ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PRELIMINARY DRAFT

Permit Number: AK0000507

Nutrien Kenai Nitrogen Operations

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

Public Comment Period Start Date: DRAFT

Public Comment Period Expiration Date: DRAFT

Alaska Online Public Notice System

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

NUTRIEN KENAI NITROGEN OPERATIONS

For wastewater discharges from the

Nutrien Kenai Nitrogen Operations
PO Box 575
Mile 21 Kenai Spur Highway
Kenai, Alaska 99611

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to reissue an APDES individual permit (permit) to Nutrien Kenai Nitrogen Operations 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 practicesto which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Nutrien Kenai Nitrogen Operations Plant and the development of the permit including:

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

Public Comment

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

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

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

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

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

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

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

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
Mail: P.O. Box 11180
Juneau, AK 99811

In Person: 410 Willoughby Avenue, Suite 303
Juneau, AK 99811

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

See http://dec.alaska.gov/commish/review-guidance/informal-reviews for information regarding informal reviews of Department decisions.

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

Commissioner
Alaska Department of Environmental Conservation
Mail : P.O. Box 11180
Juneau, AK 99811
In Person: 555 Cordova Street
Anchorage, AK 99501

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/.

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1.0 INTRODUCTION

1.1 Applicant

This fact sheet provides information on the APDES permit for the following entity:

Permittee:	Nutrien US LLC
Facility:	Nutrien Kenai Nitrogen Operations
APDES Permit Number:	AK0000507
Facility Location:	Mile 21, Kenai Spur Highway, Kenai, AK 99611
Mailing Address:	PO Box 575, Kenai, AK 99611
Facility Contact:	Mr. Fred Werth, Facility Manager

1.2 Authority

Section 301(a) of the Clean Water Act (CWA) and AAC 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with an APDES permit. The individual permit reissuance is being developed per 18 AAC 83. 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 Statutes (AS) 46.03.760 and AS 46.03.761.

1.3 Permit History

The first National Pollutant Discharge Elimination System (NPDES) permit was issued in December 1974. At that time, the name of the facility was Collier Carbon and Chemical Corporation. In 1978, the name changed to Union Chemicals, a division of Union Oil Company of California. The permit expired in March 1981 and was reissued in March 1983. In February 1986, the name changed to Unocal Chemicals Division, Unocal Corporation. That permit expired in April 1988 and was reissued in July 1989. The company's name changed to Unocal Petroleum Products and Chemicals Division. The permit expired in July 1994. In 1999, the company again changed its name to Alaska Nitrogen Products LLC and the United States Environmental Protection Agency (EPA) administratively extended the permit until the current permit was reissued in November 2000. Agrium U.S., Inc. purchased the facility in May 2001 and changed the facility name to Agrium Kenai Nitrogen Operations (KNO). The active permit was transferred to KNO with the purchase. That permit expired in November 2005 and an application was submitted that year to EPA. The permit was administratively extended and in October 2009, authority to administer this permitting action transferred from EPA to DEC. In May 2017, the DEC reissued the KNO permit which became effective in June 2017. In December 2022, the Agrium U.S. Inc. changed their name to Nutrien US LLC and KNO became Nutrien Kenai Nitrogen Operations.

Under the Administrative Procedures Act and state regulations at 18 AAC 83.155(c), an APDES permit may be administratively extended (i.e., continues in force and effect) provided that the permittee submits a timely and complete application prior to the expiration of the current permit. A timely and complete application for a new permit was submitted by Nutrien US LLC (then dba Agrium U.S., Inc) on December 30, 2021, with technical revision 1 submitted on March 29, 2022 and technical revision 2 submitted on July 17, 2023; therefore, the 2017 permit is administratively extended until such time a new permit is reissued.

2.0 BACKGROUND

2.1 Facility Information

The Nutrien Kenai Nitrogen Operations (KNO) complex is a large nitrogen manufacturing fertilizer complex consisting of two ammonia plants, two urea plants, two associated utility plants, and a loading wharf . The KNO complex is located along the bluff above Cook Inlet at Mile 21 of the Kenai Spur Highway, near Nikiski and 10 miles north of Kenai. KNO is a large complex which occupies approximately 125 acres in an industrial area. Ammonia Plant #1, Urea Plant #2, and Utility Plant #3 (South Complex) were originally constructed in

1966 – 1968. KNO was expanded in 1977 – 1978 by the addition of Ammonia Plant #4, Urea Plant #5, and Utility Plant #6 (North Complex). The last urea loading occurred in December 2007, followed by the final ammonia shipment in April 2008, afterward the loading wharf was taken out of service. Nutrien US LLC is considering a project to resume operation of the North complex in the next five years which would include Ammonia plants #1 and #4 and Urea plant #5. This is also based on the potential availability of natural gas in the future, but due to the current lack of availability of natural gas, KNO continues to be non-operational and have no discharge, however the following is a description of their system design and historical production technology capabilities during normal operations:

Ammonia Plants #1 and #4: To produce ammonia, natural gas and steam are reacted at high temperature in the primary and secondary reformers to produce hydrogen. Air is added as the nitrogen source, the mixture is purified to remove the byproduct (carbon dioxide), compressed to 3,500 pounds per square inch gage (psig) and heated to 900 degrees Fahrenheit (°F) to form gaseous ammonia. The anhydrous ("without water") ammonia is then liquefied by cooling to -28° F, and stored in one of two atmospheric storage tanks (30,000 and 50,000 tons, respectively). The average daily production estimate is 630,000 metric tons of ammonia (about half of which is used in the production of urea) and 620,000 metric tons of urea when the plant is started. When the plant is fully operational, production of ammonia and urea would be double the initial amount.

