire at a facility. Fire control system water discharges occur as an overboard discharge. Chemicals are not added to the fire control system water at the Julius R. platform. Based on monitoring data collected during the most recent five-year period from June 2015 through May 2020, the maximum daily discharge rate ranged between 120 and 3,300 gpd with an average of 1,580 gpd.

2.3.4 Noncontact Cooling Water (Discharge 009B)

Non-contact cooling water is seawater used for non-contact, once-through cooling of various pieces of machinery at the facility (e.g., power generators or draw work brakes) that is discharged overboard. The volume and discharge temperature of noncontact cooling water depends on the configuration of heat exchange systems on the MODU or fixed platform. Some systems use smaller volumes of water that are heated to a greater extent resulting in a higher temperature difference between the wastewater and the receiving water, while other systems use larger volumes of water to cool equipment resulting in a smaller temperature difference. The Spartan 151 MODU has two separate systems that discharge to the same location (Appendix A, Figure A-6). During the most recent five-year period from June 2015 through May 2020, the maximum daily discharge rate ranged between 0.54 million gallons per day (mgd) and 1.8 mgd with an average of 1.2 mgd, while the maximum daily temperature ranged between 10.8 degrees Celsius (°C) and 25.6 °C. Because a thermal discharge may not increase the ambient temperature more than 1 °C per 18 AAC 70.020(b)(22), a chronic mixing zone is required (See Fact Sheet Section 3.3.1.3).

2.3.5 Uncontaminated Ballast Water (Discharge 010B)

Uncontaminated ballast water is unaltered seawater that has not been comingled with wastes and has been taken in by filling the preload tanks in the hull (e.g., Spartan 151) or the legs of a MODU for setting the legs into the seafloor, or for stability during transport. In the case of MODUs, ballast water is seawater added or removed to maintain the proper ballast and ship draft for stabilization while the MODU is in transit. Ballast water is also discharged to set the legs of jack-up rigs on the seafloor, which happens intermittently a few times during an active drilling season. The deployment of the legs of a jack-up rig will require pre-loading of seawater which will be discharged as uncontaminated ballast water. Although there are no chemical additives or other contaminants anticipated in the discharge, ballast water is considered a point source applicable to coverage under an APDES permit. The applicant has indicated the volume can be up to 1.2 million gallons for each positioning attempt (Figure A-6). Based on monitoring data collected during the most recent five-year period from June 2015 through May 2020, there was only one month where a maximum daily rate of 0.95 mgd was reported.

2.4 Compliance History

2.4.1 Limits Exceedances

Two facets of compliance were assessed: the ability of the facility to meet the numeric and narrative permit limitations and the permittee compliance with the monitoring and reporting requirements. Permits require the submission of discharge monitoring reports (DMRs) to the Department, as well as self-reporting of noncompliance events. A review of facility compliance during the 2014 Permit term was conducted for the five-year period from June 2015 through May 2020 (review period), using DMR data submitted over 60 months.

An on-site compliance inspection of both the Platform and the MODU was led by EPA with accompaniment by DEC in June 2016. EPA discussed the areas of concern identified during the 2016 inspection with the Platform and MODU representatives during the inspection closing conference and post-inspection communications, as well as in a follow-up a warning letter in December 2017. The areas of concern identified were 1) lack of static sheen test equipment and procedures on the Platform; 2) retention of original records of visual observation monitoring data after transfer to electronic format; and 3) documentation of visual observations specifically for each applicable discharge. The applicant accordingly procured static sheen test equipment as well as updated their procedures to include use of the test equipment, and adjusted the procedures for documentation and recordkeeping of visual observations. As part of the inspection process, EPA had also conducted an administrative review of facility DMRs and in the warning letter, noted limit exceedances in the domestic wastewater discharges, which are discussed further in Section 2.4.2. No enforcement actions were taken during the review period.

2.4.2 Domestic Wastewater (Discharges 003A/003B) Limit Exceedances

DEC compared the compliance monitoring data during the review period to the limits established in the 2014 Permit. Multiple exceedances from the 2014 Permit limits for BOD_5, TSS, TRC, and pH were reported for the domestic wastewater discharges from the Platform (Discharge 003A) and the MODU (Discharge 003B) and are summarized in Table 8.

Table 8: Domestic Wastewater (Discharge 003A/003B) Limit Exceedances

Parameter	Number of Observed Excursions	
	Platform (003A)	**MODU (003B)**
BOD_5	1 – daily maximum; 2 – monthly average	7 – daily maximum; 7 – monthly average
TSS	4 – daily maximum; 4 – monthly average	5 – daily maximum; 7 – monthly average
TRC	1 – daily minimum; 2 – daily maximum	7 – daily maximum
pH	6 – instantaneous minimum	1 – instantaneous maximum

2.4.2.1 Limit Exceedances of Discharges from the Platform

Domestic wastewater discharge from the platform began in September 2015. During the system start-up period, three of the reported exceedances of TSS and the single exceedance of BOD_5 from the 2014 Permit limits in the platform domestic wastewater occurred starting in November 2015. Furie investigated and on December 22, 2015 informed DEC that a former galley hand (cook) who had been relieved of duties in late October 2015, due to

problems with the crew and peers, had dumped considerable amounts of cooking grease along with detergents and degreasers down the sink. Fury enlisted the treatment manufacturer, Red Fox, to help resolve the issue and after extensive testing of the system, eventually completely drained the system and thoroughly cleaned it out in December. The difficulties with meeting TSS limits apparently continued into January 2016 but resolved by February 2016 when permit limit exceedances no longer occurred.

Between January 2018 and August 2019, there were some intermittent and limited exceedances of the pH, TRC, BOD_5, and TSS limits for domestic wastewater, indicative of minor system fluctuations. However, during the first quarter of 2020 the TSS in the domestic wastewater discharged from the platform consistently exceeded the AML, although the daily maximum limit was only exceeded once. This pattern is indicative of a slight upset in treatment conditions. The subsequent results later in the same year were compliant, indicating that the applicant had successfully addressed the upset that caused the elevated TSS in the domestic wastewater discharge earlier that year.

2.4.2.2 Limit Exceedances of Discharges from the MODU

The 2014 Permit was developed based on the use of the Spartan 151 MODU for development drilling. The Permit was developed to allow the MODU to submit plans to receive approval to discharge based on the appropriateness of the domestic wastewater treatment system. The Spartan 151 was unable to successfully obtain approval to discharge domestic wastewater. Given this failure, Furie requested a major modification to allow any MODU capable of meeting the domestic wastewater discharge limits to operate under the Permit. The operator of the Randolph Yost submitted plans for an advanced electro-coagulation treatment system purported by OmniPure to be able to meet the permit limits based on secondary standards. DEC approved the installation of the treatment system and modified the Permit in April 2016 to allow the use of the Randolph Yost MODU and add uncontaminated ballast water; the effective date of modification is May 23, 2016.

The Randolph Yost MODU initially began operation under the permit in June 2016 discharging domestic wastewater. The OmniPure electro-coagulation sewage treatment system on the Randolph Yost MODU is designed to oxidize sewage in an electrochemical cell and generate sodium hypochlorite for the disinfection of the sewage streams. However, the system experienced repeated and ongoing power failure and the solids system was not operational until September 2016, which resulted in permit limit exceedances in the domestic wastewater for BOD_5 and TSS concentrations; the MDL for TRC was also exceeded. Despite ongoing trouble-shooting efforts, the problems with the Randolph Yost MODU OmniPure system were never completely resolved before the Yost separated from the Platform at the end of October 2016. The domestic waste discharge from the Randolph Yost MODU never met the MDL for TRC, nor any of the BOD_5 and TSS limits while attached to the platform, from June through October 2016.

2.4.3 Reporting Noncompliance

During the review period, the method of reporting transitioned from paper to electronic DMRs (NetDMRs). The EPA Electronic Reporting (eReporting) Rule (40 CFR 127) was initiated in December of 2016 and has been implemented in phases. The eReporting Rule also authorized delegated State Programs, including Alaska, to integrate NetDMR data with the EPA Integrated Compliance Information System (ICIS) database.

As part of the permit development process, DEC conducted a review of reporting noncompliance (RNC), both self-reported noncompliances by the permittee and those identified through ICIS. During the review period, the permittee generally submitted the monthly DMRs on schedule with a few exceptions, which were documented to have been circumstances outside permittee control and appropriately self-reported as required under the terms of the 2014 Permit. The self-reporting included submittal of 18 self-reported noncompliance notifications during the review period. Nine of the noncompliance notifications were for small accidental releases associated with the construction of the platform and pipeline. The remaining half of the non-compliance notifications were regarding permit limit exceedances in the domestic wastewater discharges from the platform and MODU, already discussed in Section 2.4.2, and regarding issues with deck drainage WET sampling and testing, discussed later in this section.

The 2014 Permit required WET testing of deck drainage from the platform once within the first two years, during periods of significant rainfall or snowmelt. The major modification of the 2014 Permit made in 2016 to enable the use of the Randolph Yost MODU similarly added a WET testing requirement for the deck drainage from the MODU, also once within the first two years. Timely chronic WET results for deck drainage discharges for the Platform were reported twice and once from the Yost in compliance with WET testing requirements. However, the ICIS database erroneously identified unresolved RNCs for chronic toxicity in the deck drainage discharges from the platform and/or MODU for August, September, and October of 2018.

ICIS also identified DMR RNCs for FC bacteria for June of 2019 and of both FC and EC bacteria for August of 2019 in the domestic wastewater discharge from the Platform. Upon further investigation, it was determined that the permittee had included comments with the relevant eDMR submissions explaining that the samples had been collected and recollected, but that transit logistics and circumstances outside of their control caused the lack of valid analytical results for the reporting month due to hold time exceedances.

3.0 RECEIVING WATERBODY

3.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with 18 AAC 70 – Alaska Water Quality Standards. The WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

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

3.2 Water Quality Status of Receiving Water

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

Cook Inlet is not included as an impaired waterbody in the *Alaska's Final 2018 Integrated Water Quality Monitoring and Assessment Report*, March 26, 2020 (*2018 Integrated Report*) nor is it listed as a CWA 303(d) waterbody requiring a TMDL. Accordingly, a TMDL has not been established for Cook Inlet.

3.3 Mixing Zone Analysis

Per 18 AAC 70.240, excluding 18 AAC 240(g)(2), (3), and (4) as amended through March 23, 2006 the Department may authorize mixing zone(s) in an APDES permit. Determination of mixing zones requires an evaluation of critical characteristics of the receiving water, effluent discharges and other pertinent factors, combined with use of an approved mixing zone modeling program such as the Cornell Mixing Zone Model or Visual Plumes.

The Mixing Zone Analysis Checklist (Appendix D) outlines the criteria that must be considered and met per mixing zone regulations for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's regulatory mixing zone analyses.

3.3.1 Modeling Inputs and Outputs

3.3.1.1 Domestic Wastewater Discharge 003A/003B

The effluent characterization for domestic wastewater (Discharge 003A/003B) identified TRC as the driving water quality parameter requiring acute and chronic mixing zones. Mixing zones for domestic wastewater are sized for a maximum discharge of 1.0 mg/L TRC, a TBEL using a density of 998.2 kilograms per cubic meter (kg/m^3) reflecting freshwater. The maximum discharge flow rates for the Julius R. platform (Discharge 003A) and the MODU (Discharge 003B) are based on maximum population and typical per capita wastewater generation for a platform, 50 to 75 gpd-c, which resulted in a maximum combined discharge rate of 8,400 gpd. The platform was constructed to allow for a comingling of the two discharges into a single port diffuser. This is allowable given the individual compliance points are prior to commingling and both discharges are limited to the 1.0 mg/L TRC.

The critical ambient conditions at the Julius R. platform used in the 2014 Permit include a uniform density profile with a value of 1018 kg/m^3, a 90^{th} percentile current speed of 2.3 meters per second (mps), and a 10^{th} percentile current speed of 0.2 mps. The depth at the platform is 27 meters at the mean lower low water (MLLW) and the point of discharge is 9 meters above the seafloor. During the term of the 2014 Permit, additional receiving water data became available through an exploration Environmental Monitoring Program that indicated there may be a slight linear density profile where the density is 1,019 kg/m^3 at the

surface and 1,019.6 kg/m^{3}at the seafloor. DEC used this new data to verify whether the previous acute mixing zone of a 9-meter radius and chronic mixing zone of 18-meter radius is still appropriate.

Based on modeling the critical effluent and updated receiving water conditions (i.e., linear density profile), the acute mixing zone is still a 9-meter radius and the chronic mixing zone is still an 18-meter radius extending from the sea surface to the seafloor. Hence, the slight density profile did not result in modified mixing zones. Similarly, the authorized acute dilution factor is 77 whereas the chronic mixing zone dilution factor is 133. For consistency, the linear density profile is used in subsequent model runs for subsequent mixing zone evaluations.

3.3.1.2 Graywater Discharge 004B

The Spartan 151, that is being used to inform requirements of the Permit, has been unable to obtain Department approval to discharge domestic wastewater under Discharge 003B due to the ineffectiveness of the MSD treatment system to meet the requirements for secondary treatment standards. Instead, the Spartan 151 uses the MSDs to provide primary treatment for graywater and has obtained a waiver from secondary standards from the Department. Because the Spartan uses MSDs for primary treatment, the graywater discharge also has a TBEL for TRC of 1 mg/L. Therefore, graywater can be discharged through the combined outfall with Discharge 003A since the critical effluent conditions are similar. Alternatively, for the Spartan 151 or potentially other MODUs approved to discharge the graywater overboard (i.e., discharge to the water surface at a height of 12 meters above). However, this requires modeling the discharge as a surface jet discharge rather than the submerged outfall for Discharge 003A/003B. All of the critical receiving water conditions are same as for Discharge 003A/003B except the discharge occurs 12 meters above the surface of the water. This scenario is similar to that for noncontact cooling water discussed in Section 3.3.1.3.

A sensitivity analysis was conducted to determine the maximum extent of a potential mixing zone. A jet discharge was determined to be the most sensitive (i.e., results in the largest dimensions). The direct discharge to the surface results in a smaller mixing zone for graywater than the submerged; the acute mixing zone is a 2-meter radius while the chronic is a 5-meter radius. Note that the surface discharge of graywater may cause concerns over creation of foam on the surface of the waterbody which would be considered a violation of ELGs in 40 CFR 435. Hence, adherence to housekeeping BMPs to mitigate the discharge of pollutants that can cause foam (e.g., stipulations on detergents) would be essential for surface discharges of graywater. DEC recommends discharging to the subsurface when possible.

3.3.1.3 Noncontact Cooling Water (Discharge 009B)

The discharge of noncontact cooling water from the Spartan 151 has been modeled at two other locations: the Sabre Project Site and the Granite Point Platform. The discharge of noncontact cooling water is to the surface of the water from a height of 12 meters and has a maximum temperature of 27 °C. The critical ambient temperature is taken to be 12 °C, establishing an excess temperature of 15 °C and an excess criterion of 1 °C. The remaining critical conditions are as described previously, a linear density profile and 10th percentile and 90th current speeds of 0.2 and 2.3 mps, respectively.

A sensitivity analysis was used to determine at what point the heated effluent would comply with water quality criteria, which is one degree above ambient. The most sensitive

assumption was a spray discharge over a 1.0 square-meter area on the water surface. The KLU site-specific results indicate water quality criteria for temperature will be met within 23 meters of the surface discharge. This KLU result compares to a 17-meter distance for the Sabre Project Site, which has a lower ambient current speed. Although water quality criteria for temperature is met within 23 meters, there is potential for the MODU to use chemical additives in the discharge, which could require a larger mixing zone. Therefore, DEC approves a standardized 100-meter radius mixing zone for the discharge of noncontact cooling water as has been done for other facilities operating in Cook Inlet. The modeling results demonstrates there would be no exceedance of temperature criteria within the 100-meter chronic mixing zone sized based on the possibility that chemical use may be necessary.

3.3.1.4 Produced Water (Discharge 015A)

The applicant submitted a mixing zone analysis for a submerged produced water discharge based on the critical ambient conditions discussed in this section and the effluent characteristics described in Section 2.2. Per 18 AAC 72.275(a)(6), the applicant submitted the mixing zone analysis to evaluate the design submitted to the Department for approval to construct as discussed in Section 1.4.3. The chronic mixing zone is driven by the chronic toxicity of methanol with a probable maximum of approximately 250 TUc and chronic criteria of 1.0 TUc. Whereas, the acute mixing zone is driven by copper with a probable maximum concentration of 17.1 µg/L, an ambient concentration of 0.926 µg/L, and acute criteria of 5.78 µg/L. The results of the modeling indicate the chronic mixing zone size is 110 meters long by 48 meters wide and the acute mixing zone is 0.4 meters square extending from the sea surface to the seafloor. The chronic and acute authorized dilution factors are 250 and 3.25, respectively.

3.3.1.5 Mixing Zone Size Summary

The following summarizes the mixing zone sizes and dilution factors authorized by the Permit.

Platform/MODU Combined Domestic Wastewater 003A and 003B or 004B: As previously authorized in the 2014 Permit, the mixing zone sizes for the chronic mixing zones are 35-meter radius and the acute mixing zones are 17-meter radius extending from the sea surface to the seafloor for TRC. The authorized dilution factors are 133 chronic and 77 acute.

MODU Graywater Overboard 004B: The over boarding of graywater from the MODU is authorized to have a 2-meter radius acute mixing zone and a 5-meter radius chronic mixing zone, both extending from the sea surface to the seafloor. The authorized dilution factors are 133 chronic and 77 acute for TRC.