Urea Plants #2 and #5: The anhydrous ammonia and carbon dioxide recovered from the ammonia process are mixed together at high pressure and temperature to form urea. Any water from the reaction is removed. In plant #2 the urea is crystallized, dried, and transported to the top of a tower where it is melted and then cooled (by spraying), to form a prill product. The prills are transported via an enclosed conveyor belt to a 50,000 ton bulk storage warehouse. Plant #5 produces urea in the same manner, concentrates by evaporation and sprays it in a molten state into large rotating cylindrical granulators to make a granular product. The granules are transported by an enclosed conveyor belt to an 80,000 ton bulk storage warehouse. The urea products are transported from the warehouses to the wharf (on covered conveyor belts), where the products are loaded on ships and barges for transport to west coast and overseas customers. The finished product is primarily used as a fertilizer. However, a small percentage may be combined with formaldehyde to produce resins and glues, or used as a protein nitrogen supplement in cattle feed. The average daily production of prilled and granulated urea is 3,089 tons/day.

Utility Plants #3 and #6: Utility Plants #3 and #6 define operational control centers that control cooling towers, water treatment systems and boilers. The utility plants generate electricity, steam, and dry compressed air for use in the ammonia and urea plants. Well water is demineralized for use as makeup for the natural gas fired steam boilers. Some well water is also used for cooling water in the plants. Electricity for plant use is produced by natural gas fired piston and turbine generators. The utility plants also control the waste water effluent system. The domestic sewage and graywater generated at the plants are not covered by the proposed permit. The domestic wastewater is treated by a large onsite leachate septic system.

General Effluent (GE) Treatment System: The GE treatment system consists of lead and lag skim ponds, and a main pond. The system accepts approximately 300,000 gallons per day (gpd) of influent from the ammonia plants. The influent is generated from deionization (i.e., water treatment), boiler blowdown, plant laboratory, monitoring well purge water, process area drainage, and compressor building drainage. Additionally, air compressor and carbon dioxide (CO_2) knockout pots drain to the GE system. The ammonia process condensate is stripped of carbon dioxide, compressed, and cooled in stages. Water collected from this process is discharged into the GE system. The influent is pH neutralized prior to entering the GE Lead Skim Pond (capacity 100,000 gallons) and drained through a submerged inverted draw-off and gate valve box into the GE Lag Skim Pond (capacity 100,000 gallons). The flow is drawn off into the GE Main Pond (capacity 1.3 million gallons) and finally to the Process Effluent Main Equalization Pond (see below), before being discharged to Cook Inlet. See Figure 2 for a diagram of the ammonia and urea treatment processes. All ponds are generalized into the GE effluent system box in Figure 2.

Process Effluent (PE) Treatment System: The PE treatment system accepts approximately 633,000 gpd of influent from the urea plants consisting of deionization backwash, boiler blowdown water, and cooling tower

blowdown. Process condensate is recycled to the waste-heat boilers or recycled to the cooling towers before being discharged to the PE treatment system. Any waste through the floor drain is routed to an oil coalescer before going to the hydrolyzer stripper or desorber rectifier and being recycled back to the urea plants. The backwash and rinse water from the deionization system is routed to a neutralization tank (that uses soda ash) for pH control prior to entering the PE system. The influent is collected in a sump in the Utility Plant and pumped into the PE Lead Settling Pond (capacity 100,000 gallons). Once there, a draw-off system allows the water to run into the PE Lag Settling Pond (capacity 100,000 gallons) and finally into the PE Main Equalization Pond (capacity 1.4 million gallons). Any waste oil is skimmed from the ponds and burned. The PE Main Equalization Pond receives the GE Main Pond effluent prior to discharge (approximately 734,000 gallons/day). Discharge is to Cook Inlet via diffuser, at an approximate rate of 0.870 million gallons per day (mgd). The total retention time in the two treatment systems (GE and PE) is up to three days depending on the pumping rates. All six of the treatment ponds are lined in concrete. The rate of 0.870 mgd represents 3-year average flows from 2002 – 2004. Note that this value differs from .752 mgd used in the mixing zone analysis that represents a reasonable worst-case scenario maximum flow capacity based on an updated water balance sheet supplied by Nutrien KNO for proposed plans of just starting up the North Complex which consists of Plant #1, #4, and #5.

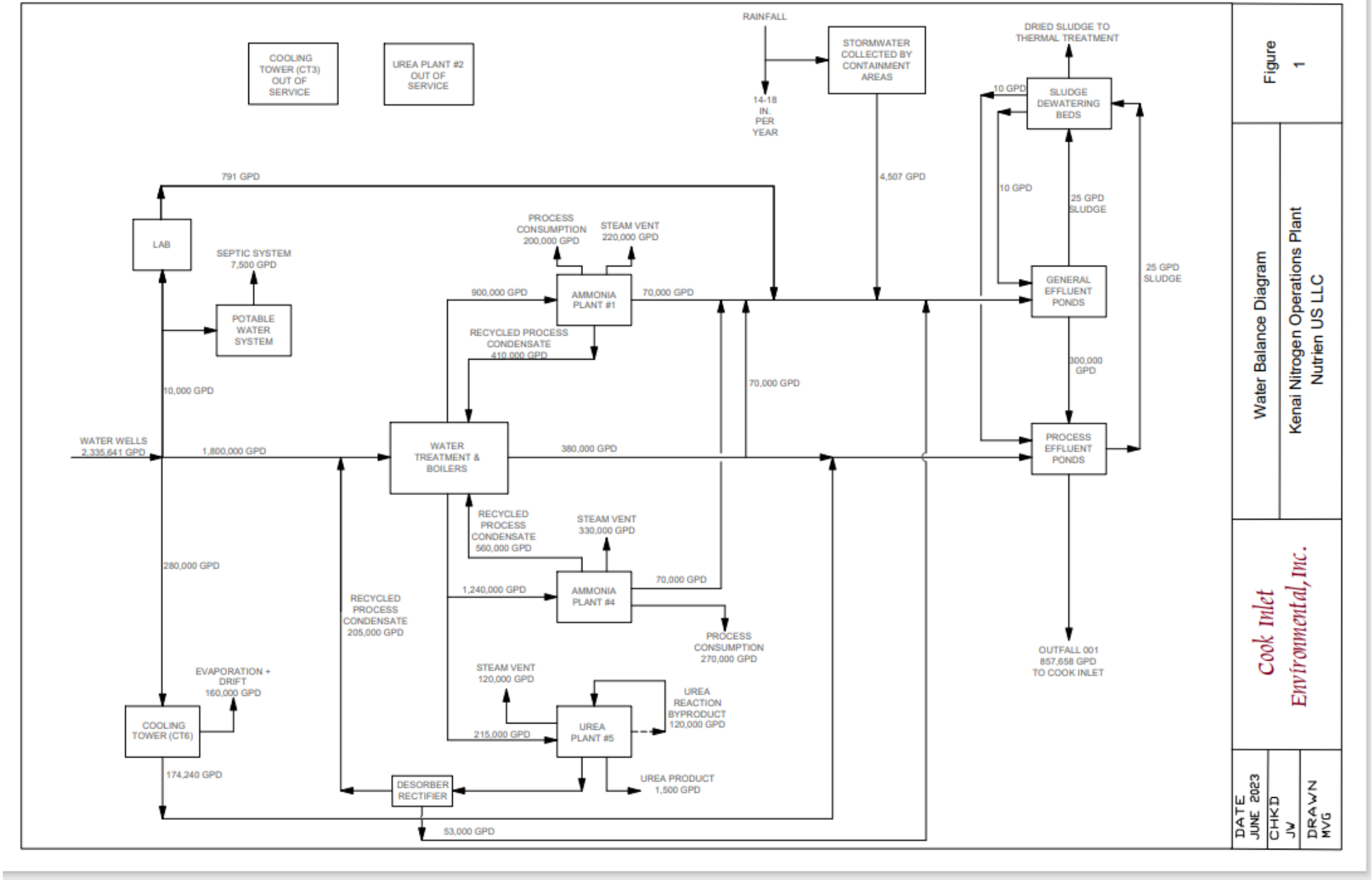
Effluent Sludge: Approximately 3,650 to 7,150 cubic feet of effluent sludge accumulates each year in the bottom of the ponds. This sludge primarily consists of water hardness minerals removed in the deionization process. Each summer, the ponds are drained and the sludge is collected by vacuum trucks and transported to five drying beds. A perforated pipe collects the water that drains from the drying beds and is pumped to the effluent ponds for treatment. In the spring, the sludge thaws, is removed from the beds for disposal and shipped off site for additional treatment. The draft permit does not address the disposal or handling of sludge. Sludge disposal for this type of facility's sludge is addressed by the Resource Conservation and Recovery Act.

The wharf storm water is covered separately by Alaska Pollutant Discharge Elimination System (APDES) storm water Multi-Sector General Permit (MSGP), however, because there are no point source discharges of storm water from onshore operation directly to surface water, all storm water collected at the onshore portion of the Facility, is routed through the effluent system.

Figure 1 depicts the location of the Nutrien Kenai Nitrogen Operations map.
Figure 2 depicts a schematic of the Nutrien Kenai Nitrogen Operations Process Flow Diagram.

Figure 1: Nutrien Kenai Nitrogen Operations Map

Figure 2: Nutrien Kenai Nitrogen Operations Schematic



2.2 Pollutants of Concern

The pollutants of concern known to be present in the KNO plant discharge during normal operations are ammonia, organic nitrogen, temperature, oil & grease, total residual chlorine, pH, arsenic, copper, manganese, nickel, zinc, total aromatic hydrocarbons, total aqueous hydrocarbons, and whole effluent toxicity.

The facility is still not discharging and therefore these pollutants will be carried forward into the next permit cycle in order to get a more robust data set should the facility become partial or fully operational.

2.3 Compliance History

DEC reviewed Discharge Monitoring Reports (DMRs) submitted from July 2017 through January 2023 to determine the facility's compliance with effluent limits. There were no exceedances of effluent limits during this time period and Table 4 summarizes DEC Compliance and Enforcement actions at the Nutrien Kenai Nitrogen Operations plant.