MODU Noncontact Cooling Water Overboard 009B: Consistent with all other noncontact cooling water discharges from oil and gas facilities operating in Cook Inlet, the MODU is authorized for a 100-meter radius chronic mixing zone extending from the sea surface to the seafloor for temperature and chronic toxicity. The authorized chronic dilution factor is 189.

Platform Produced Water 015A: The discharge of produced water is authorized to have a rectangular chronic zone that is 220 meters long (110 meters in each prevailing current

direction) by 28 meters wide extending from the sea surface to the seafloor for chronic toxicity, copper, silver, and selenium with a chronic dilution factor of 250. In addition, an acute mixing zone that is a 0.4-meter radius extending from the sea surface to the seafloor is authorized for copper with a dilution factor of 3.25.

3.3.2 Regulatory Size Constraints

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

Per 18 AAC 70.240(k)(1)(A), for estuarine and marine waters, measured at MLLW the cumulative linear length for all mixing zones intersected on any given cross section of an estuary, inlet, cove, channel, or other marine water may not exceed 10 % of the total length of that cross section. Additionally, per 18 AAC 70.240(k)(1)(B), the total horizontal area allocated to all mixing zones at any depth may not exceed 10 % of the surface area. DEC determined the critical cross section for produced water mixing zones extends through Furie and the Bruce Platform produced water mixing zones. The total transect is approximately 39 miles long, while, the cumulative length of the intersected mixing zones is approximately 0.53 miles, or 1.4 % of the total length. Hence, the mixing zones are less than 10 % of the critical cross section. On an area basis, the area of Cook Inlet where oil and gas discharge may be allowed is approximately 416,528 hectares. Meanwhile, the total area of all produced water mixing zones including the Julius R. Platform is 1,318.7 hectare. Hence, the area of the mixing zone is infinitesimal (0.3 %) compared to the overall surface area of the waterbody making it significantly smaller than the size allowed by 18 AAC 70.255(k)(1)(B). See Figure A-7 for more information.

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

The largest acute mixing zone in the Permit is 17 meters for the combined discharges of domestic wastewater (Discharges 003A/003B or 004B). All other acute mixing zones are much smaller and can be determined by the largest. The exposure time is calculated by dividing the length of the mixing zone (17 meters in the down-current direction) by the 10^{th} percentile current (0.02 mps). The calculation indicates an organism would spend approximately 1 minute 15 seconds in the largest acute mixing zone during low current conditions. Therefore, no lethality will occur, and the mixing zones have been sized to be small as practicable.

3.3.3 Technology

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

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

The first part of the definition includes all TBELs applicable to federal ELGs that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case best professional judgement (BPJ). The Permit applies TBELs based on the ELGs for produced water establishing limits for oil and grease, 42 mg/L MDL and 29 mg/L AML. Similarly, the discharge of deck drainage has a limit of no free oil and the discharge of graywater has a limit of no foam, both also from the ELGs. The discharge of graywater also includes a limit of 1.0 mg/L after dechlorination established as a case-by-case TBEL.

The second part of the definition per 18 AAC 72.050 refers to the minimum treatment requirements for domestic wastewater as applicable to Discharge 003A/003B – Domestic Wastewater and Discharge 004B – Graywater. Since the discharge from Discharge 003A/003B must meet minimum treatment standards for BOD_5 and TSS, these discharges comply with the definition. Because Discharge 004B – Graywater has been granted a waiver from the minimum treatment requirements per 18 AAC 72.060 for the Spartan 151 MODU, it is not required to meet the minimum treatment standards of 18 AAC 72.050. Any other MODU used under the Permit would also be required to obtain a waiver to minimum treatment standards in order to discharge graywater. Accordingly, the second part of the definition has been met.

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

3.3.4 Existing Use

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

3.3.5 Human Consumption

Per 18 AAC 70.240(c)(4)(B) the mixing zone must not create a public health hazard that would preclude existing uses of the waterbody for water supply or contact recreation. Per 18 AAC 70.240(c)(4)(C), the mixing zone must not preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Lastly, 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.

The mixing zones are not authorized in a location where aquatic resources are harvested or that could result in precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Nor is there any indication that the pollutants discharged would produce objectionable color, taste or odor in aquatic resources harvested for human consumption if such activity occurred near the outfall. Any human consumption of marine water would require a level of treatment that would remove all pollutants (e.g., desalination or reverse osmosis). Therefore, human consumption is not impacted by the discharges under the Permit.

3.3.6 Spawning Areas

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

3.3.7 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 from the treatment system pilot testing that reasonably demonstrates bioaccumulation or bioconcentration will not occur as a result of discharges authorized by the Permit. The parameters present in the discharges that could pose bioaccumulation/bioconcentration concerns below human health criteria at the point of discharge. The only human health parameter that exceeded criteria at the point of discharge is manganese. Per the mixing zone evaluation, human health criteria for manganese will be met within 2.4 meters. Per 18 AAC 70.240, human health criteria must be met prior to the boundary of the chronic mixing zone, which is 110 meters in the prevailing current direction. Hence, human health criteria are met within a small fraction, 2.2 %, of the overall chronic mixing zone.

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

An analysis of available information reasonably demonstrates that the authorized chronic mixing zone will protect human health. Unlike aquatic life criteria that have short exposure periods, human health criteria are based on much longer exposure periods (e.g., lifetime exposure). Therefore, when assessing human health criteria, it is appropriate to consider average effluent and receiving water conditions commensurate with the long exposure periods for which

the human health criteria are based. The Department considered the low, long-term average concentration of manganese in the mixing zone during the modeling efforts to derive the required dilution factor (7.8) and distance (2.4 meters) needed to meet the human health criteria. Meanwhile, the chronic mixing zone length is 110 meters in each current direction Therefore, the Department has concluded that the available information reasonably demonstrates the discharge will not pose a human health risk when considering likely pathways of exposure and pollutant persistence in the vicinity of the discharge.

3.3.8 Aquatic Life and Wildlife

Per 18 AAC 70.240(c)(4)(A),(D), and (E), pollutants for which the mixing zones will be authorized will not result in an acute or chronic toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone; a reduction in fish or shellfish population levels; or in permanent or irreparable displacement of indigenous organisms. In addition, the mixing zone must not result in undesirable or nuisance aquatic life per 18 AAC 70.240(d)(5). Because all criteria are met at the respective acute and chronic mixing zone boundaries, toxic effects in the water column, sediments, or biota will occur outside these boundaries; existing water quality criteria protect from these occurrences. In addition, there are no anticipated displacement of indigenous species nor promotion of undesirable or nuisance aquatic life.

3.3.9 Endangered Species

Per 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. Based on the information regarding endangered species in the area of the discharges, authorized mixing zones are not likely to adversely affect threatened or endangered species per the Beluga Recovery Plan. The discharge area is within Type 2 habitat for the beluga whale, which primarily serves as a seasonal migration pathway between upper Cook Inlet summer feeding areas and lower birthing and rearing locations. Based on limited time that beluga whales migrate through this area, the discharges are not likely to cause adverse effects to beluga whales. For more information on local endangered species see Section 8.1.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Effluent Limits

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

The development of limits and monitoring requirements for the Permit is summarized in Appendix C. The following summarizes the limits imposed for the four discharges authorized under the Permit:

- The limits for Discharge 002A/002B – Deck Drainage include WQBELs for oil and grease visual sheen;

- The limits for Discharge 003A/003B include numeric TBELs for pH, BOD_5, TSS, and TRC and narrative WQBELs for oil and grease (visible sheen);
- The limits for Discharge 004B include numeric TBELs for TRC and narrative WQBELs for oil and grease (visible sheen);
- The limits for Discharge 009B – Noncontact Cooling Water and Discharge 008A – Fire Control Test Water include primarily BMPs, but a chemical inventory and chronic WET testing could be required if chemicals are used; and
- The limits for Discharge 015A – Produced Water include numeric TBELs for oil and grease, pH; numeric WQBELs for chronic WET and copper; and narrative WQBELs for oil and grease (visible sheen).

4.2 Effluent Limits and Monitoring Requirements

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

4.2.1 Effluent Limits and Monitoring Requirements for Discharge 002A/002B – Deck Drainage

Effluent limits and monitoring requirements for Discharge 002A/002B – Deck Drainage are summarized in Table 9 with corresponding referenced notes provided in subsequent sections.

Table 9: Effluent Limits and Monitoring Requirements for Deck Drainage (Discharge 002A/002B)

Parameter (Units)	Effluent Limitations	Monitoring Requirements	
		Frequency	Type
Total Flow Volume (mgd) [4.2.1.1]	Report	Monthly	Estimated
Oil and Grease (Visible Sheen) [4.2.1.2]	No Discharge	Daily	Visual
Chronic WET (TU_c) [4.2.1.3]	Report	1/Term	Grab

4.2.1.1 Total Flow Volume

The Permit requires estimating flow volumes daily, maintained in a log at the facility, and made available to DEC upon request. The total monthly volume must be reported on the DMR.

4.2.1.2 Oil and Grease (Sheen)

The permittee must ensure that deck drainage contaminated with oil and grease is processed through an OWS, or other oil removal process, prior to discharge. The permittee must develop specific BMPs to ensure precipitation in contact with pollutants are treated per Section 7.3.1.1. Daily while discharging, the permittee must observe the receiving water surface during a time when observation of the water surface is possible and record observations in a daily log maintained onsite. If conditions prevent observations, the

permittee may use the Static Sheet Test (EPA Method 1617). Static Sheen Test equipment must be maintained onsite.

4.2.1.3 Chronic WET Monitoring for BMP Validation

Chronic WET testing is applicable to Outfall 002A only for validation that BMPs required by Section 7.3.1.1 are effective. Samples must be collected downstream of the OWS during periods of significant rainfall or snowmelt. For characterization of deck drainage, the most sensitive invertebrate species is required per Sections 4.3.1 and 4.3.1.2using a dilution series of 3.13, 6.25, 12.5, 25, and 50% including a control (zero % effluent) and maximum dilution after hypersaline adjustment (approximately 70 %). A chronic WET result less than or equal to 4 TU_c validates the effectiveness of BMPs such that future monitoring will not be required in the next permit reissuance or authorization under a general permit.

4.2.2 Effluent Limits and Monitoring Requirements for Domestic Wastewater (Discharge 003A/003B)

Effluent limits and monitoring requirements for Discharge 003A/003B – Domestic Wastewater are summarized in Table 10.

Table 10: Effluent Limits and Monitoring Requirements for Domestic Wastewater (Discharges 003A/003B)

Parameter (Units)	Effluent Limits		Monitoring Requirements	
	MDL	AML	Frequency	Sample Type
Flow (gpd)	---	Report	Continuous	Estimate or Meter
pH (su)	6.5 ≤ pH ≤ 8.5		1/month	Grab or Meter
TSS (mg/L)	60	30	1/month	Grab
BOD_5 (mg/L)	60	30	1/month	Grab
TRC Minimum (mg/L) [1]	1.0		1/month	Grab
TRC Maximum (mg/L) [2]	1.0		1/month	Grab
EC Bacteria (CFU/100 ml)	Report		1/quarter	Grab
FC Bacteria (MPN/100 ml)	Report		1/quarter	Grab

Notes:

1. TRC minimum samples must be taken immediately after chlorination prior to dechlorination. The minimum TRC concentration limit is a surrogate for bacteria destruction.
2. TRC maximum samples must be taken downstream of a dechlorination treatment prior to discharge.

During the term of the Permit, the permittee must develop and implement specific BMPs that help ensure compliance with permit limits per Section 7.3.1.6.

4.2.3 Effluent Limits and Monitoring Requirements for Graywater (Discharge 004B)

Graywater is considered domestic wastewater and is held to the same treatment requirements per 18 AAC 72, unless a waiver for secondary treatment is requested and approved by DEC. Accordingly, any MODU covered under the Permit must satisfy the requirements in the most recent version of 18 AAC 72. The Spartan 151 has successfully obtained a waiver for secondary treatment from DEC. Effluent limits and monitoring requirements for Discharge 004B – Graywater are summarized in Table 11 with corresponding referenced notes provided in subsequent sections.

Table 11 Effluent Limits and Monitoring Requirements for Graywater (004B)

Parameter (Unit)	Effluent Limitations	Monitoring Requirements	
		Frequency	Type
Total Monthly Volume (million gallons (mg)) [4.2.3.1]	Report	Daily	Estimate or Meter
O&G (visible sheen) [4.2.3.2]	No Discharge	Daily	Observation
TRC Maximum (mg/L) [4.2.3.3]	1.0	Monthly	Grab

4.2.3.1 Total Monthly Volume

The Permit requires effluent flow volume to be measured or estimated for each month a discharge occurs with the total monthly volume reported on the DMR.

4.2.3.2 Oil and Grease (Visible Sheen)

The Permit prohibits the discharge of oil and grease as determined by a visible sheen on the receiving water surface per 18 AAC 70.020(17). Receiving water observations must be conducted once per day during daylight at the time of maximum estimated discharge (e.g., following morning or midday meals). Observations must be recorded in daily operating logs and made available upon request by DEC. To support this narrative limit, the permittee must develop specific housekeeping BMPs to minimize introduction of oil and grease and foam causing agents at the source per Section 7.3.1.2.

4.2.3.3 Total Residual Chlorine Maximum

For MODUs that use an MSD to treat graywater to greater than primary treatment (e.g., Spartan 151), the Permit establishes a maximum limit on the concentration of TRC of 1.0 mg/L after dechlorination and prior to discharge. The permittee must develop specific BMPs to ensure proper operation and maintenance of the chlorination and dechlorination systems per Section 7.3.1.6. If the MODU uses a treatment system other than an MSD to provide primary treatment, the 1.0 mg/L maximum TRC limit and specific BMPs do not apply.

4.2.4 Effluent Limits and Monitoring Requirements for Fire Control Test Water Discharge 008A), Noncontact Cooling Water (Discharge 009B), and Uncontaminated Ballast Water (Discharge 010B)

The monitoring and reporting requirements listed in the Table 12 apply to the discharges of Fire Control System Test Water (Discharge 008A), MODU Noncontact Cooling Water (Discharge 009B), and MODU Uncontaminated Ballast Water (Discharge 010B). Although the Spartan 151 does not use treatment chemicals, other potential MODUs may require use of unidentified chemical additives (e.g., biocides or corrosion inhibitors) in noncontact cooling water and may trigger chronic WET testing if the discharge exceeds 10,000 gpd. These discharges must comply with the following effluent limitations and monitoring requirements as qualified in subsequent sections referenced to notes in Table 12.

Table 12: Effluent Limits and Monitoring for Fire Control Test Water, Noncontact Cooling Water, and Uncontaminated Ballast Water, (Discharges (008A/009B/010B)

Parameter	Effluent Limitations	Monitoring Requirements	
		Frequency	Type
Maximum Daily Flow (mgd) 4.2.4.1	Report	Monthly	Estimate
Oil and Grease (visual sheen) 4.2.4.2	No Discharge	Daily	Visual
Chemical Inventory 4.2.4.3	Report	Once/Year	Inventory
Chronic WET 4.2.4.6 and 4.3	Report	Once/Year	Grab

4.2.4.1 Maximum Daily Flow

The Permit requires the maximum daily effluent flow for a given month to be measured, or estimated, and reported in MGD on the DMR. If chemicals have been added to the discharge, the daily flow measurement must be conducted over a 24-hour period and recorded in a log and made available to DEC upon request. If chemicals are used and the 24-hour flow volume is greater than 10,000 gpd, the permittee must collect grab sample that is representative of the chemically treated effluent and conduct a chronic WET testing per Section 4.3 and conduct a chemical inventory per Section 4.2.4.3.

4.2.4.2 Oil and Grease (Visible Sheen)

The prohibition of O&G visible sheen applies to all miscellaneous discharges (Discharges 008A/009B/010B). The permittee must observe for a visible sheen on the water surface during slack tide while discharging or by Static Sheen Test at the permittee's discretion. If the ballast water from the MODU (Discharge 010B) to be discharged has visible sheen, the discharge must be treated using an OWS, or equivalent treatment process (See Specific BMP in Section 7.3.1.4.

4.2.4.3 Chemical Inventory

The permittee is allowed to use chemical additives in Noncontact Cooling Water (Discharge 009B) but in a manner that does not exceed the most stringent of the following three constraints:

- The maximum concentrations and any other conditions specified in the EPA product registration labeling if the chemical is an EPA registered chemical;
- The maximum manufacturer's recommended concentration;
- 500 mg/L; or
- The estimated chronic toxicity based on the mixed concentration of the chemical(s) in the waste stream may not be greater than 189 TUc based on the most limiting 25 % effect concentration listed from the aquatic toxicological information obtained in material safety data sheet (MSDS) for the chemical, if available. Note that when only acute toxicity data is provided on an MSDS, the permittee must use a reported ACR for that chemical and species, or a default ACR of 10, to estimate the TUc of the mixture.

The permittee must maintain a precise chemical inventory of all constituents added, including the time, dose, and frequency of each chemical additive used in miscellaneous discharges. The permittee must submit these inventory records to DEC annually with BMP certifications required in Section 7.3 even if it to report no chemicals have been used.

4.2.4.4 Temperature

A standard 100-meter mixing zone for Noncontact Cooling Water (Discharge 009B) has been authorized for chronic toxicity and temperature. Mixing zone modeling for temperature was based on estimates on the temperature of the noncontact cooling. Based on adequacy of characterization data submitted to date, monitoring for temperature is not required in the Permit.

4.2.4.5 Specific Pollution Reduction BMPs and BMP Revision Action Levels

For Noncontact Cooling Water (Discharge 009B) with chemical additives and a discharge greater than 10,000 gpd, the permittee must implement a chemical dosing BMP to optimize the use of chemicals and to minimize the potential for chronic toxicity per Section 7.3.1.5. In addition, the permittee must make revisions to existing BMPs should any single chronic WET result exceed the Pollution Reduction (PR) BMP Revision Action Level of 189 TUc.

If a PR BMP Revision Action Level is exceeded, the permittee must revise the BMP to achieve less toxicity in the subsequent WET test. These BMPs could be operational or physical modifications to the chemical dosing system. The permittee must notify DEC in writing within one week of obtaining chronic WET results that exceed the chronic WET PR BMP Revision Action Level of 189 TU_c and submit a letter within 60 days specifying what BMP revisions will be implemented prior to the next scheduled chronic WET monitoring event. If BMPs require modification to the physical system, updated line diagrams must be developed and submitted to DEC as an attachment to the letter. Note, DEC may require additional monitoring per Section 4.6. The revised BMP must be implemented to satisfy compliance with this specific BMP requirement for pollution reduction. Revisions must continue until the PR BMP Plan Action Level is achieved. If the discharge of chemicals is eliminated, no PR BMPs are required. If chemicals are used but the discharge is reduced below 10,000 gpd, chronic WET testing is not required and the permittee must follow the chemical dosing limitations of Fact Sheet Section 4.2.4.3.

4.2.4.6 Specific Chronic WET Requirements for Chemically Treated Noncontact Cooling Water

Chronic WET monitoring applies to Noncontact Cooling Water (Discharge 009B) if chemical additives are used and greater than 0.010 mgd (10,000 gpd) is discharged over a 24-hour period, including discharges that may be commingled and discharged accumulatively.

Test Species: For discharges that have chemical additives and discharge 0.01 mgd (10,000 gpd) or more in a 24-hour period, the permittee is required to conduct chronic WET monitoring on one invertebrate species listed in Section 4.3.1.2.

Dilution Series: The dilution series for chronic WET monitoring of chemically treated Noncontact Cooling water must bracket the PR BMP Reduction Action Level represented by the trigger of 189 TU_c. Hence, the dilution series is 0.125, 0.25, 0.5, 1.0, and 2.0 including a control (zero % effluent).

Monitoring Frequency: When WET monitoring is required based on the condition of chemical use and daily flow volume, the permittee must conduct chronic WET monitoring annually. Note that this frequency does not include possible accelerated testing per Section 4.2.4.5.

Sample Collection: The permittee must evaluate chemical dosing practices versus sample collection methods and timing in order to ensure the collected sample is representative of the toxicity of the dosing. For example, for continuous discharges with continuous chemical injection rates a grab or composite sample could result in collection of a representative sample. However, if the discharge is intermittent and/or chemical dosing is discontinuous, the permittee must evaluate the timing and duration of peak concentrations in the effluent to properly time sample events to obtain a representative sample. Each facility must have a Quality Assurance Project Plan (QAPP) that specifies this procedure (See Section 7.2).

4.2.5 Effluent Limits and Monitoring Requirements for Produced Water (Discharge 015)

Facility-specific effluent limits and monitoring requirements for Flow, pH, oil and grease, Total Recoverable Copper, and Chronic WET are provided in Table 13 with referenced table notes provided in subsequent sections.

Table 13: Effluent Limits and Monitoring Requirements for Produced Water (Discharge 015)

Parameter (Units)	Effluent Limitations		Monitoring Requirements	
	MDL	AML	Frequency	Sample Type
Flow Rate (mgd)	Report	0.21	l/Week	Estimate or Measure
pH (su)	6.0 < pH < 9.0		1/Week	Grab
Oil and Grease (Visible Sheen) [4.2.5.1]	No Discharge		1/Week	Observation
Oil and Grease (mg/L)	42	29	1/Week	Grab
Total Recoverable Copper (µg/L)	16.7	8.3	l/Month	Grab
Chronic WET (TUc) [4.2.5.2, 4.2.5.3 and 4.3]	410	---	l/Month	Grab
Methanol (mg/L) [4.2.5.3]	Report		l/Month	Grab
TAH (µg/L)	Report		l/Quarter	Grab
TAqH (µg/L)	Report		l/Quarter	Grab
Selenium (µg/L)	Report		l/Quarter	Grab
Nickel (µg/L)	Report		l/Quarter	Grab
Manganese (µg/L)	Report		l/Quarter	Grab
Mercury (µg/L)	Report		l/Quarter	Grab

4.2.5.1 Visual Sheen and Supplemental Oil and Grease Monitoring

While discharging from platforms, the permittee shall monitor for oil and grease using visual observations of the receiving water surface in the vicinity of the discharge during periods of the day when observation of a sheen on the water surface is possible. . If conditions prevent observations, the permittee may use the Static Sheet Test (EPA Method 1617). Static Sheen Test equipment must be maintained onsite. Observations must be maintained in a log at the facility and reported on the DMR. Upon observation of a sheen, a supplemental oil and grease sample must be collected and analyzed by a laboratory for verification the numeric limit has not been exceeded. This requirement does not apply to shore based facilities or unmanned platforms.

4.2.5.2 Specific Chronic WET Monitoring of Produced Water for Permit Compliance

There are two purposes for conducting chronic WET monitoring under the Permit, compliance with the limit in Table 13 and chronic toxicity characterization and correlation to methanol per Section 4.2.5.3. To comply with chronic WET limits, the permittee is required

to conduct chronic WET monitoring for both a vertebrate and invertebrate species discussed in Sections 4.3.1.1 and 4.3.1.2, respectively.

The compliance dilution series is based on a pass/fail approach and, accordingly, must bracket the critical dilution associated with the limit, two dilutions above and below the critical dilution of 0.25. The compliance dilution series is 0.0625, 0.125, 0.25, 0.5, 1.0 including a control (zero % effluent). Should any chronic WET result exceed the limit in Table 13, the permittee must notify DEC within 24 hours per Appendix A - Standard Conditions Section 3.4.1, research the anomalously high toxicity event, and provide written notification to DEC within one week and provide information on any unusual circumstance and assessment as to what may have caused exceeding the notification level. The permittee must repeat the chronic WET monitoring within 30 days of notifying DEC and submit a follow up written notification of the subsequent results. Based on these results, DEC may require additional monitoring per Section 4.6.

4.2.5.3 Specific Chronic WET Monitoring of Produced Water for Characterization/Correlation

Currently, there is no facility-specific data that compares methanol concentrations to chronic toxicity. Based on initial characterization discussed in Section 2.2, ongoing characterization is necessary to develop a correlation with methanol concentrations with the intent of using methanol as a surrogate for compliance with chronic toxicity. If a result for chronic WET required for compliance with the MDL exceeds 250 TUc, the permittee must inform DEC within one week of receiving the results and present a schedule for completing a minimum of 10 chronic WET tests for characterization that meets DEC approval. In addition, chronic toxicity characterization is necessary to support the next application for reissuance. Lastly, if the permittee decides to substitute a different chemical for methanol, it would also need to be characterized to ensure the substitution would result in less toxicity than methanol to support DEC approval for use under the Permit.

The characterization dilution series is different than the pass/fail dilution series used for compliance; the toxicity is anticipated to be observed in much higher dilutions and is likely variable and correlated to the concentration of methanol. The investigative objectives for characterizing and correlating methanol to toxicity requires flexibility in applying dilution series so that it brackets “actual effluent toxicity.” Therefore, the initial dilution series of 0.75, 1.5, 3, 6, 12, 24 including a control (zero % effluent) and maximum dilution after hypersaline adjustment (approximately 70 %) is proposed and can be adjusted based on previous results to help ensure useful data is collected. DEC encourages coordination on dilution series adjustments, but pre-approval is not required. For characterization and correlation of produced water, the most sensitive invertebrate species is required per Sections 4.3.1 and 4.3.1.2; testing of vertebrate species is not required for produced water characterization or correlation. It is incumbent upon the permittee and the contract laboratory to ensure appropriateness of the data collected by developing BMP procedures per Section 7.3.1.4 and supported by a QAPP per Section 7.2. Note that the QAPP for methanol characterization procedures may be included in the BMP Plan so long as it is appropriately labeled as a QAPP section of the Plan.

Methanol monitoring for characterization must be conducted monthly with the chronic WET results to determine if a correlation may be effective for monitoring that the effluent does not exceed the chronic WET limit of 410 TU_c using methanol as a surrogate for chronic WET. A

reasonable demonstration of a correlation will be based on a minimum of 10 paired data sets (i.e., the chronic WET result representing the most sensitive species and the methanol concentration) and a correlation coefficient greater than 0.7. A reasonable data set to approve a substitution is based on 10 WET results indicating the toxicity is less than that for methanol. Based on presenting a reasonable demonstration that a correlation between chronic toxicity and methanol concentrations exists for the effluent, or other approved chemical substitutions for methanol are less toxic in two consecutive samples, the permittee may submit a written request to DEC for a frequency reduction to quarterly on compliance monitoring of chronic WET for produced water. If approved by DEC in writing, the quarterly chronic WET monitoring will use a dilution series for characterization in this section, rather than pass/fail dilution series described in Section 4.2.5.2. The written approval may include other reporting requirements associated with using methanol, or other chemicals, as a surrogate for chronic toxicity.

4.3 Chronic WET Monitoring Requirements

The permittee must conduct chronic WET testing per this section while applying discharge-specified requirements for noncontact cooling water discharges in Section 4.2.4.6 that supersedes requirements in this section for test species, dilution series, sampling frequencies, and sample collection. See also Section 7.3.1.4 for specific chronic WET monitoring of produced water for methanol characterization for correlation studies and chemical substitutions for methanol.

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 unless otherwise stated in discharge specific sections of the Permit (See Section 4.2.4.6). The permittee must conduct the WET testing to screen for the most sensitive invertebrate species in Section 4.3.1.2 once per permit term for each discharge (i.e., noncontract cooling water and produced water). For produced water, the appropriate dilution series for screen most sensitive species is that for characterization per Section 4.2.5.3. The elimination of the less sensitive species over more sensitive invertebrate species must be approved by DEC in writing for use in subsequent chronic WET tests. Upon identification of the most sensitive test species, the permittee may submit a written request to eliminate the less sensitive species in subsequent WET analysis for DEC approval. DEC can also approve written requests to substitute the less sensitive species during periods when the more sensitive species is unavailable. The permittee shall not make any changes to the selection of test species without prior written DEC approval.

4.3.1.1 Vertebrate (survival and growth)

Atherinops affinis (topsmelt). In the event that topsmelt is not available, *M. beryllina* may be used as a substitute. The permittee shall document the use of substitute species in the DMR for the testing.

4.3.1.2 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).

4.3.2 Monitoring Frequency.

See discharge-specific sections for frequency requirements, Sections 4.2.5.2 and 4.2.5.3 for produced water and Section 4.2.4.6 for chemically treated noncontact cooling water.

4.3.3 Procedures.

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

4.3.3.1 Methods and Endpoints

For the shrimp and alternate fish species, inland silverside, the presence of chronic toxicity must be estimated as specified in *EPA Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition* (EPA-821-R-02-014). For the bivalve species and topsmelt, chronic toxicity must be estimated as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136). The WET testing will determine the 25 % effect concentration (EC_{25}) endpoint estimate of the effluent concentration that would cause a 25 % reduction in normal embryo development for the bivalves or in survival for fish and/or mysid shrimp. The WET testing will also determine the 25 % inhibition concentration (IC_{25}) point estimate of the effluent concentration that would cause a 25 % reduction in the growth of the fish and/or mysid shrimp.

4.3.3.2 Reporting Results

Results must be reported on the DMR using 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. The permittee must report the NOECs in the full WET test report. DEC may compare this information with the IC_{25} during reissuance of the Permit.

4.3.3.3 Acute Toxicity Estimates

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

4.3.3.4 Dilution Series

A series of at least five dilutions and a control must be tested. See Section 4.2.4.6 for dilution series for chemically treated noncontact cooling water. For compliance monitoring of produced water, see Section 4.2.5.2 and Section 4.2.5.3 for characterization and correlation of produced water. Depending on objectives for characterization, DEC may provide written direction to modify the previous dilution series based on review of previous test results.

4.3.3.5 Hold Times

WET sample holding times are established at 36 hours but longer hold times up to 72 hours may be approved by DEC. The permittee must document the conditions that resulted in the need for the holding time to exceed 36 hours and the potential effect on the test results.

4.3.3.6 Additional Quality Assurance Procedures

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

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

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

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

4.3.4 WET Reporting

4.3.4.1 DMRs and Full Report Deliverables

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

4.3.4.2 Full Report Preparation

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

4.3.4.3 Additional Reporting Information

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

a) The date and time of sample collection and initiation of each test,
b) The discharge flow rate at the time of sample collection, and
c) A list of corrosion inhibitors, biocides, algaecides, clarifying agents, or other additives being used by facility that could potentially be in the effluent during the 30-day period preceding sampling, and
d) All raw data and statistical analysis from the tests, including reference toxicant tests.

4.4 Electronic Discharge Monitoring Reports

4.4.1 E-Reporting Rule, Phase I (DMRs)

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

(http://dec.alaska.gov/water/Compliance/EReportingRule.htm) that contains general information about this new reporting format. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

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

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

4.5 Monitoring Frequency Reductions

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

The 2014 Permit included monthly monitoring for FC and EC bacteria in Discharge 003A/003B – Domestic Wastewater which has been reduced to quarterly in the Permit. The reduction is justified based on knowledge that the geometric mean of the EC bacteria data is only 8 % of the applicable water quality criteria. Similarly, the FC bacteria geometric mean is 3.5 % of the applicable water quality criteria. Hence, reduction in frequency for bacteria in domestic wastewater is justified.

4.6 Additional Monitoring

DEC may require additional monitoring of effluent or receiving water for facility or site-specific purposes, including, but not limited to: data to support applications, demonstration of water quality protection, obtaining data to evaluate ambient water quality, evaluating causes of elevated concentrations of parameters in the effluent, and conducting chronic WET 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:

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

5.0 ANTIBACKSLIDING

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

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

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

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

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

5.1 Antibacksliding of WQBELs

The 2014 Permit included requirements to monitor for chronic WET for Discharge 002A/003B once within the first two-years of operation. Based on the results obtained during the term of the

permit, as well as evaluating results from other facilities, chronic WET does not appear to be a significant concern as BMPs have proven to provide adequate control pollutants, segregation of sources from contact with precipitation. Therefore, the monitoring for chronic WET has been removed with continued emphasis on BMP implementation.

The 2014 Permit required monitoring for temperature in the discharge of noncontact cooling water in order to obtain data for characterization. Given there is no reasonable potential for temperature to exceed the criterion at the boundary of the authorized 100-meter mixing zone, further data collection is not necessary, and this requirement has been removed.

The 2014 Permit included a prohibition of chemical use in noncontact cooling water based on the proposed use of the Spartan 151 MODU. However, the Permit needs to consider the possibility of a different MODU being used at the Platform that may require chemical additions in noncontact cooling water. Therefore, the prohibition has been removed and a requirement for a chemical inventory, PR BMPs, and chronic WET testing has been included to ensure chemicals use is minimized. These requirements are consistent with other permits issued to oil and gas facilities discharging noncontact cooling water with chemical additives.

Reissuance of the Permit includes removal of specified toxicity reduction evaluation and toxicity identification evaluation (TRE/TIE) requirements for discharges that exceed of a chronic WET limit or trigger. However, the authority for the Department to require a TRE/TIE is not removed but rather is now included in Section 4.6 - Additional Monitoring. Hence, the Department will consider whether a TRE or TIE is appropriate and to what degree it is implemented on a case-by-case basis. Although the authority to require toxicity identification or reduction evaluations has not diminished, DEC considers the removal of the mandatory specified requirement as backsliding of a water quality permit condition. Per CWA 402(o)(1). Backsliding is allowable as long as it does not violate an ELG and complies with WQS including the Antidegradation Policy per CWA 303(d)(4). All of the items discussed in this section meet WQS. See Section 6.3 Finding B for further discussion.

6.0 ANTIDEGRADATION

6.1 Legal Basis

Antidegradation is implicit in CWA Section 101(a) goals, explicitly referenced in CWA Section 303(d)(4)(B), and implemented through 40 CFR 131.12. Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State 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 Department conformance with the *Policy* and *Implementation Methods* for reissuance of APDES Permit AK0053686 – Furie Operating Alaska, Julius R. Platform.

6.2 Receiving Water 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. However, at this time no Tier 3 waters have been designated in Alaska.

As previously presented in Section 3.2, the facility wastewaters covered under the Permit discharge to the marine waters of Cook Inlet, which are not listed as being impaired by any water quality parameter. Consequently, there are no parameters where only the Tier 1 protection level applies. However, a Tier 1 analysis must be conducted even for Tier 2 waters to ensure existing uses are protected. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

The antidegradation analysis must be conducted with implementation procedures in 18 AAC 70.016(b)(5)(A-C) for Tier 1 protection (Tier 1 analysis), and with the implementation procedures in 18 AAC 70.016(c)(7)(A-F) for Tier 2 protection (Tier 2 analysis). Because Tier 3 waters have not been designated in Alaska, an analysis for the Tier 3 protection level (Tier 3 analysis) is not applicable. These antidegradation analyses and associated findings are summarized below.

6.3 Tier 1 Analysis of Existing Use Protection

The summary below presents the Department's 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 submitted by the applicant on existing uses in the vicinity of the Julius R. platform. The Department finds the reviewed information 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. Consequently, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (DEC 2008) apply and were evaluated to ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected. The Permit includes WQBELs that either meet water quality criteria at the point of discharge or at the boundary of an appropriately sized mixing zone. Because the criteria have been developed to protect the uses of the waterbody, and all applicable criteria are to be met at the point of discharge or at the boundary of a mixing zone, the uses of the receiving waterbody as a whole 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 does not meet applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).