Table 1- Compliance and Enforcement Actions

Date	Activity	Summary
December 17, 2019	Routine Inspection	No violations and no deficiencies observed
October 28, 2021	Routine Off site Inspection via Teams	No violations and no deficiencies observed
December 4, 2023	Routine Inspection	Compliance letter for late DMR's

3.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

3.1 Basis for Permit Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of AS 46.03 and is in accordance with the CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Water Quality Standards (WQS), and (3) comply with other state requirements that may be more stringent.

The Clean Water Act (CWA) requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the Water Quality Standards (WQS) of a water body are met and may be more stringent than TBELs. Both TBELs (Code of Federal Regulations (CFR) 40 CFR § 418 adopted by reference in 18 AAC 83.010) and WQBELs are included in the permit. A detailed discussion of the basis for the effluent limits contained in AK0000507 is provided in APPENDIX A.

3.2 Basis for Effluent and Receiving Water Monitoring

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving waterbody quality. The permittee is

responsible for conducting the monitoring and for reporting results on NetDMR or with the application for reissuance, as appropriate, to the Department.

3.3 Effluent Limits and Monitoring Requirements

Monitoring is required to determine compliance with effluent limitations and/or for use in future reasonable potential analyses (RPA). The permit requires monitoring of wastewater that is discharged through Outfall 001A for flow, ammonia, organic nitrogen, temperature, oil and grease, total residual chlorine (TRC), arsenic, copper, manganese, nickel, zinc, total aromatic hydrocarbons (TAH), total aqueous hydrocarbons (TAqH), whole effluent toxicity (WET), and production values for urea and ammonia to determine compliance with the effluent limitations and/or for use in future reasonable potential analyses (RPA).

Monitoring frequencies are based on the nature and effect of a pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than are required under the permit. These samples must be used in calculations and used for averaging if they are conducted using Department-approved test methods (generally found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]) and if the method detection limits are less than the effluent limits.

The reissued permit is based on monitoring requirements and applicable effluent limits for the North Complex only, which consists of Ammonia plant #1, #4 and Urea plant #5, should the plant even become operational in this next permit cycle. Monitoring with report only requirements from the previous APDES permit cycle for flow, temperature, arsenic, copper, manganese, nickel, zinc, total aromatic hydrocarbons (TAH), total aqueous hydrocarbons (TAqH), whole effluent toxicity (WET) have been carried forward into the reissued permit. For the reporting of flow, the permit will also require maximum daily in addition the monthly average. Effluent limits for oil and grease and pH will remain the same and carried forward in the reissued permit. Effluent limits for ammonia were calculated using both a TBEL and WQBEL then compared and the WQBEL was found to be more stringent than the proposed TBEL and will be set forth in the reissued permit. Effluent limits for Urea (Organic Nitrogen, as N) were calculated using a TBEL and will be set forth in the reissued permit. For the TRC, the Nutrien KNO agreed to implement a dechlorination unit upon start up as required by their prior permit's TRC treatability study. However, after further discussion, Nutrien KNO acknowledged that even with the proposed implementation of a dechlorination system, their general effluent system would still be incapable of meeting the TRC water quality criteria end of pipe limits of .0075 mg/L for the average monthly limit and .013 mg/L for the daily maximum limit. While this is standard for other major and non-major facilities, both the DEC and Nutrien KNO agreed their TRC effluent limits would be calculated using the ammonia dilution factors in order to establish limits in this permit. The ammonia dilution factors are more stringent than in prior permit cycle, so the proposed TRC limits will be set forth in the reissued permit .

A detailed discussion of the basis for the effluent limits contained in AK0000507 is provided in APPENDIX A.

Table 2 contains Outfall 001A Effluent limits and monitoring requirements.

Table 3 contains effluent limits and monitoring requirement changes from the last permit issuance.

Table 2- Outfall 001A Effluent Limits and Monitoring Requirements

Parameter		Effluent Limits				Monitoring Requirements		
	Units [a]	Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Discharge Flow	mgd	N/A	Report	N/A	Report	Effluent	Continuous [b]	Recorded
Total Ammonia, as N	mg/L	N/A	181	N/A	376	Effluent	1/Week	24-hour Composite [c]
	lbs/day [d]	N/A	1,135	N/A	2,358			
Organic Nitrogen, as N	mg/L	N/A	127	N/A	238	Effluent	1/Week	24-hour Composite [c]
	lbs/day	N/A	796	N/A	1,492			
Temperature [e]	° C	N/A	N/A	N/A	Report	Effluent	Continuous [b]	Recorded
Oil and Grease [f]	mg/L	N/A	N/A	N/A	15	Effluent	1/Week	24-hour Composite [c]
Total Residual Chlorine (TRC) [g]	mg/L	N/A	0.26	N/A	0.53	Effluent	Continuous [b]	Recorded
	lbs/day [d]	N/A	1.6	N/A	3.3		1/Day	Calculated
pH	SU	6.0	N/A	N/A	9.0	Effluent	Continuous [b]	Recorded
Arsenic, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite [c]
Copper, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite [c]
Manganese, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite [c]
Nickel, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite [c]
Zinc, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite [c]
Total aromatic hydrocarbons	µg/L	N/A	N/A	N/A	Report	Effluent	1/Quarter	Grab
Total aqueous hydrocarbons	µg/L	N/A	N/A	N/A	Report	Effluent	1/Quarter	24-hour Composite [c]
Production	Air dried tons per day	N/A	N/A	N/A	Report	N/A	1/Day [h]	N/A

Footnotes:

a. Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, SU= standard units, °C= degrees Celsius, FC/100 mL = Fecal Coliform per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, µg/L = micrograms per liter

b. Continuous recording may be interrupted for infrequent shutdowns for maintenance, process changes, or similar activities.

c. See Appendix C for a definition.

d. lbs/day = concentration (mg/L) x flow (mgd) x 8.34 (conversion factor).

e. Temperature shall be reported as instantaneous maximum.

f. Method 1664 may be used.

g. The TRC effluent limits are not quantifiable using EPA-approved analytical methods. DEC will use the minimum level (ML) of 0.1 mg/L as the compliance evaluation level for this parameter.

h. The maximum daily production values for urea and ammonia for the previous year shall be submitted with the January Discharge Monitoring Report of the following year.

Table 3- Changes to Effluent Limits and Monitoring Requirements

Parameter	Units	Average Monthly Limit		Maximum Daily Limit		Sample Frequency	
		2016 Permit	2024 Permit	2016 Permit	2024 Permit	2016 Permit	2024 Permit
Total Ammonia, as N	lbs/day	1849	1135	3636	2358	1/week	1/week
Organic Nitrogen, as N	lbs/day	2842	796	5313	1492	1/week	1/week
Total Chlorine Residual	mg/L	1.43	0.33	4.75	0.53	Continuous	Continuous

3.4 Whole Effluent Toxicity Monitoring

Alaska WQS at 18 AAC 70.030 require that an effluent discharged to a water may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TUc at the point of discharge, or if the Department authorizes a mixing zone in a permit, approval, or certification, at or beyond the mixing zone boundary, based on the minimum effluent dilution achieved in the mixing zone.

WET tests are laboratory tests that measure the total toxic effect of an effluent on living organisms. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two different durations of toxicity test: acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure. State regulation 18 AAC 83.335 recommends chronic testing for facilities with dilution factors less than 100:1 at the boundary of the mixing zone, acute testing for facilities with dilution factors greater than 1000:1 at the boundary of the mixing zone, and either acute or chronic for dilution factors between 100:1 and 1000:1 at the boundary of the mixing zone.

In the prior permit cycle, the KNO was not operational and therefore there was no toxicity reported at the previous permit's critical concentration of 0.16%. The critical concentration of 0.16% had been revised from the prior permit issuance to both account for the new CORMIX mixing zone driver as being ammonia, as well as reflect the WQS requirement of meeting 1.0 chronic toxic unit at the boundary of the chronic mixing zone (after accounting for dilution available in the authorized chronic mixing zone). The critical concentration for this permit issuance has been revised to 0.36% to reflect the WQS requirement of meeting 1.0 chronic toxic unit at the boundary of the chronic mixing zone (after accounting for dilution available in the authorized chronic mixing zone) (See 18 AAC 70.030)

The CORMIX mixing zone analysis showed that the expected dilution at the boundary of the chronic regulatory mixing zone would be 278:1 for this permit cycle. Dividing 1by 278 produces the critical dilution. Therefore, the toxicity testing on each organism shall include a series of five test dilutions and a control in order to bracket the expected dilution at the boundary of the chronic regulatory mixing zone which is driven by ammonia, and to stay under the limit of percent brine that can be used in a marine toxicity test.

The previous permit required that permittees conduct chronic toxicity tests when the facility's is fully operational as defined in Permit Section 1.5.1, with the monitoring on a quarterly basis during the permit term. This requirement shall be carried over for the KNO Plant in the reissuance. A WET monitoring frequency reduction or discontinuance may be requested by the permittee and granted by Department written approval if WET results from four consecutive quarters demonstrate that the effluent discharge does not exceed toxicity at the maximum dilution concentration. The permittee must continue to conduct WET tests on effluent composite

samples using one vertebrate and one invertebrate species as follows:

- Vertebrate (survival and growth): Atherinops affinis (Topsmelt). In the event that topsmelt is not available, Menidia beryllina (inland silverside) may be used as a substitute. The permittee shall document the substitute species in the WET report following the testing.
- Invertebrate: For larval development tests, the permittee must use the bivalve species Crassotrea gigas (Pacific oyster) or Mytilis spp. (mussel). 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)

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, 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).

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

- If organisms are not cultured by the testing laboratory, concurrent testing with reference toxicants must be conducted, unless the test organism supplier provides control chart data from at least the last 5 months of reference toxicity testing. Where organisms are cultured by the testing laboratory, monthly reference toxicant testing is sufficient.
- If either of the reference toxicant tests or the effluent tests does not meet all test acceptability criteria as specified in the test methods manual, then the permittee must re-sample and re-test as soon as possible.
- Control and dilution water should be receiving water or salinity adjusted laboratory water. If the dilution water is different from the culture water, a second control using culture water must also be used.