The Permit requires that the discharge shall not cause or contribute to a violation of WQS. As previously stated, the receiving water, the marine waters of Cook Inlet, are not listed as impaired. Therefore, no parameters were identified as not meeting the applicable water quality criteria in 18 AAC 70.020(b), 18 AAC 70.030 or 18 AAC 70.236(b).

As a result of the foregoing Tier 1 analysis, the Department concludes the terms and conditions of the Permit are adequate to fully protect and maintain the existing uses of the receiving water and that the findings required under 18 AAC 70.016(b)(5) for Tier 1 protection are met.

6.4 Limiting Scope for Tier 2 Analysis

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

DEC reviewed information provided by the applicant to determine if any of the discharges require a Tier 2 analysis. The review indicates the provided information is sufficient and credible per 18 AAC 70.016(c)(4). With the exception of produced water, which is a new discharge, the authorized concentration limits and mass loadings in the Permit are the same as those in the 2014 Permit. Accordingly, the potential of the new discharge of produced water to lower water quality to Cook Inlet is the focal point of the Antidegradation Tier 2 analysis. However, given new information available that allows the Spartan 151 to discharge graywater, which is a component of domestic wastewater authorized in the 2014 Permit, DEC includes applicable discussion with respect to meeting secondary treatment requirements per 18 AAC 72.050.

6.5 Tier 2 Alternatives Analysis

Per 18 AAC 70.016(c)(4)(C-F) the applicant must submit a description and analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the new discharge of produced water. The analysis must identify the water quality environmental impacts and relative costs for each practicable alternative. The following paragraphs summarize the applicant's alternative analysis which led to their decision to request the new discharge of produced water.

6.5.1 Alternatives Eliminated Due to Being Impracticable.

The Tier 2 Antidegradation Alternative Analysis does not require the applicant to consider alternatives that are known not to be practicable. The term "practicable" is defined in 18 AAC 70.990 (18) as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." The goal is to identify an alternative that avoids limiting the production potential at the KLU while mitigating the potential for hydrate formation that, in early 2019, caused the pipeline to completely shut down for 75 days during the winter season, which led to Furie filing for Chapter 11 Reorganization. In addition, the platform has space limitations that make modifications to infrastructure impracticable. Based on these limiting conditions, the following alternatives were eliminated due to be impracticable.

6.5.1.1 Impracticality of Onshore Processing and Discharge/Disposal of Produced Water

The applicant indicates that transferring produced water to the onshore CPF for treatment and discharge to marine waters, or disposal via injection, is not practicable because of hydrates forming in the gas pipeline system. The hydrates must be removed at the platform in order to ensure continuous and full production capacity. Although the gas from the Beluga formation has significantly less produced water and hydrates, the economics of operating the platform requires production from both the Beluga and Sterling formations. Eliminating the 23.6 billion standard cubic feet (Bscf) reserves from the Sterling formation would be detrimental to not just Furie but the State and local communities reliant on Cook Inlet gas production for energy. DEC concurs with eliminating this broad alternative on the basis of being impracticable.

6.5.1.2 Impracticality of Offshore Disposal via Injection at the Platform

The cost of installing an injection well at the Julius R. platform would cost approximately 20 million dollars ($20M) with no guarantee of finding a subsurface formation capable of accepting the volume of produced water. In Cook Inlet, the typical formation used for waste disposal is gas reservoirs that have been depleted such that injection would not affect the permittees ability to produced gas. A producing formation, such as the Beluga or Sterling, is incompatible with waste injection. Similar to the onshore treatment and disposal alternative, the lost revenue associated with eliminating one of the gas producing formations imposes significant economic hardship to Furie and the State. Furie estimates that injection at the platform would result a loss of 12.6 Bscf gas reserves with $86M lost revenue to Furie and $10.7M lost by the State. DEC concurs with the assessment by Furie that injection at the platform is not practicable. It appears that treatment and discharging to marine water at the platform represents a practicable solution so long as the treatment system fits into the tight space constraints available at the platform.

6.5.1.3 Impracticality of Model Treatment Technology Given Space Constraints

The Julius R. platform was constructed to have a small footprint and did not include consideration of space for treatment equipment for produced water. The applicant considered the footprint of the model technology described in the ELGs, induced gas flotation (IGF) and/or Dissolved Air Flotation (DAF). These treatment units require more space than is available at the platform. Furie considers installation of model technology as impracticable, and DEC concurs. However, given the produced water from the Beluga and Sterling formations does not have significant concentrations of oil, a unique treatment solution may be more effective and practicable.

6.5.2 Alternatives Considered

The evaluated alternatives include:

1. /Status Quo/No Action: Continue limiting the produced fluid flows in the pipeline to avoid hydrate formation, produced fluids separation at the onshore CPF, and transportation of produced water from the CPF to an onshore underground injection control well disposal facility owned and operated by a third-party;
2. Separation with Two-Stage Filtration: Off-shore separation with two stage filtration of produced water treatment using activated carbon and discharge to Cook Inlet within a small mixing zone; and

3. Flotation-enhanced Separation with Two-Stage Filtration: Off-shore two stage filtrate in Alternative 2 plus an easily added flotation in the separator system that would enhance oil separation prior to filtration and activated carbon to ensure compliance and prolong the useful life of the activated carbon and discharge to Cook Inlet within a small mixing zone.

6.5.2.1 Alternative 1 – Status Quo/No Action

Under Alternative 1, status quo or no action, the produced water laden with methanol would be piped from the platform to the onshore CPF. Although this alternative has been determined impracticable and not a viable alternative, it presented as a baseline alternative to compare with the viable Alternatives 2 and 3 and to illustrate relevant cross-media environmental impacts.

The produced water and methanol would be separated from the gas at the onshore CPF and then transported via the road system to a disposal well owned and operated by a competing third-party gas producer, Hilcorp Alaska Grind and Inject Facility. Transporting produced water to an injection well poses cross-media environmental risks from vehicular accidents and spills. Based on the Beluga formation that generates approximately 50 bbl/d of produced water, 140 round trips would be required annually. Assuming it could be possible to keep the pipeline operational by injecting massive amounts of methanol into the produced water with an average daily volume of 1,500 bbl/d, it would take approximately 4,000 round trips annually at a cost of approximately $10M. However, it would introduce cross-media environmental risks associated with combustion of fuel, increase traffic, dust, noise due to the truck traffic on the gravel roads near the CPF, which are shared by local residents. Although the probability is extremely low, there is also risk of a spill of unfiltered produced water caused by accidents during loading or transport.

Although this status quo alternative would eliminate the need to discharge produced water into Cook Inlet (i.e., represent maximize environmental benefit to Cook Inlet), it poses an unacceptable risk of pipeline blockages from gas hydrates at full production, or result in an inability to reach maximum production in order to reduce, but not eliminate, the risk of blockage due to hydrates. Hydrate formation in the pipeline shutdown production at the platform in 2019 for 75 days. Alternative 1 would limit gas production from the Sterling reservoir to 2.5% of the maximum observed gas production. This cap on production is counter to production goals that make operating the platform cost-effective. The financial analysis by the applicant indicates the no action or status quo alternative would not be economically sustainable, and therefore is not practicable alternative to be considered.

6.5.2.2 Alternative 2 – Separation Followed by Two-Stage Filtration

Alternatives 2 includes treating the methanol-laden produced water at the platform and discharge to the surrounding Cook Inlet receiving water. Given space constraints, Furie sought to find a unique treatment system that could fit tight confines and produce exceptional-quality effluent. The treatment system includes a separator to remove free-phase oil and sediment followed by a two-stage filtration process consisting of a 25-micron cartridge filter followed by a granular activated carbon (GAC) filter. Furie determined an IGF or DAF unit was not needed to obtain adequate removal of O&G prior to filtration. Furthermore, if the GAC filter becomes exhausted too quickly due to solids build-up, the 25-micron cartridge filter could be converted to 5-micron cartridges.

Furie conducted a pilot test on the proposed treatment system and those results are presented in Section 2.2.3. The treatment demonstrated very efficient removal of hydrocarbons as well as a range of reasonable efficiencies for metals; hydrocarbons and most metals were shown to meet their respective water quality criteria post treatment. The high removal efficiencies resulted in the need for small mixing zones, with the chronic mixing zone driven chronic toxicity associated with the methanol dosing needed to ensure hydrates do not form in the wellhead or treatment piping. The only other parameter that exceeded criteria was copper, which was the driving parameter for the acute mixing zone of 0.4-meter radius.

The estimated cost of Alternative 2 is $1.2M with an operating cost of approximately $20,000 per month. Compared to the Alternative 1 - Status Quo/Do Nothing and Alternative 3 – Modified Flotation with Two-Stage Filtration, Alternative 2 is the least expensive option capable of meeting the ELGs and treat water quality parameters to a high degree. Hence, Alternative 2 provides a significant level of environmental protection of the receiving water. Accordingly, Alternative 2 is the applicant's preferred alternative.

6.5.2.3 Alternative 3 – Modified Flotation with Two-Stage Filtration

Concerned that the oil and grease characteristics of the raw produced water influent could change over time, Furie also considered a modification to the separation unit to include an air flotation add-on. The add-on would have a limited increase in space requirements and provide more assurance that compliance with the oil and grease ELGs as well as GAC filter performance could be maintained. However, the pilot test indicates the system in Alternative 2 provides adequate removal of hydrocarbons and metals such that implementation of Alternative 3 is likely not necessary to meet Permit limits. Furie intends to implement Alternative 3, if necessary, to meet limits or extend the useful life of the GAC.

6.5.2.4 Selected Alternative

The applicant selected Alternative 2 as the preferred alternative because it allows the facility to maintain economically sustainable production rates while minimizing the risk of a repeat of the 2019 hydrate blockage as well as be protective of the receiving water. However, the methanol added to suppress the formation of hydrates cannot be removed by the treatment system. While there is no water quality criterion for methanol, it does impose chronic toxicity ameliorates in the environment due to biodegradation with a half-life of one to seven days. Although methanol is not considered a pollutant of significant concern, there may be other chemicals available to mitigate hydrate formation that has less toxicity. Therefore, the applicant plans to research and pilot test other chemicals during the term of the Permit to further reduce the environmental impacts and arrive at a smaller mixing zone during the next reissuance.

6.5.3 Basis for Reduction of Water Quality

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

6.5.3.1 Accommodation of Important Social or Economic Develop in the Vicinity

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

To maintain production levels to meet existing contracts or to expand production for future contracts, Furie states that it may drill up to four more wells at the Julius R. platform in the next five to ten years, if it can do so economically. The Julius R. platform has two open well slots available for future development. Expenditures on a new production well may exceed $30M, much of which would be spent on local labor, equipment rental, and other goods and services. Based on previous development at the platform, Furie estimated the per-well seasonal employment to be 126 full-time positions. However, Furie contributes to the local economy in jobs, commercial spending, royalties, and tax revenue is expected to decrease if it cannot continue to develop and produce gas from the KLU at a competitive price. (Jacobs 2020). Issuance of the Permit is crucial for Furie to realize these economic and social benefits.

Since acquiring the company out of bankruptcy, the new management team has reaffirmed a commitment in- supporting Southcentral Alaska with an emphasis on local hire and supporting various youth programs. Furie continues to bolster philanthropic efforts to develop youth within the local communities. These efforts include but are not limited to the following:

- Partnership with the Kenai Peninsula College Petroleum Technology Program;
- Support of local community elementary, middle, and high school scholastic programs;
- Academic scholarships, including the Luke Spruill Memorial Scholarship; and
- Youth athletic sponsorships.

The development and production of natural gas resources provides community services to Southcentral Alaska in the form of a stable energy supply (natural gas) for home heating, cooking, and electricity. Gas and electric public utilities contribute to health and safety in ways such as providing hot water for sanitary activities such as bathing, dish washing, and hand washing as well as light and warmth in the winter. Affordable energy also powers industries and businesses, supports economic activity, and is an essential component of modern life in Southcentral Alaska.

Furie provides a diversification of supply to the utilities. A single producer currently accounts for more than 70 % of the total gas produced and consumed in Cook Inlet. Furie is currently the second largest producer of natural gas in Cook Inlet, producing approximately 9 % of the total volume of natural gas on a monthly basis. Furie's entry into the natural gas market in Southcentral Alaska provided immediate downward pressure on energy prices and contributed significantly to energy stability in the region. In March 2016, Furie contracted with Homer Electric Association to provide natural gas for power plants in Nikiski and Soldotna, Alaska. Initially, Homer Electric Association expected to save up to $3 million per year, with long-term savings of about $350,000 per year in later years of the agreement. Since that time, Furie also signed an agreement with Enstar Natural Gas Company, with initial rates approximately 20 % lower than previous agreements. Furie plans to help Chugach Electric Association, Inc. (CEA) diversify their future natural gas supply with an agreement to provide up to 20 % of its needs beginning in 2023. Furie's 2023 contracted gas price with CEA is approximately 10 % less than the base price CEA has under contract from another producer during 2023. During the third and fourth quarters of 2019, Furie sold gas to all the southcentral utilities and furthermore, supplied gas used to generate electricity for Golden Valley Electric Association Inc., located in the interior of Alaska.

To continue providing these social and economic benefits, Furie must find a disposal option for produced water and continue to reduce the costs associated with delivering the gas to market (Jacobs 2020).

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

6.5.3.2 Reducing Water Quality Will Not Violate Applicable Criteria

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

18 AAC 70.020(b) specifies the State's protected water use classes, subclasses, and water quality criteria. The Permit places limits and conditions on the discharge of pollutants. The limits and conditions are established after comparing TBELs and WQBELs and applying the more stringent of these limits, or any other requirements from statutes or regulations that may be more stringent. The water quality criteria upon which the WQBELs are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. The Permit includes authorization of water quality-based mixing zones for four wastewater streams: domestic wastewater, graywater (also domestic wastewater per 18 AAC 72), noncontact cooling water, and produced water.

As previously discussed in Section 6.3, water quality criteria is either met at the point of discharge or at the boundary of an appropriately sized chronic mixing zone. For the combined domestic wastewater and graywater from the platform and MODU is a cylinder with an 18-meter radius extending from the water surface to the seafloor based on TRC as the driving parameter; for the graywater from the MODU, when graywater is discharged overboard to the surface, is a 5-meter radius also based on TRC as the driving parameter; for the overboard discharge of noncontact cooling water from the MODU to surface water, a standardized 100-meter radius for temperature rise; and for the produced water, 110-meter long by 48-meter wide rectangle based on the chronic WET caused by the addition of methanol and trace metals. All water quality criteria are met at, and beyond the boundary of each chronic mixing zone.

18 AAC 70.030(a) applies to WET limits and requires that an effluent discharged to a water may not impart chronic WET to aquatic organisms, expressed as 1.0 TUc, at the point of discharge, or if the department authorizes a mixing zone in a permit at or beyond the mixing zone based on the minimum effluent dilution achieved in the mixing zone. Chronic WET is one of the authorized mixing zone parameters for the produced water discharge (015). As discussed in Section 3.3.1.4, the authorized chronic mixing zone for produced water was sized for chronic toxicity being the driving parameter and has a dilution factor of 250. The maximum expected chronic toxicity in the effluent will not result in reasonable potential to cause, or contribute to, an instream excursion of 1.0 TUc at the boundary of the authorized chronic mixing zone. Therefore, with the chronic WET limit of 250 TUc imposed in the Permit, the requirements of 18 AAC 70.030(a) are met.

18 AAC 70.020 refers to development of site-specific water quality criteria as listed in 18 AAC 70.236. Although there are site-specific criteria established for metals near Point Woronzof, the specified location of this site-specific criteria is outside of the area of influence

for the Permit. Hence, the site-specific criteria at Point Woronzof is not applicable to discharges under the Permit so this requirement is met.

6.5.3.3 Tier 1 Protection of Existing Uses

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

As discussed in part (B) of the preceding Tier 1 analysis, marine waters are protected for all uses and this requirement is thus met at the boundaries of the four chronic mixing zones were all criteria protective of the existing uses will be met.

6.5.3.4 All Wastes and Other Substances Discharged Will be Treated and Controlled

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

The applicable "highest statutory and regulatory treatment requirements" are defined in18 AAC 70.015(d). The definition includes the four components noted below:

(1) Any federal technology-based effluent limitation identified in 40 CFR 122.29 and 125.3, revised as of July 1, 2017…;

EPA promulgated 40 CFR 435 Subpart D in 1996, as adopted in 18 AAC 83, and determined that discharges of produced water to Cook Inlet are appropriately controlled through ELGs for O&G that require an MDL of 42 mg/L and AML of 29 mg/L. Prior to the Julius R. platform obtaining authorization to discharge produced water under the Permit, successful implementation of the alternative analysis is be required. The applicant has submitted plans to the Department per 18 AAC 72 to ensure the treatment will meet the treatment requirements for the Permit as reflected by the pilot testing and alternative analysis in Section 6.5. In addition to the TBEL established through the ELG, DEC also imposes a TBEL using case-by-case BPJ for pH on produced water. For the discharge of domestic wastewater and the discharge of graywater reliant on primary treatment using an MSD, a TBEL is established using case-by-case BPJ of 1.0 mg/L TRC immediately after dechlorination is imposed in the Permit.

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

This part of the definition addresses the minimum treatment standards for domestic wastewater discharges, Discharge 003A/003B – Domestic Wastewater and Discharge 004B – Graywater (Spartan 151-based). Per 18 AAC 72.050(a)(4) domestic wastewater discharges into the waters of the U.S. must have received secondary treatment prior to discharge. As described in earlier Section 2.3.2, the Permit requires that any domestic wastewater discharged from the facility must have adequate domestic wastewater treatment to meet minimum treatment requirements associated with domestic wastewater, per 18 AAC 72.050 which is also reflected in the MDLs and AMLs for TSS and BOD_5 for domestic wastewater in the Permit. For Graywater, the permittee must seek a waiver per 18 AAC 72.060 to discharge under the Permit. While the Spartan 151 has already received this waiver, any other MODU used to conduct seasonal drilling must similarly obtain a waiver in order to discharge graywater under the Permit. Consequently, this part of the definition is thus met.