The permit also requires accelerated WET testing if toxicity is greater than 278 TUc in any test. The permit requires two more biweekly WET tests be conducted over a four week period. If the permittee demonstrates through an evaluation of the facility operations that the cause of the exceedance is known and corrective actions have been implemented, only one accelerated test is required. If toxicity is greater than 278 TUc in any of the accelerated tests, the permittees must initiate a Toxicity Reduction Evaluation (TRE). A TRE is required so that the specific cause of the toxicity can be identified and mitigated (see section 1.3.5 of the permit for further details). If a TRE is initiated, a toxicity identification evaluation (TIE) may be initiated and must be performed in accordance with EPA guidance manuals, similar to other recently issued APDES permits that require WET testing and discharge to marine waters.

3.5 Receiving Waterbody Monitoring Requirements

Receiving water monitoring was established in the previous permit to monitor for total ammonia, pH, temperature, and salinity. The DEC is maintaining the receiving water monitoring to gather a more robust and statistically meaningful ambient data set for temperature, pH, and salinity which can then be used for future mixing zone decisions. Data for ammonia and TRC will be used to evaluate the presence of these parameters outside of the calculated mixing zone and should be included in an annual report.

In the prior permit cycle, TRC was the pollutant of concern and therefore the mixing zone driver. The DEC required a TRC treatability study and the KNO chose to install dechlorination if or upon startup of normal operations to include just the North Complex only of plant #1, #4, and #5. With the decision by KNO of implementation of dichlorination and as a result of the treatability study, the Permit Section 1.5.13 in the prior permit has been removed and the receiving water requirements have been reduced to three monitoring locations.

One background station at a point representative of the quality of Cook Inlet, not influenced by the facility's discharge and two at the boundary of the chronic mixing zone. Sampling at the boundary of the chronic mixing zone shall be taken at two locations. One sample representative of the chronic mixing zone length boundary and one sample representative of the chronic mixing zone width boundary shall also be collected. The monitoring requirements are also listed in Table 4.

Table 4. Receiving Water Monitoring Requirements

Parameter	Units	Background Sampling Frequency	Boundary of Mixing Zone Sampling Frequency	Sample Type
TRC	µg/L	Once per quarter between May 1 and October 31 [a]	1/Quarter	Grab
Total Ammonia as N	mg/L		1/Quarter	Grab
Temperature	°C		N/A	Grab
pH	Standard Units		1/Quarter	Grab
Salinity	grams/kilogram		N/A	Grab

Footnote:

a. Quarterly means one sample in each of the following time periods: April-June, July-Sept, Oct-Dec

4.0 RECEIVING WATERBODY

4.1 Description of Receiving Waterbody

Cook Inlet is a 217 mile (350 kilometer) long, narrow, and semi-enclosed waterbody that has a free connection to the open ocean with a general northeast-southwest orientation. It is divided naturally into the upper and lower regions by the East and West Forelands, where Cook Inlet is approximately 10 miles (16 kilometers) wide. The East and West Forelands constrict water flow and influence the movement of water. Cook Inlet, and its channels, coves, flats, and marshes, are a mixture of terrestrial sources from numerous river drainages and marine waters of Shelikof Strait and the Gulf of Alaska. Tidal components are responsible for mixing freshwater inputs from rivers within Cook Inlet and from the Alaska Coastal Current entering Cook Inlet at Kennedy Entrance. Cook Inlet varies in width from about 62 miles (100 kilometers) near the entrance to less than 12 miles (20 kilometers) at its head. It has shoals towards its head where it separates into two narrow shallow arms (Knik and Turnagain).

4.2 Outfall Location

The Nutrien Kenai Nitrogen Operations discharges treated effluent into marine waters of Cook Inlet at latitude 60.67151211 North by 151.39174974 West. The outfall is comprised of a six port, 0.5 meter long diffuser oriented vertically in the water column on the KNO wharf dock.

4.3 Water Quality Standards

Section 301(b)(1)(C) of the CWA required the development of limits in permits necessary to meet water WQS by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with WQS. Additionally, regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the WQS. The State's WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system identifies the designated 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 designated use classification of each waterbody. The antidegradation policy ensures that the existing uses and the level of water quality necessary to protect the uses are maintained and protected.

Water bodies 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 criteria per 18 AAC 70.235, such as those listed under18 AAC 70.236(b). The receiving water for this discharge, Cook Inlet, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, existing uses and designated uses are the same and Cook Inlet must be protected for all marine use classes listed in 18 AAC 70.020(a)(2). These marine water designated uses consist of the following: (A) water supply (aquaculture, seafood processing, and industrial), (B) water recreation (contact and secondary), (C) growth and propagation of fish, shellfish, other aquatic life, and wildlife, and (D) harvesting for consumption of raw mollusks or other raw aquatic life

4.4 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not, or is not, expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the State's impaired waterbody list. Cook Inlet is not included on any of the impaired water body lists catalogued in *Alaska's Final 2018 Integrated Water Quality Monitoring and Assessment Report*, June 23, 2020 (Alaska's 2018 Integrated Report).

4.5 Mixing Zone Analysis

In accordance with 18 AAC 70.240, the Department may authorize a mixing zone in a permit. A chronic mixing zone is sized to protect the ecology of the waterbody as a whole and an acute mixing zone is sized to prevent lethality to passing organisms.

The Nutrien KNO submitted their initial application for reissuance and proposed mixing zone, December 30, 2021, for ammonia, arsenic, TRC, copper, manganese, mercury, nickel, zinc, whole effluent toxicity, and temperature with TRC as the driving pollutant of concern for their requested mixing zone. After review of the application and technical document submitted, the DEC determined that the Nutrien KNO would need to modify their permit application and remodel their mixing zone with ammonia as the driver. This was due to prior permit requirements as it pertained to a TRC treatability study and that in their initial application for reissuance, their proposed mixing zone size increased along with their dilution factors for both acute and chronic. The KNO submitted a revised application on March 29, 2022, for ammonia, arsenic, chlorine, copper, manganese, mercury, nickel, zinc, whole effluent toxicity, and temperature with ammonia as the chronic mixing zone driver and copper as the acute mixing zone driver. Upon review and meetings between the DEC and Nutrien KNO, more information regarding the proposed discharge was discovered and the DEC learned that Nutrien KNO only had potential plans to start up and operate using the North Complex of the facility, based again on the availability of natural gas, but would significantly reduce both production and flow. Additionally, in the prior permit cycle development, the DEC evaluated ammonia, TRC, arsenic, chromium, copper, manganese, nickel, and zinc, for reasonable potential using the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (APDES RPA Guide, DEC 2014). Only ammonia and TRC had sufficient sample data to make reasonable potential and effluent limit decisions, so the DEC made the determination that Nutrien KNO would use ammonia as the driver for both acute and chronic in this reissuance. The DEC asked for a revised application and mixing zone from the Nutrien KNO which was received and submitted on July 17, 2023. In the Nutrien KNO Technical Revision 2 doc, and third application submittal, the KNO then requested a proposed mixing zone for ammonia, arsenic, chlorine, copper, manganese, mercury, nickel, zinc, whole effluent toxicity, and temperature. DEC evaluated their submittal and analysis is detailed below.

Appendix D outlines the regulatory criteria that must be met 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 DEC's mixing zone analysis:

4.5.1 Size

In accordance with 18 AAC 70.255, the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, the DEC used CORMIX to model the chronic and acute mixing zones. 18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed the facility's effluent monitoring data from May 2017 through January 2024 to identify pollutants of concern and to determine which pollutants have reasonable potential to exceed water quality criteria and then which pollutant require the most dilution to meet both chronic and acute water quality criteria.

Mixing zone modeling was conducted using CORMIX Version 12.0GTD. CORMIX is a widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. CORMIX predicts the distance at which a modeled parameter meets water quality criteria as well as the corresponding dilution at that point.

As indicated in section 4.5 of the Fact Sheet, DEC made the determination that Nutrien KNO would use ammonia as the driver for both acute and chronic in this reissuance. The DEC reviewed KNO's revised and final Technical Document Revision 2 , Forms 2M, 2G, RPA and CORMIX runs and found that the ammonia water quality results used to establish the ammonia criteria was derived from long term averages which were based on a combination of ambient seawater field data gathered from another facility for the months of April, August, and November only and resulted in KNO using a receiving water pH of 8.0, salinity of 29 g/kg, and a temperature of 6.2 degrees C. The temperature long term average, as noted on Table 11 of Technical Document Revison 2, was taken from the NOAA NKTA2 bouy station. This calculated the resulted criteria of ammonia-N to be an acute (CMC) of 20.4 mg/L and a chronic (CCC) of 3.0 mg/L. Additionally, the KNO used the ammonia-N technology-based maximum daily limit (MDL) (lbs/day) converted to an end of pipe concentration (mg/L) using the 10th percentile observed critical low flow for the Facility of .310 MGD in order to establish the maximum effluent concentration of 929 mg/L which was also used in the Nutrien KNO CORMIX modeling.

The DEC found these data sets, flow, and ammonia calculations to be inconsistent with our Effluent Limit Guidelines (ELGs). For the flow used and subsequent calculations as it pertains to the mixing zone, the ELG's state that the 10^{th} percent of critical low flow can be used for streams, rivers, or other flowing fresh waters, also referenced in 18 AAC 70(*l*)(2). As mentioned above, the Nutrien KNO used the .310 MGD based on a 10^{th} percentile critical low flow derived from historical plant flow of .870 MGD, but then used the total design flow of 2.1 MGD (0.0921 m^3/s**)** in their CORMIX runs. The Nutrien KNO is a marine discharger and our ELG's state that for industrial dischargers without treatment systems, batch treatment systems, or where no design flow information is available, the permit writer should use actual flows as the critical effluent flow. The DEC determined that the actual flow of .752 provided in the water balance sheet would be used for flow. The ELG's require salinity, temperature and pH sampling data to be done during the critical season of May-October in marine receiving waters and although the DEC did try to use the combined ambient data from the month of August for pH and salinity, it was determined that due to lack of data points , the calculated acute (CMC) and chronic (CCC) would not size the mixing zone as small as practicable, and in fact increase the dilutions from the current permit. In the prior permit development, ammonia was initially the mixing zone driver prior to the TRC being selected. The decision was made at that time at the management level that a water temperature of 15° C, a pH of 8, and a receiving water salinity of 20 g/kg would be used as default inputs in order to determine a reasonable worst-case scenario to establish water quality criteria for ammonia. The DEC did run a current temperature data set from the NKTA2 bouy referenced in the Nutrien KNO Technical Revision Doc 2 for May-October, with temperature readings taken at same time each day in 2023, which resulted in an 85^{th} percentile of 13° C. Using our RPA guidance, the DEC then used a pH of 8, Salinity of 20 g/kg and temperature of 13° C in order to establish the reasonable worst case scenario for the proposed discharge. The DEC carried these criteria