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

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

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

Alaska water quality criteria are presented in 18 AAC 70.020 and the *Water Quality Criteria for Toxics and Other Deleterious Substances* amended through December 12, 2008 (*Toxics Manual*). WQBEL limits have been established to be more stringent than applicable TBELs per the *Reasonable Potential Analysis and Effluent Limits Development Guide*, June 30, 2014 (*RPA/WQBEL Guidance*), which complies with 18 AAC 83.435 and CWA 301(b)(1)(C). The Permit imposes WQBEL for chronic WET (MDL of 410 TUc) and for copper (MDL of 16.7 µg/L and AML of 8.3 µg/L). During development of these WQBELs, DEC used ambient data collected from various receiving water studies that provided information on the existing water quality and potential contributions of pollutants in nonpoint sources and other point sources discharging within the area of coverage. For copper, an ambient concentration of 0.926 µg/L representing the 85th percentile of the data collected was used in the WQBEL development.

Per 18 AAC 70.016(c)(7)(C), DEC must consider other point sources and state-regulated non-point sources discharging to the waterbody that could impact water quality and if there are any outstanding compliance issues with point source permits or BMPs for non-point sources. In this fourth finding, DEC identifies all the discharges in the Permit and discharges from the following eight permitted point sources that have limits for O&G, pH, or copper:

- AK0000396 – Cook Inlet Pipeline Company, Drift River Terminal,
- AK0000507 – Agrium Inc., Kenai Plant,
- AK0000841 – Tesoro Alaska Petroleum Company, Kenai Refinery,
- AK0001155 – Kenai LNG Corporation, Kenai LNG Plant,
- AK0026603 – Chugach Electric Association, Beluga Power Plant,
- AK0053619 – Alaska Electric and Energy Coop., Nikiski Combined Cycle Plant,
- AKG315000 – Various Authorizations to Hilcorp Alaska, Inc., and
- AK0053309 – Cook Inlet Energy, Osprey Platform (Authorization Pending).

In review of these individual permits, DEC found no outstanding compliance issues that affect the antidegradation analysis. For state-regulated non-point sources, DEC considered several contaminated sites in the vicinity of the Nikiski industrialized area (e.g., refinery, LNG, power plant, fertilizer plant) that have plumes that enter Cook Inlet through groundwater. These sources are regulated by the DEC Contaminated Sites Program and require continued monitoring of plume attenuation. With respect to these

point source and non-point sources, DEC indicates that none of the receiving water samples collected in various studies reported detected concentrations of TAH. In addition, the 85th percentile concentration for copper from these studies is 0.926 mg/L, which is below the chronic marine water quality criteria for copper. This information supports the finding that discharges from new and existing point sources meet the highest statutory and regulatory requirements. In addition, it supports the finding that all cost-effective and reasonable BMPs are being applied to non-point sources. Therefore, DEC concludes that the fourth finding is met.

Per the aggregate findings in Sections 6.5.3.1 through 6.5.3.4, DEC determines that the applicant has submitted sufficient evidence for the Department to authorize lowering of water quality associated with the discharges from the Julius R. platform.

7.0 OTHER PERMIT CONDITIONS

7.1 Standard Conditions

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

7.2 Quality Assurance Project Plan

The permittee is required to develop and implement a facility-specific QAPP that ensures all monitoring data associated with the Permit are accurate and to explain data anomalies if they occur. The permittee is required to develop and implement procedures in a QAPP that documents SOPs the permittee must follow for collecting (e.g., *EPA Method 1669* or similar industry standard*)*, handling, storing and shipping samples; laboratory analysis (e.g., most sensitive methods); and data reporting. At the discretion of the permittee, QAPP for ongoing studies to correlated methanol to chronic toxicity or evaluation of a substitute for methanol may be included in a separate document specific to the unique requirement so long as the document clearly indicates it is a unique QAPP. See Section 7.3.1.4. If a QAPP has already been developed and implemented, the permittee must review and revise the existing QAPP to ensure it includes the necessary content. The permittee must submit a letter to the Department within 90 days of the effective date of the Permit certifying that the QAPP(s) has been revised and implemented. The QAPP shall be retained onsite and made available to the Department upon request.

7.3 Best Management Practices Plan

A BMP Plan presents operating and housekeeping measures intended to minimize or prevent the generation and potential release of pollutants from a facility to the waters of the U.S. during normal operations and additional activities. Per 18 AAC 83.475(4), “A permit must include best management practices to control or abate the discharge of pollutants and hazardous in a permit when the practices are reasonably necessary to achieve effluent limitations and standards…”

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

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

7.3.1 Discharge-Specific BMP Plan Requirements:

The permittee must develop and implement the following unique BMP requirements, (as applicable) at the facility:

7.3.1.1 Deck Drainage Separation BMP

Per Section 4.2.1, the permittee must develop BMPs to ensure deck drainage that is contaminated with O&G and other pollutants is processed through an oil-water separator, or other similar treatment process, prior to discharge. BMPs must also include mitigating contact between precipitation, or snowmelt water, and sources of pollution stored on deck using appropriate housekeeping and other BMP activities discussed in Permit Section 4.2.5.

7.3.1.2 Graywater Housekeeping BMPs

Per Section 4.2.3.2f, permittees shall develop and implement housekeeping BMPs which ensure discharges do not contain oil (e.g., cook oils), floating solids, foam or garbage and have minimal chemical cleaning compounds and disinfection products (e.g., chlorine) through adherence with manufacturer's instructions.

7.3.1.3 Noncontact Cooling Water Pollution Reduction BMPs

Per Section 4.2.4.5, DEC requires that the BMP Plan include a specific BMP to optimize the use of chemicals (e.g., a chemical-dosing matrix) and to minimize the potential for chronic toxicity in discharges of, noncontact cooling water (Discharge 009). Upon exceeding the chronic WET PR BMP Revision Action Level of 189, the permittee must modify this specific BMP to reduce subsequent chronic toxicity to below the PR BMP Revision Action Level. Examples of BMP revisions include, but are not limited to, revamping the chemical dosing matrix or injection practices; substitution of less toxic chemicals; eliminating, reducing, or controlling spikes resulting from batch dosing; or alternative disposal options. BMPs must continue to be revised until the chronic WET PR BMP Revision Action Level is attained. If the BMP revision involves significant physical changes to the treatment and disposal system, the permittee must describe these modifications in submittals required in Section 4.2.4.5 and submit update line diagrams reflecting these modifications with the notification letter.

7.3.1.4 Treatment of Oil-contaminated Ballast Water

The Permittee must develop BMPs specifically to address the possible encounter of oil-contaminated ballast water and the requirement to treat it in an OWS or other similar removal process

7.3.1.5 Methanol Correlation or Replacement

As discussed in Sections 2.2.4 and 4.2.5.3, the chronic toxicity of the produced water is anticipated to correlate with methanol given the low concentration of other pollutants. In addition, there may be other chemical additives effective in mitigating hydrate formation that has imparts less chronic toxicity. A reduction in less toxicity, or a correlation of toxicity to methanol, can be used by the permittee to justify less frequent chronic toxicity monitoring for compliance per Section 4.2.5.3. Given the chronic WET results obtained to date have yet to be based on observed endpoints in the dilution series tested, the permittee must develop a specific BMP plan for conducting ongoing chronic WET monitoring for the purpose of evaluating a correlation with methanol or demonstrating a substitute for methanol imparts less toxicity than methanol. If the permittee chooses not to seek a correlation to methanol, substitution of another chemical, or a frequency reduction then this requirement is not applicable.

For correlative investigations, Section 4.2.5.3 provides objectives, initial dilution series, and target benchmarks (at least 10 detectable results and a correlation coefficient of 0.7 or greater) for establishing an appropriate correlation for methanol to use for the purpose of frequency reduction on chronic WET monitoring for compliance. If the permittee seeks frequency reduction through correlation, a specific characterization BMP Plan must be developed and submitted to DEC for review and comment that adequately addresses the objectives and requirements of Section 4.2.5.3. The BMP Plan may include components of the QAPP required per Section 7.2 so long as it is appropriately labeled in the BMP Plan.

For demonstration of an acceptable substitution for methanol, approximately one year of chronic WET data with observed endpoints must be available to compare to the chronic toxicity of a substitute. The number of discrete data points for the substitute needed to adequately characterize the effluent and demonstrate it is less toxic will be based on a direct comparison of WET data for methanol with the proposed substitute. The permittee may request a substitution and a frequency reduction to quarterly once the multiplied results (minimum 10) are less than the highest reported chronic toxicity for methanol laden produced water in two consecutive tests. If the permittee seeks frequency reduction through correlation, a specific characterization BMP Plan must be developed and submitted to DEC for review and comment that adequately addresses the objectives described in this paragraph.

Note that the correlative or substitution investigations require development of a QAPP per Section 7.2. At the permittee's discretion, the QAPP requirements may be embedded within the BMP Plan so long as it is appropriately identified as QAPP section of the BMP Plan.

7.3.1.6 Treatment Systems Standard Operating Procedures

Domestic Wastewater: For discharges of domestic wastewater, the permittee must develop and implement operation and maintenance SOPs that ensure consistent and effective removal of $BOD_5$and TSS to minimum treatment standards per 18 AAC 72.050 as well as bacteria destruction using chlorine followed by dechlorination to achieve appropriate chlorine levels (e.g., less than 1.0 mg/L).

Domestic Graywater: For discharges of graywater treated using an MSD, or other system adding chlorine, the permittee must develop and implement operation and maintenance SOPs that ensure primary treatment for BOD_5 and TSS consistent with any waiver to minimum

treatment issued by DEC and effective bacteria destruction using chlorine followed by dechlorination to achieve appropriate chlorine levels (e.g., less than 1.0 mg/L).

Produced Water: For discharges of produced water using separation followed by two-stage separation, the permittee must develop SOPs for the treatment system to ensure compliance with permit limits. The SOPs must include modes of operation (parallel versus series), operation and maintenance, troubleshooting, contingency modifications (added flotation to separation), prediction and monitoring of carbon exhaustion.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act

Per Section 7 of the Endangered Species Act (ESA), federal agencies are required to consult with National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult under Section 7 regarding wastewater discharge permitting actions. However, this does not absolve DEC from complying with Section 9 and 10 of the ESA. Therefore, the Permit emphasizes that the Permit does not absolve the permittee from securing approvals from other authorities having jurisdiction (e.g., obtaining incidental take or harassment authorizations).

DEC voluntarily sent an email to both the FWS and NOAA Fisheries on September 21, 2020 notifying the agencies of current permit development activities and requesting information regarding the presence of threatened or endangered species and their critical habitat in the vicinity of the Julius R. platform. In response, NOAA Fisheries Protected Resources Division referred the Department to the Alaska Endangered Species and Critical Habitat Mapper web application and to their website for detailed information regarding endangered species and critical habitat designations. FWS referred the Department to its Information, Planning, and Conservation (IPaC) System internet tool.

DEC accessed the NOAA web application which identified the Cook Inlet beluga whale (*Delphinapterus leucas*) population to be the only listed endangered species with distribution range within the waters adjacent to the facility. While all beluga whale populations are protected under the Marine Mammal Protection Act (MMPA), NOAA Fisheries has also designated the Cook Inlet beluga whale population as depleted under the MMPA. Of the five stocks of beluga whales in Alaska, the Cook Inlet population is the most isolated stock, spending the entire year in Cook Inlet and the majority of the time in the northern portion of Cook Inlet. The critical habitat areas for Cook Inlet beluga whales are prioritized according to levels of sensitivity and are designated as Area 1 or Area 2. Area 1 has the highest concentrations of beluga whales from spring through fall as well as the greatest potential for adverse impact from anthropogenic threats. Area 2 has less concentrated spring and summer beluga whale use but is known to be dispersed fall and winter feeding and transit areas in waters where whales typically occur in smaller densities or deeper waters. The NOAA web application was also used to determine that the designated critical habitat Area 2 for the Cook Inlet Beluga Whale overlaps the waters surrounding the facility.

DEC accessed the FWS IPaC internet tool at https://ecos.fws.gov/ipac/location. The Department used this website to gain an approximate determination that the area encompassing the facility

does not overlap with the range or area of influence for any listed threatened or endangered species under the jurisdiction of FWS.

8.2 Essential Fish Habitat

Essential fish habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional Fishery Management Councils and includes waters and substrate (sediments, etc.) necessary for fish from commercially fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA Fisheries when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a State agency, DEC is not required to consult with federal agencies regarding EFH. DEC did; however, voluntarily send an email request to NOAA Fisheries on September 21, 2020 notifying the agency of current permit development activities and requesting EFH listings in the vicinity of the Julius R. platform. In response, NOAA Fisheries referred DEC to the EFH information available through its Alaska EFH Mapper tool and to their website for Fisheries Management Plans.

The Alaska EFH Mapper tool is located at https://www.fisheries.noaa.gov/resource/map/alaska-essential-fish-habitat-efh-mapper. The tool reported groundfish EFH for the Alaska plaice (*Pleuronectes quadrituberculatus*), flathead sole (*Hippoglossoides elassodon*), walleye pollock (*Gadus chalcogrammus*), yellowfin sole (*Limanda aspera*), Dover sole (*Microstomus pacificus*), northern rock sole (*Lepidopsetta polyxystra*), Pacific cod (*Gadus macrocephalus*), rex sole (*Glyptocephalus zachirus*), southern rock sole (*Lepidopsetta bilineata*). The tool also identified EFH in the vicinity of the discharge for five species of Pacific salmon (*Oncorhynchus spp*): Chinook (*O. tshawytscha*), Sockeye (*O. nerka*), Coho (*O. kisutch*), Pink (*O. gorb*uscha), and Chum (*O. keta*). Habitat areas of particular concern (HAPCs) are specific sites within EFH that are of particular ecologic importance to the long-term sustainability of managed species, are of a rare type, or are especially susceptible to degradation or anthropogenic development. HAPCs are meant to provide greater focus to conservation and management efforts and may require additional protection from adverse effects. There were, however, no HAPCs identified within these EFHs."

8.3 Ocean Discharge Criteria Evaluation

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

The Permit requires compliance with Alaska WQS. Consistent with 40 CFR 125.122(b), adopted by reference at 18 AAC 83.010(C)(8), discharges in compliance with Alaska WQS shall be presumed not to cause unreasonable degradation of the marine environment. EPA made the connection between the similar protections provided by ODCE requirements and WQS when promulgating ocean discharge criteria rules in 1980, as stated, "the similarity between the objectives and requirements of [state WQS] and those of CWA Section 403 warrants a presumption that discharges in compliance with these [standards] also satisfy CWA Section 403." (Ocean Discharge Criteria, 45 Federal Register 65943.). As such, given the Permit requires

compliance with Alaska WQS, unreasonable degradation to the marine environment is not expected and further analysis under 40 CFR 125.122 is not warranted for this permitting action.

8.4 Permit Expiration

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

9.0 REFERENCES

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2. *18 AAC 70. Water Quality Standards*, as amended through June 26, 2003.
3. *18 AAC 70. Water Quality Standards*, as amended through July 1, 2008.
4. *18 AAC 70. Water Quality Standards*, as amended through April 8, 2012.
5. *18 AAC 70. Water Quality Standards*, as amended through February 19, 2016.
6. *18 AAC 70. Water Quality Standards*, as amended through April 6, 2018
7. *18 AAC 70. Water Quality Standards*, as amended through March 5, 2020
8. *18 AAC 72. Wastewater Disposal*, as amended through December 23, 2009.
9. *18 AAC 83. Alaska Pollutant Discharge Elimination System Program*. As amended Through October 23, 2008.
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11. ADEC 2014. *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide*, June 30, 2014.
12. ADEC 2020. *Alaska's Final 2018 Integrated Water Quality Monitoring and Assessment Report*, March 26, 2020.
13. Jacobs Engineering Group 2020. *Application for Modification of APDES Permit for Produced Water Revised Anti-degradation Analysis Report, Cook Inlet, Alaska.* Prepared for Furie Operating Alaska, October 2020.
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16. U.S. EPA, *Technical Support Document for Water Quality-based Toxics Control*. Office of Water, EPA-505-2-90-001, PB91-127415. Washington D.C., March 1991.
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18. U.S. EPA, *Interim Guidance for Performance-Based Reduction of NPDES Monitoring Frequencies*. Office of Water, EPA-833-B-96-001, Washington D.C., April 1998.
19. U.S. EPA, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition.* Office of Water, EPA-821-R-02-014, Washington, D.C., October 2002.National Marine Fisheries Service. 2016. Recovery Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas). National Marine Fisheries Service, Alaska Region, Protected Resources Division, Juneau, AK

Appendix A FIGURES

Figure A-1: Location Map – Julius R Platform

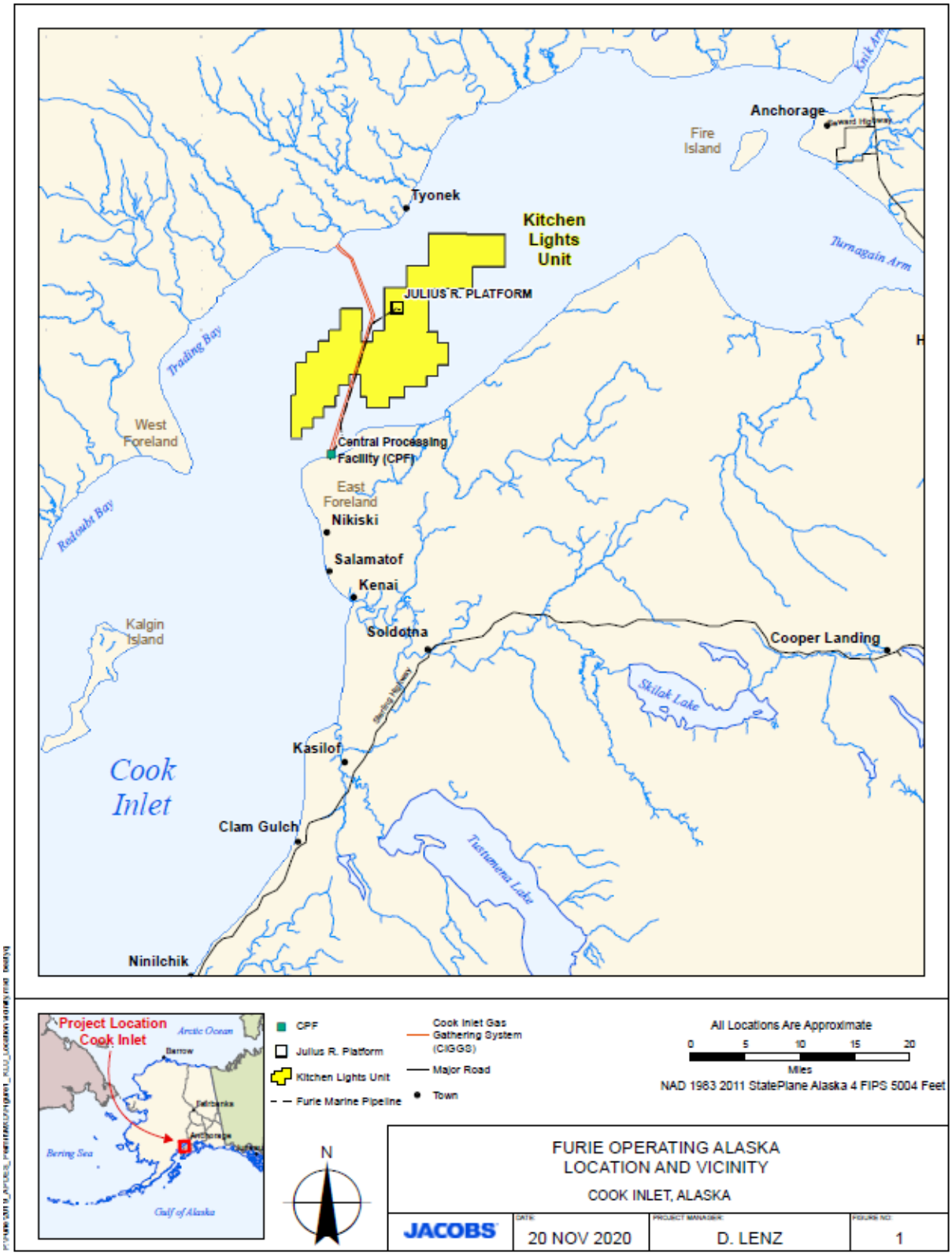

Figure A-2: Produced Water Process Flow Diagram

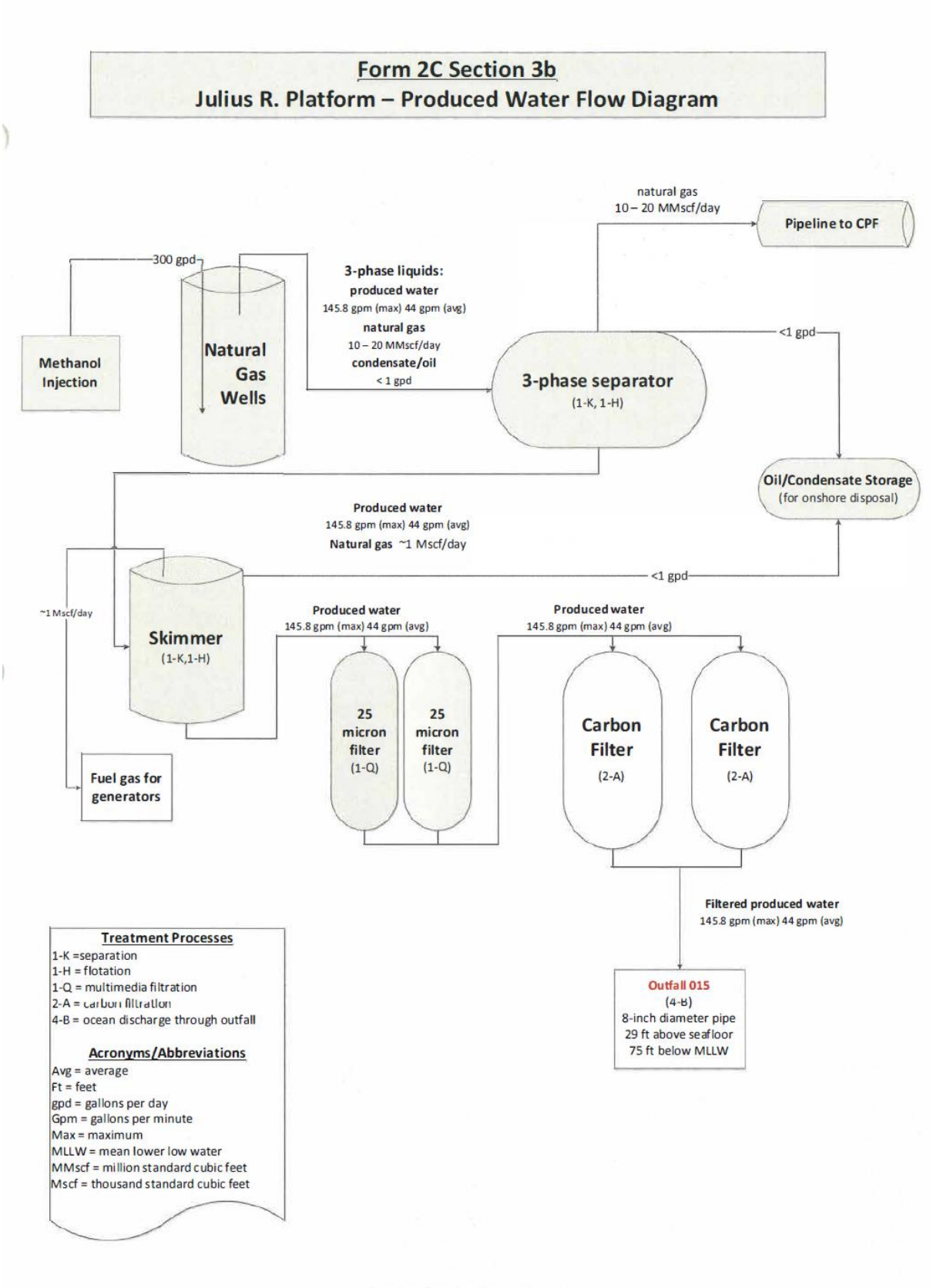

Figure A-3: Produced Water Treatment System Flow Diagram

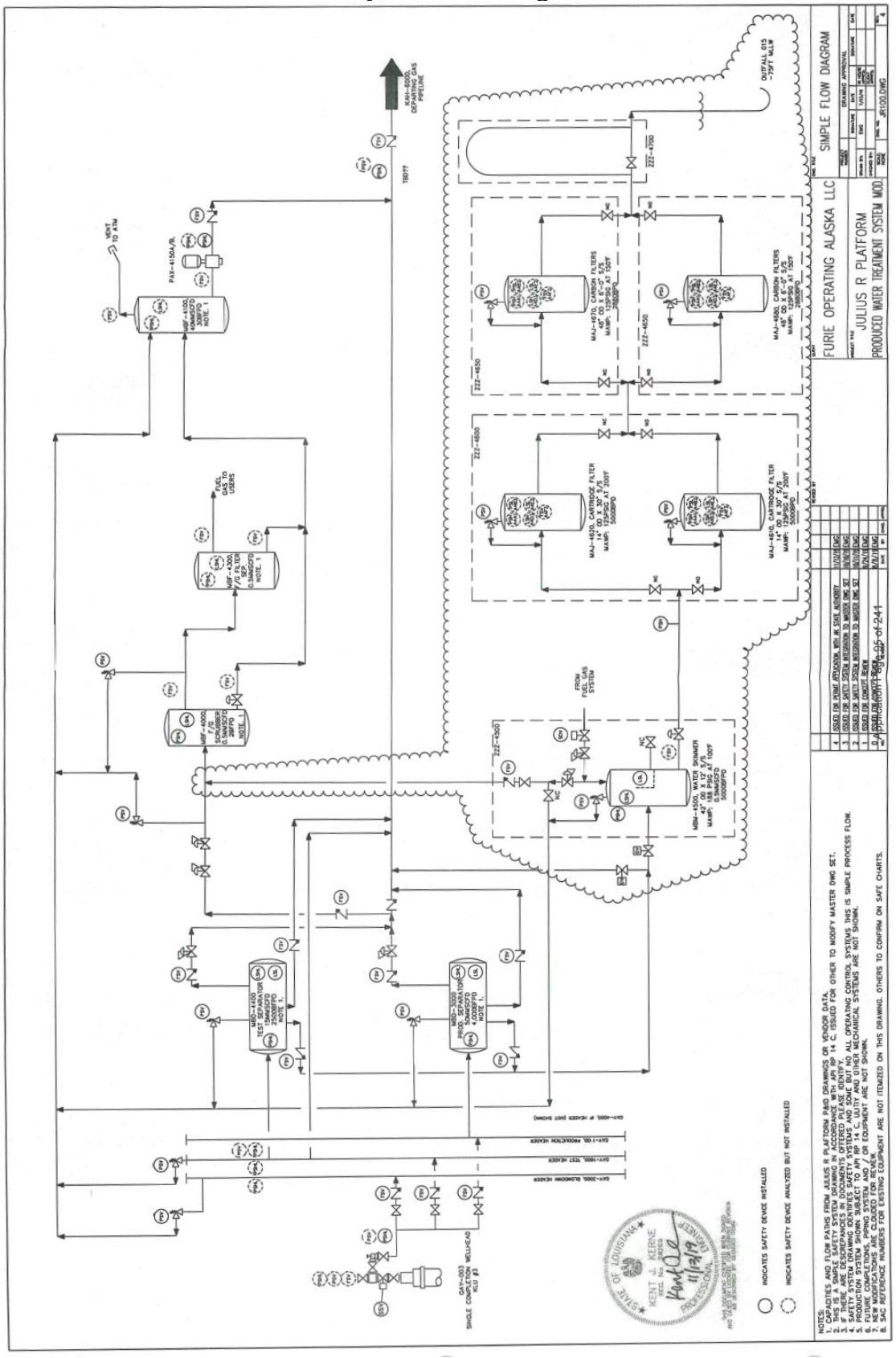

Figure A-4: Julius R. Platform Water Flow Diagrams for Discharges 002, 003, 004 and 008

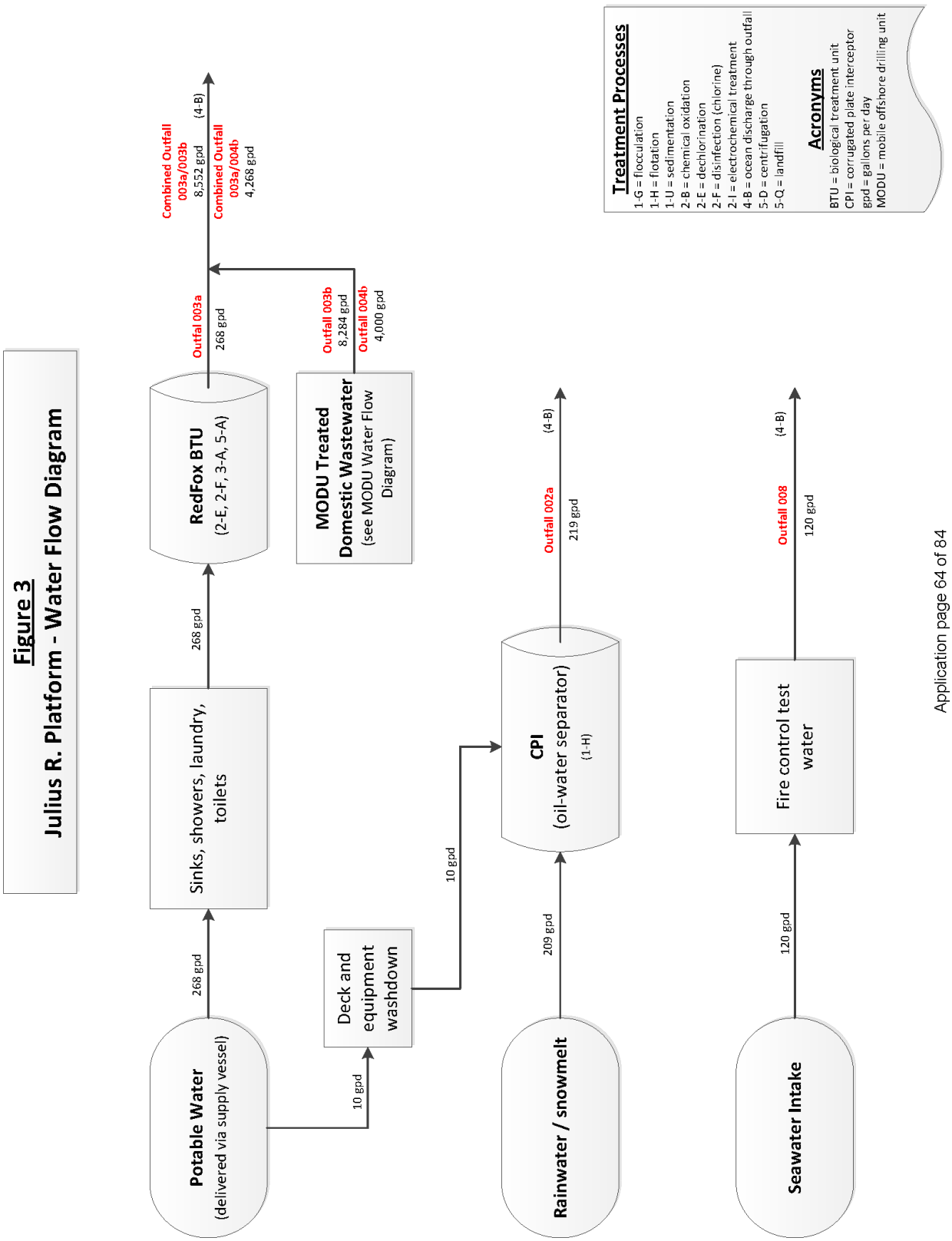

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Figure A-5: MODU Water Flow Diagrams for Discharges 002, 003, and 004

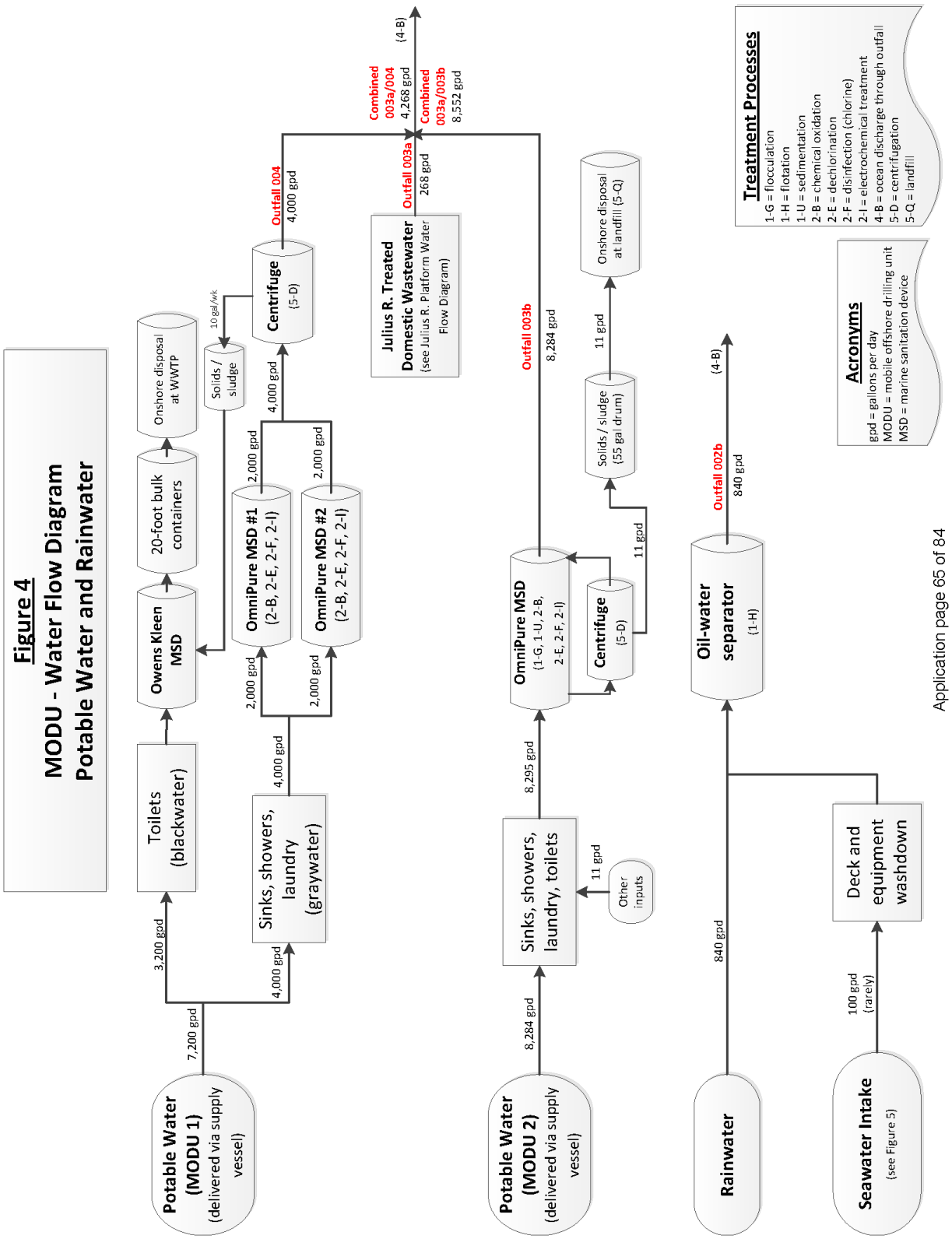

Figure A-6: MODU Water Flow Diagrams for Discharges 008, 009, and 010

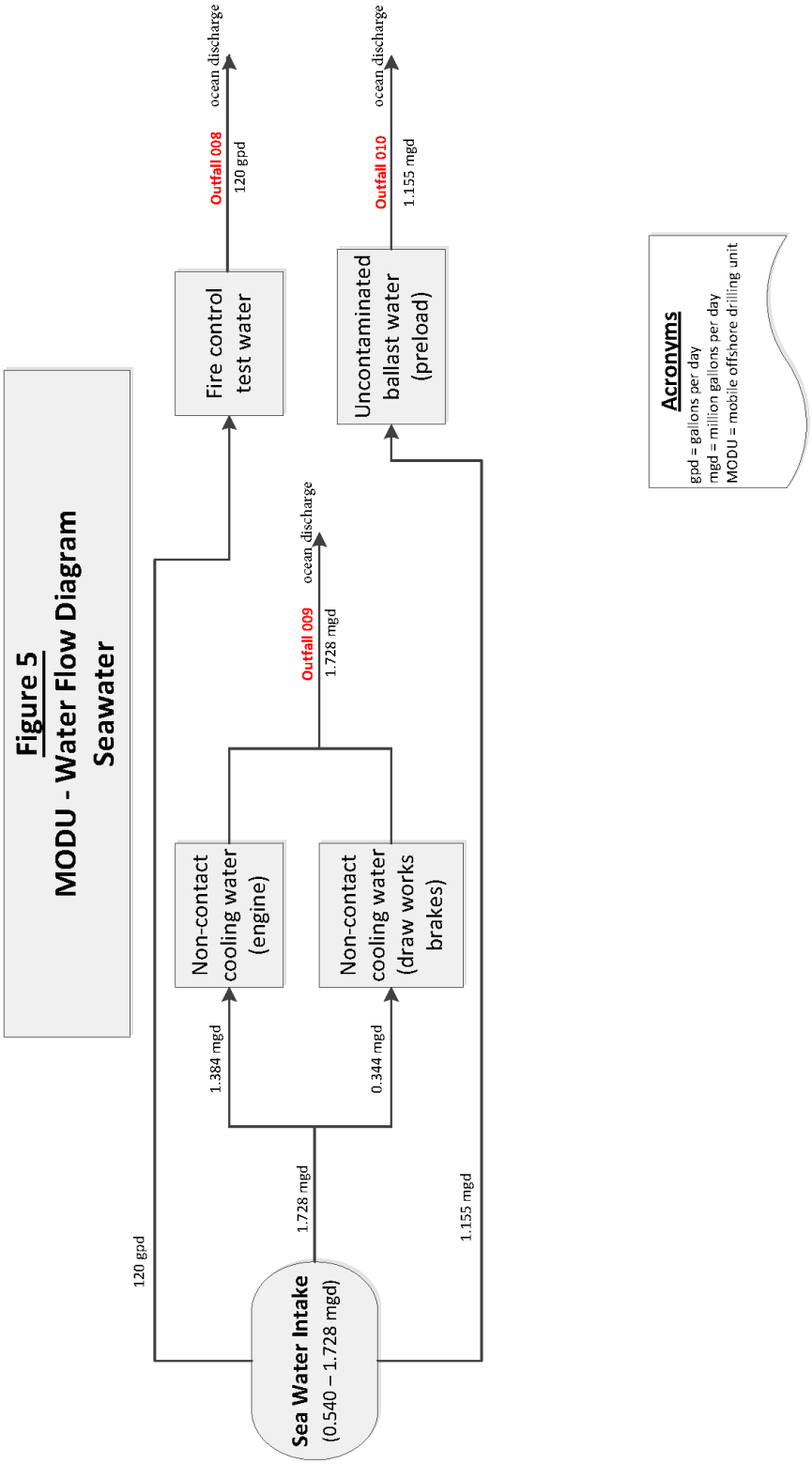

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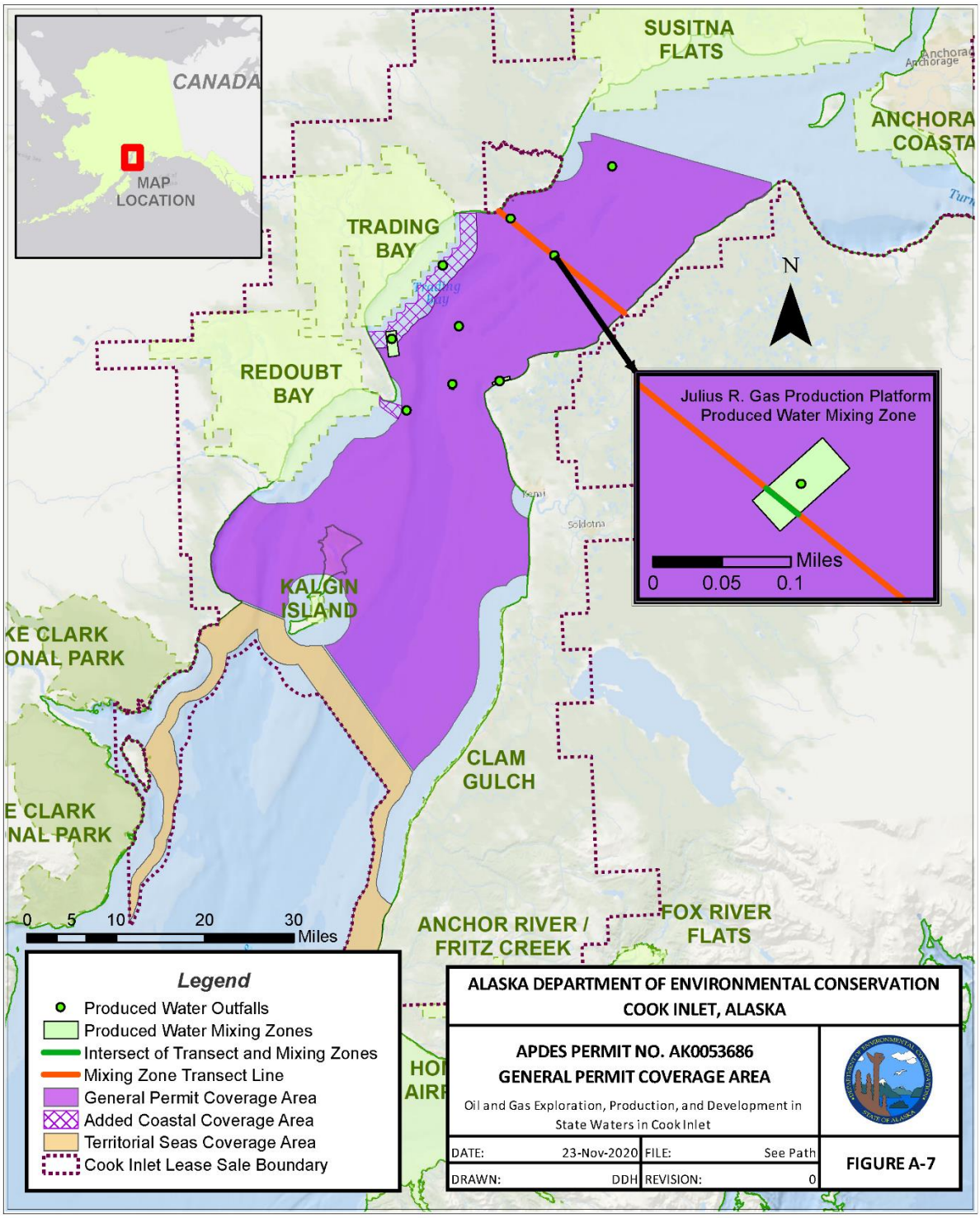
Figure A-7: Cook Inlet Mixing Zone Transect and Area Evaluation



The Department of Environmental Conservation (DEC) has compiled the computer representation from data or information sources that may not have been verified by the DEC. This general representation should not be re-used without verification of sources by an independent professional qualified to verify such data or information. DEC does not guarantee the accuracy, completeness or timelines of the information shown and shall not be liable for any loss or injury resulting from reference upon the representation. Sources: Alaska Department of Natural Resources, Land Records GIS, National Marine Fisheries Service,

Appendix B REASONABLE POTENTIAL ANALYSIS

This Appendix summarizes the reasonable potential analysis (RPA) process used by the Alaska Department of Environmental Conservation (Department or DEC) to determine and develop water quality-based effluent limits (WQBELs) for individual permit AK0053686 – Furie Operating Alaska, Julius R Gas Production Platform (Permit).

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

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

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

B.1 Screening of Characterization Data for Reasonable Potential Data of Produced Water

Produced water is the only discharge authorized under the Permit that requires an RPA based on numeric criteria; other discharges are adequately controlled using technology-based effluent limits (TBELs) or narrative water quality criteria. The pilot test completed by Furie provided the data used in the RPA. The data was reviewed and analyzed by DEC to determine the driving parameters of concern (POCs) and is presented in Fact Sheet Sections 2.2.

For the chronic mixing zone, the characterization of the produced water after treatment indicated the chronic whole effluent toxicity (WET) associated with methanol injection into the producing formations is the driving parameter. No other parameter evaluated exceeded chronic criteria to the degree that chronic WET such that a limit for chronic WET is required. Because chronic WET is directly related to methanol concentrations, it may be possible to impose a limit based on methanol concentrations once a correlation is developed based on ongoing monitoring.

For the acute mixing zone, only copper had concentrations above detection that resulted in exceeding acute criteria. Hence, copper is the driving parameter for the acute mixing zone and must have a WQBEL using the statistical variability of the characterization data for that parameter:

B.2 Mass Balance

For a discharge of a POC at the maximum expected concentration (MEC) (i.e., variability factor applied to the maximum observed concentration or WET (MOC) into a marine receiving environment with a known ambient water concentration (AWC), the projected RWC is determined using a steady state model represented by the following mass balance equation:

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

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum expected concentration.

AWC = Ambient waterbody concentration, taken as the 85th percentile of data or 15 percent of the chronic criteria if no ambient data is available.

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

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

Definition:

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

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

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

Rearranging Equation B-3 to solve for RWC yields:

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

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

B.3 Maximum Projected Effluent Concentration

To calculate the MEC, the Department uses the *RPA&WQBEL Guide* that modifies procedures in *TSD* Section 3.3. Specifically, DEC uses a 95th confidence interval with a 99th percentile to determine a reasonable potential multiplier (RPM). These MEC can also be referred to as the maximum probable concentration during mixing zone determinations. In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 4.1 (ProUCL)* rather than assuming a lognormal distribution as described in the *TSD* in calculating the coefficient of variation (CV). The possible statistical distributions include lognormal, normal, gamma, or non-parametric.

The RPM is calculated differently depending on the type of distribution, CV of the data, and the number of data points. When fewer than 10 data points are available, the *RPA&WQBEL Guide* assumes the CV = 0.6, a conservative estimate that assumes a relatively high variability.

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

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

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

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

Where: $\hat{\mu_n}$ = estimated mean = $\Sigma[x_i] / k$, $1 \leq i \leq k$

σ^2 = estimated variance = $\Sigma[(x_i - \mu)^2] / (k - 1)$, $1 \leq i \leq k$

$\hat{\sigma}$ = estimated standard deviation = $(\sigma^2)^{1/2}$

k = number of samples

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

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

Where: $y_i = \ln(x_i)$ for $i = 1, 2, \ldots, k$
$\hat{\mu_y}$ = mean = $\Sigma(y_i) / k$
$\hat{\sigma_y}^2$ = variance = $\Sigma [(y_i - \hat{\mu_y})^2] / (k - 1)$
k = number of samples

The RPM is the ratio of the upper bound of the distribution at the 99th percentile to the percentile represented by the MOC at the 95% confidence level. The general equation is as follows:

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

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

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

For the lognormal distribution, Equation B-7 becomes:

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

In both Equations B-8 and B-9, the percentile represented by the MOC is:

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

Where,

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

Although it is possible to have an RPM less than one with large data sets, the *RPA&WQBEL Guide* establishes the minimum RPM as one. The MEC is determined by multiplying the MOC by the RPM:

$$\text{MEC} = (\text{RPM}) \times (\text{MOC}) \quad \text{(Equation B-11)}$$

Either the acute or chronic projected RWC at the boundary of an authorized mixing zone can be determined using the MEC calculated in Equation B-11 in Equation B-4.The projected RWC at the boundary of the mixing zones are then calculated as follows:

$$\text{RWC}_{a,c} = \frac{\text{MEC} - \text{AWC}}{\text{DF}_{a,c}} + \text{AWC} \quad \text{(Equation B-12)}$$

Where:

RWC $_{a, c}$ = receiving water concentration at the boundary of the acute or chronic mixing zone, and

$DF_{a, c}$ = the authorized acute or chronic dilution factor.

If the RWC at either the acute or chronic mixing zone boundary is found to have an instream excursion above the respective criteria for the POC, then reasonable potential exists for that parameter and a WQBEL must be developed for that parameter.

B.4 Example Calculations for WET as a Chronic WQBEL

The mixing zone analysis identified chronic WET as the driving parameter for the chronic mixing zone at the platform and the Department authorizes a chronic mixing zone with a DF_c of 250. Chronic WET is found to have reasonable potential because the required dilution factor needed to meet the chronic WET water quality criteria of 1.0 chronic toxicity unit (TUc) is 253 and Department authorizes slightly less dilution than required to meet water quality criteria at the boundary, 250. The following calculations demonstrate how TAH resulted in reasonable potential:

Number of effluent data (n) = 10
MOC = 100 TUc

Due to the various testing dilution series used in the pilot test, none of the chronic WET test results are based on an observed endpoint. Hence, all 10 results are considered nondetectable with the MOC estimated to be 100 TUc and a default CV of 0.6 is applied per the *RPA&WQBEL Guide.*: A lognormal distribution is assumed to apply to the data so equation B-9 applies to the RPM,

For a data set containing 10 chronic WET samples:

$$\text{Percentile represented by MOC } (p_n) = p_8 = (1 - 0.95)^{1/8}$$

$P_8 = 0.7411$ and $Zp_8 = 0.6468$

By inputting values into Equation B-9 results in an RPM = 2.537

The MEC is then calculated by Equation B-11 as the product of the RPM x MOC

MEC = (2.537)(100 TUc) = 253.7 TUc

The chronic receiving water concentration is then calculated based on the following input parameters into Equation B-12:

AWC = 0 mg/L (Ambient water is assumed to have no toxicity)

DF_c = 250 (As authorized in Fact Sheet Section 3.3.1.4)

Resulting in:

$$RWC_c = \frac{253.7\ mg/L_e - 0}{250} + 0\ mg/L = 1.01\ TUc$$

In order to determine if reasonable potential exists for the discharge to violate water quality criteria, the projected toxicity at the boundary of the chronic the mixing zone is compared to the water quality criteria of 1.0 TUc. As shown in the comparison below, chronic WET has reasonable potential to cause, or contribute to, an instream excursion above applicable water quality criteria at the boundary of the chronic mixing zone.

Chronic: 1.01 TUc > 1.0 TUc (chronic criteria) **YES**, there is a reasonable potential.

Since there is a reasonable potential for the effluent to cause, or contribute to, an instream exceedance of chronic water quality criteria for protection of aquatic life, a WQBEL for chronic WET is required. See Appendix C for development of this limit.

B.5 Example Calculations for Copper as an Acute WQBEL

The mixing zone analysis identified copper as the driving parameter for the acute mixing zone at the platform and the Department authorizes an acute mixing zone with a DF_a of 3.25, which is less than the dilution factor required to meet acute water quality criteria for copper (3.3). The calculations demonstrating reasonable potential for copper are summarized below:

Number of effluent data (n) = 7
MOC = 5.85 µg/L Total Recoverable (Conversion factor for dissolved is 0.83)

The characterization data in Section 2.2.3for post treatment produced water resulted in six of the seven samples for copper to have detectable concentrations. Because there are fewer than 10 detected sample results, a default CV of 0.6 is used along with an assumption of lognormal distribution per the *RPA&WQBEL Guide*. Since a normal distribution applies to the data so equation B-9 applies to the RPM

For a data set containing 7 copper samples:

$$\text{Percentile represented by MOC } (p_n) = p_7 = (1 - 0.95)^{1/7}$$

$P_7 = 0.6518$ and $Zp_7 = 0.3902$

By inputting values into Equation B-9 results in an RPM = 2.93

The MEC is then calculated by Equation B-11 as the product of the RPM x MOC

MEC = (2.93)(5.85 µg/L) = 17.11 µg/L

The chronic receiving water concentration is then calculated based on the following input parameters into Equation B-12:

AWC = 0.926 µg/L (Represents the 85th percentile of ambient data used in Cook Inlet)

$DF_c = 3.25$

Resulting in:

$$RWC_a = \frac{17.11 \text{ ug/L} - 0.926 \text{ ug/L}}{3.25} + 0.926 \text{ ug/L} = 5.91 \text{ µg/L}$$

In order to determine if reasonable potential exists for the discharge to violate ambient criteria, the projected concentrations of copper at the boundary of the acute the mixing zone is compared to the acute water quality criteria. As shown in the comparison below, copper has reasonable potential to violate applicable water quality criteria at the boundary of the chronic mixing zone.

Acute: 5.91 µg/L > 5.78 µg/L (acute criteria) **YES**, there is a reasonable

Since there is a reasonable potential for the effluent to cause, or contribute to, an instream excursion above chronic water quality criteria for protection of aquatic life, a WQBEL for copper is required. See Appendix C for development of this limit.

Appendix C BASIS OF LIMITS

The Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) per Alaska Administrative Code (AAC) 18 AAC 83.015 unless first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402 (CWA 402). Per these statutory and regulatory requirements, general permit AKG315200 – Oil and Gas Exploration, Development, and Production in Cook Inlet in State Waters (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), (3) and comply with other state requirements that may be more stringent.

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

C.1 TECHNOLOGY BASED EFFLUENT LIMITS

C.1.1 TBELs Based on Effluent Limitation Guidelines

EPA has promulgated national ELGs for the Oil and Gas Extraction Point Source Category at 40 CFR 435 Subparts A (Offshore Subcategory) and D (Coastal Subcategory). DEC adopted the ELGs by reference at 18 AAC 83.010(g)(3). These subparts specify Best Available Technology Economically Achievable (BAT); Best Conventional Pollutant Control Technology (BCT); and Best Practicable Control Technology Currently Available (BPT), and new source performance standards for the Offshore and Coastal Subcategories of the Oil and Gas Point Source Category.

The ELGs for the Coastal Subcategory were promulgated in 1996. During development of the ELGs, information from the discharging platforms Anna, Baker, Bruce, Dillon, and Tyonek A along with onshore production facilities Trading Bay Production Facility (TBPF), Middle Ground Shoal Onshore, and Granite Point Tank Farm were included in the evaluation of applicable ELGs. The evaluation led to an understanding that the Cook Inlet oil and gas region is unique when compared to other coastal locations in the U.S. for discharging drilling fluids and drill cuttings and produced water. Furthermore, because the produced water treatment systems were included in the evaluation, the existing facilities listed comply with model technology and meet the definition of highest statutory and regulatory requirements for ELGs. However, the Julius R. platform that is seeking first time authorization to

discharge produced water under the ELGs as a New Source and must ensure that the treatment of produced water meets, or exceeds, the best available demonstrated control technology. The following sections discuss the applicable ELGs for Deck Drainage (Discharge 002); Domestic Wastewater as defined by 18 AAC 72 but titled sanitary waste in the ELGS (Discharge 003); Graywater as defined by 18 AAC 72 but titled domestic waste in the ELGS (Discharge 004); and Produced Water (Discharge 015).

C.1.1.1 ELGs for Deck Drainage (002) per 40 CFR 435 Subpart A and Subpart D

EPA determined that the BPT available for treatment of deck drainage is a sump and skim pile system. Oil and water are gravity-separated in the sump, and the oil is sent off-site to an oil treatment system. After treatment in an oil-water separator (OWS), clean water is discharged, and oily water is stored aboard until transferred to an approved treatment and disposal site. The Permit requires that deck drainage contaminated with oil and grease is processed through an OWS prior to discharge, and prohibits the discharge of free oil in deck drainage discharges.

The ELGs for BAT and BCT require a limitation of no discharge of free oil as determined by the presence of film, sheen, or a discoloration of the surface of the receiving water for deck drainage discharges. Contaminated deck drainage treated for removal of oil and/or grease can also comply with no free oil by conducting an optional Static Sheen Test prior to discharge.

C.1.1.2 ELGs for Domestic Wastewater (003) per 40 CFR 435 Subpart A and Subpart D

For domestic wastewater (referred to as sanitary waste in the ELGs), the ELGs for BPT and BCT require TRC to be maintained as close to 1.0 mg per liter (mg/L) as possible for facilities that are continuously manned by 10 or more staff (M10). The ELGs also require no discharge of floating solids for facilities that continuously manned by nine or fewer staff or are intermittently manned at any number (M9IM).

The ELGs requiring TRC to be a minimum of, and kept as close as practicable to, 1.0 mg/L is to ensure that adequate disinfection of bacteria is achieved and is considered a surrogate limit for fecal coliform and enterococci bacteria.

C.1.1.3 ELGs for Graywater (004) per 40 CFR 435 Subpart A and Subpart D

For graywater (referred to as domestic waste in the ELGs) discharges, the ELGs prohibit the discharge of floating solids, garbage or foam.

C.1.1.4 ELGs for Produced Water (015) per 40 CFR 435 Subpart A and Subpart D

The evaluation conducted by EPA during promulgation of the ELGs in 1996, led to a determination that Cook Inlet is unique compared to other coastal locations in the U.S. This uniqueness allows for the discharge of produced water where everywhere else, it is prohibited. The ELGs for produced water discharge to Cook Inlet requires an oil and grease average monthly limit (AML) of 29 mg/L a maximum daily limit (MDL) of 42 mg/L. In formulating those ELGs, EPA examined all existing facilities and the pollutants that could be expected to be discharged in produced water and concluded that they could be appropriately controlled by the oil and grease limits when discharging to Cook Inlet. Therefore, DEC cannot impose more stringent TBELs using case-by-case BPJ, such as a no discharge of produced water limitation.

C.1.2 TBELs Developed Using Case-by-Case Best Professional Judgement

In situations where ELGs have not been developed or have not considered specific discharges or pollutants, a regulatory agency can develop case-by-case TBELs using BPJ. Where national ELGs have not been developed, or did not consider specific pollutant parameters in discharges, the same performance-based approach applied to develop national ELGs is applied to a specific industrial facility using BPJ. The Permit contains TBELs developed on case-by-case basis using BPJ derived during development of other oil and gas permits for Cook Inlet (e.g., Cook Inlet General Permit). The Department has reevaluated these BPJ limits to ensure compliance with Section 402 of the CWA.

Per Section 402 of the CWA, developing TBELs using case-by-case BPJ requires the permitting authority to consider the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), the cost of implementing these conditions relative to the environmental benefits achievable, and such other factors as deemed appropriate. The Department has evaluated the original TBELs developed by EPA using case-by-case BPJ in relation to age of equipment and current engineering aspects of control techniques, as well as other pertinent considerations. The Department has determined that these TBELs established in the 1999 and 2007 Cook Inlet General Permits are still directly applicable to the Permit. However, DEC will ultimately compare these TBELs to applicable WQBELs to determine which is more stringent for final limits.

C.1.2.1 TBELs Using Case-by-Case BPJ for Domestic Wastewater (003A/003B) and Graywater (004B)

In the 2014 Permit, TBELs were developed using case-by-case BPJ for MDLs and AMLs for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) in domestic wastewater (003). This requirement is required under 18 AAC 72.050 minimum treatment DEC is retaining these TBELs appropriately citing the state authority under 18 AAC 72 for regulating domestic wastewater, which includes domestic wastewater (003A/003B) and graywater (004B). See Fact Sheet Section 2.3.2 for a clarifications and discussions. In addition, DEC is also retaining the TBEL developed using case-by-case BPJ for a maximum limit for TRC of 1 mg/L after dechlorination. DEC requires dechlorination as a technology requirement for the domestic wastewater systems using chlorine destruction/disinfection, including graywater treated using a marine sanitation device (MSD). This TRC maximum limit was first introduced in the 2015 Exploration GP, which will be superseded by the Permit. Lastly, DEC applies this same 1 mg/L maximum limit to graywater that is treated with MSDs to meet the primary treatment requirement and imposes dechlorination treatment prior to discharge. See also Fact Sheet Section 2.3.2.3.

C.1.2.2 Produced Water pH Limits Developed Using Case-by-Case BPJ

Although the discharge of produced water was included in the ELGs, the ELGs did not include pH limits and pH was considered an appropriate control. In previous Cook Inlet General Permits, EPA adopted pH limits of between 6.0 and 9.0 standard units (su) for discharges of produced water (015) and DEC has evaluated these TBELs and has determined the evaluation conducted by EPA is appropriate for the Permit.

C.2 WATER QUALITY-BASED EFFLUENT LIMITS

C2.1 Statutory and Regulatory Basis

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 cause, or contribute to, an instream excursion above water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the 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 [CV]), existing controls on point sources (e.g., treatment systems), and nonpoint sources of pollution (e.g., ambient receiving water concentrations). 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.

C2.2 Reasonable Potential Analysis

The *RPA/WQBEL Guidance* uses statistical methods to estimate MECs based on the 99th percentile at a 95 % confidence interval. Using a mass balance approach, the RPA projects the concentration 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 exceeds, or contributes to an instream excursion above water quality criteria at the boundary of either the acute or the chronic mixing zone. Based on the RPA summarized in Appendix B, the Department has determined there is a reasonable potential for the discharge to cause, or contribute to, an instream excursion above the chronic marine criterion for chronic toxicity of 1.0 chronic toxicity unit (TUc) at the boundary of the chronic mixing zone for the discharge of produce water. DEC also determined that certain copper has reasonable potential to cause, or contribute to, an instream excursion above the acute marine criterion for copper at the boundary of the acute mixing zone for produced water. Accordingly, WQBELs for copper and chronic toxicity are required in the Permit and numeric WQBELs for copper and chronic toxicity have been developed per 18 AAC 83.435 to be consistent with the calculated available WLA and stringent enough to ensure compliance with WQS. There were no other discharges authorized under the Permit that resulted in a reasonable potential for establishing numeric limits. However, reasonable potential for certain narrative criteria is discussed in Section C.2.6.

C.2.3 Wasteload Allocations

In the context of this section, a WLA is the concentration, or chronic toxicity, 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 250 for chronic toxicity and an acute dilution factor of 3.25 for copper. For chronic toxicity there is no ambient (Amb) toxicity to consider. For copper, data collected near produced water discharges during Integrated Cook Inlet Monitoring and Assessment Program (ICIEMAP) in 2008 and 2009 and other samples collected near the industrialized location near Nikiski have been used to estimate applicable ambient copper concentrations. The 85^{th} percentile of the copper data is used to determine an ambient

concentration of 0.926 micrograms per liter (µg/L). The WLA is calculated by rearranging Equation B-3 in Appendix B and substituting WQC for receiving water concentration and WLA for the maximum expected concentration. The resulting mass balance equation is:

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

C.2.4 WQBEL for Chronic Toxicity for Produced Water (Discharge 015)

This section describes the WQBEL procedure for chronic toxicity for the produced water discharge at the Julius R. platform. The RPA revealed that chronic toxicity has reasonable potential to cause, or contribute to, an instream excursion above the chronic water quality criterion for toxicity at the boundary of the chronic mixing zone for the facility, requiring development of WQBELs. The authorized chronic dilution factor, DF_c, for the Julius R Platform chronic mixing zone is 250. The MDL and AML are based on an MEC (TUc –based) derived from mass balance equal to TUc, a default CV of 0.6, and an assumed four samples per month. The calculations for the MDL and AML for chronic toxicity on the platform produced water discharge is shown below.

Input Parameters for TAH WQBEL Development

- The chronic wasteload allocation (WLA_c) for chronic toxicity is 250 TUc
- Coefficient of Variation (CV) = 0.6
- Sampling Interval = 4 samples/month
- z statistic for 99th percentile probability basis (Z_{99}) = 2.326
- z statistic for 95th percentile probability basis (Z_{95}) = 1.645

Calculations

Determine Long Term Averages (LTAs)

There is no acute criterion for toxicity. Therefore, the chronic LTA, LTA_c is calculated as follows:

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

$$WLA_c = 250 \text{ TUc, } CV = 0.6, Z_{99} = 2.326, \text{ and } \sigma_4^2 = 0.08618$$

LTA_c = 131.9 TUc

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

LTA_c is most limiting = 131.9 TUc

Calculate the MDL and AML

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

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

MDL = 410.67 TUc
USE 410 TUc

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

$$CV = 0.6, Z_{95} = 1.645, \text{ and } \sigma_4^2 = 0.0862$$

AML = 204.7 TUc

Because the monitoring frequency is monthly, or less, the application of an AML is not practicable given difficult logistics of coordinating and executing multiple sample events and transporting samples via helicopter during periods of inclimate weather. DEC believes the benefit of conducting multiple tests per month to support an AML for chronic WET is outweighed by the risk to human life and safety and the potential for not meeting sample schedules, hold times, and persistence of WET samples exceeding hold times due to the logistics of sample collection on the platform and transportation by helicopter to onshore and to out-of-state bioassay laboratories. An MDL without an AML provides better assurance that the permittee can comply with the monthly monitoring despite remote logistics and impacts from inclimate weather as well as the cost of having to repeat sample collections if weathered out. . Therefore, there will only be an MDL established for the discharge. Furthermore, a correlation with methanol, the primary cause of toxicity in the discharge, may developed and substituted for toxicity in future issuances.

C.2.5 WQBEL for Copper on Produced Water Discharge

This section describes the WQBEL procedure for copper for the produced water discharge at the Julius R. platform. The RPA revealed that copper has reasonable potential to cause, or contribute to, an instream excursion above the acute water quality criterion for copper at the boundary of the acute mixing zone for produced water, requiring development of WQBELs. The authorized dilution factor for the platform chronic mixing zone is 3.25. The MDL and AML are based on an MEC derived from mass balance equal to 17.11 μg/L, a default CV of 0.6, and an assumed four samples per month. The calculations for the MDL and AML for copper on the Julius R. Platform produced water discharges is shown below.

Input Parameters for copper WQBEL Development

- The chronic wasteload allocation (WLA_c) for copper is 3,751 μg/L
- The acute wasteload allocation (WLA_a) for copper is 22.78 μg/L
- Coefficient of Variation (CV) = 0.502
- Sampling Interval = 4 samples/month
- z statistic for 99th percentile probability basis (Z_{99}) = 2.326
- z statistic for 95th percentile probability basis (Z_{95}) = 1.645

Calculations

Determine Long Term Averages (LTAs)

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

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

WLA_a = 16.70 μg/L, CV = 0.6, Z_{99} = 2.326, and $\sigma^2 = 0.3075$

LTA_a = 5.36 μg/L

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

WLA_c = 701.9 μg/l, CV = 0.6, Z_{99} = 2.326, and $\sigma_4^2 = 0.08618$

LTA_c = 370.2 μg/L

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

LTA_a is most limiting = 5.36 µg/L

Calculate the MDL and AML

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

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

MDL = 16.7 µg/L
USE 16.7 µg/L

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

$$CV = 0.6,\ Z_{95} = 1.645, \text{ and } \sigma_4^2 = 0.08618$$

AML = 8.3 µg/L
USE 8.3 µg/L

C.2.6 Other Numeric or Narrative Water Quality-Based Effluent Limits and Monitoring

In addition to the parameters evaluated in the RPA, the limited and 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.2.6.1pH

The criteria for pH are no less than 6.5 su and not greater than 8.5 su. Discharges of produced water (Discharge 015) have a TBEL developed using case-by-case BPJ per Section C.1.2.2 applied at the compliance point prior to commingling. DEC has assessed the impacts of authorizing these limits and determined that these limits would not result in causing, or contributing to, an instream excursion of water quality criteria at the boundary of the chronic mixing zone; the criteria will be reached in close proximity of the discharge due to available dilution and buffering capacity of the receiving water. Hence, the water quality criteria for pH can be exceeded within the mixing zone but not beyond the TBEL for pH (i.e., 6.0 to 9.0 su).

C.2.6.2Narrative Requirements

Oil and Grease (Visual Sheen): Per 18 AAC 70.020(b)(17)(A)(i), there may be no concentrations of petroleum hydrocarbons in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen or discoloration. This narrative WQBEL is compared to the no free oil TBEL in Section C.3.

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

C.3 DETERMINATION OF MOST STRINGENT EFFLUENT LIMITS

DEC compared the narrative water quality criteria for oil and grease (visible sheen) to the TBELs based on observation of receiving water per the ELGs. Because the narrative WQBEL includes additional protections for sediment and shoreline, DEC has determined the WQBEL narrative is more stringent and is applying visual observation of sheen to in lieu of the ELG of no free oil. DEC also determined that compliance with the water quality narrative using the Static Sheen Test in situations where visual observations are not possible (e.g., during periods of ice cover or broken ice conditions) is acceptable.

Appendix D Appendix D MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2006)

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

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Sections 3.3.1 and 3.3.2	18 AAC 70.240 (k)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 3.3.3	18 AAC 70.240 (c)(1)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A – Marine Discharge	18 AAC 70.240(l)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.240(c)(2)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Sections 3.3.6, 3.3.8, and 3.3.8 and 3.3.9	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 3.3.4	18 AAC 70.240(b)(1)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Sections 3.3.5, 3.3.6, 3.3.8, 3.3.9, and 8.2	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 3.3.5	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 3.3.5	18 AAC 70.240(c)(4)(C)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.240 (e) and (f)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	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 3.3.7	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 3.3.5	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 Sections 3.3.7 and 3.3.8	18 AAC 70.240 (c),(4)(A)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5 and 3.3.7	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 3.3.6	18 AAC 70.240(e) and (f)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.240(c)(4)(G)	Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.8	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 3.3.8	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 3.3.8	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 3.3.2 and 3.3.8	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 3.3.8	18 AAC 70.240(c)(4)(A)	Y

Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Sections 3.3.9 and 8.1	Program Description, 6.4.1 #5 18 AAC 70.240(c)(4)(F)	Y