over in establishing the acute criterion of 9.38 mg/L and chronic criterion of 1.4 mg/L to be used in the RPA that DEC conducted. A back calculation was then done using the actual mass based TBEL based on actual flow (.752 MGD taken from Technical Document Revision 2 ,Table 3) as per our ELG's as they pertain to Industrial dischargers, in order to determine the most stringent CORMIX input MEC of 389 mg/L for ammonia. Nutrien KNO provided water velocities of 0.252 meters per second (m/s) and 2.280 m/s, however the DEC determined the mixing zone was better sized using 0.1 meters per second (m/s) and 0.9 m/s with the use of the actual flow. This created a small as practicable mixing zone for the proposed reduced discharge at the Nutrien KNO facility for this permit cycle.

The chronic mixing zone in the previous permit for Outfall 001 was 822 meters long by 24 meters wide with a dilution factor of 633:1 and an acute mixing zone that was 478 meters long by .06 meters wide with a dilution factor of 365:1. For this permit issuance , and with the discovery of new information including significantly reduced production and flow, the DEC proposes to authorize a chronic mixing zone for Outfall 001 that is 264 meters long and 14 meters wide with a dilution factor of 278:1 and an acute mixing zone for Outfall 001 that is 11 meters long and .06 meters wide with a dilution factor of 41:1. The parameters included in the chronic and acute mixing zone for this permit issuance are for ammonia, pH, temperature, total residual chlorine, and WET.

According to EPA's Technical Support Document for Water Quality-based Toxics Control, lethality to passing organisms would not be expected if an organism passing through the plume along the path of maximum exposure is not exposed to concentrations exceeding the acute criterion when averaged over a one-hour time period. Furthermore, the travel time of an organism drifting through the acute mixing zone must be less than approximately 15 minutes if a one-hour exposure is not to exceed acute criterion. DEC determined that the travel time of an organism drifting through the Outfall 001 acute mixing zone to be approximately 22 seconds.

Table 6 summarizes the final CORMIX input data that was used to model ammonia, the driving parameter of the acute and chronic mixing zone for Outfall 001.

Table 5- Summary of CORMIX Input Data

Parameter Modeled	Maximum Expected Concentration	Ambient Concentration	Chronic Water Quality Criterion	Acute Water Quality Criterion
Total Ammonia, as N	389 mg/L	0.2 mg/L	1.4 mg/L	9.38 mg/L
Outfall and Receiving Waterbody Characteristics				
Discharge Geometry	Submerged Multiport Diffuser Discharge modeled as Single Port Discharges			
Discharge Location	Right Bank			
Outfall Length	488 meters			
Port Diameter	.0585 meters			
Depth at Discharge	17.1 meters			
Ambient Velocity	.1 m/s acute .9 m/s-chronic			
Wind Velocity	4.1 m/s			
Effluent Characteristics				
Flow Rate	0.752 mgd (0.0329 m^3/s)			

4.5.2 Technology

In accordance with 18 AAC 70.240(c)(1), the Department finds that available evidence reasonably demonstrates that the wastewater at the Nutrien Kenai Nitrogen Operations will be treated to remove, reduce, and disperse pollutants using methods found by the Department to be the most effective and technological and economical feasible, consistent with the highest statutory and regulatory treatment requirements.

TBELs and WQBELs have been calculated for ammonia (as N) and organic nitrogen (as N) in accordance with effluent limit guidelines (ELGs) found at 40 CFR § 418.23 Subpart B and 40 CFR § 418.33 Subpart C (as adopted by reference at 18 AAC 83.010) and in all cases average monthly limits and maximum daily limits for these parameters are less than the 2017 APDES permit (See APPENDIX B).

TRC does not have a requirement under the ELGs for this industrial category, however, the Nutrien KNO completed their TRC treatability study in the last permit issuance and have agreed to implement a dichlorination system upon start up to discharge. Since they are currently not operational, a WQBEL has been developed again and implemented in this permit issuance and is also less than the 2017 APDES permit. There are still no other treatment requirements of 18 AAC 70 nor 18 AAC 83 applicable to this type of discharge, therefore DEC has determined that the mixing zone requirements of 18 AAC 70.240 have been met.

4.5.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B)(C), the mixing zone has been appropriately sized to fully protect the existing uses of the Cook Inlet. The Cook Inlet's existing uses and biological integrity have been maintained and protected under the terms of the previous permit and shall continue to be maintained and protected under the terms of the reissued permit. Water quality criteria for pollutants that demonstrated reasonable potential to exceed water quality criteria will be met prior to or at the boundaries of the mixing zones. Designated and existing uses in the Cook Inlet that are beyond the boundaries of the mixing zones will be maintained and protected.

4.5.4 Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d)(6) the pollutants discharged cannot produce an objectionable color, taste, or odor in aquatic resources harvested for human consumption. There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption.

There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Additionally, the discharge has not precluded or limited established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption and primary contact recreation should not take place in the mixing zone.

4.5.5 Spawning Areas

In accordance with 18 AAC 70.240(f), a mixing zone is not authorized in an area of anadromous fish spawning or resident fish for spawning redds for Arctic Grayling (Thymallus arcticus), northern pike (Esox lucius), inconnu/sheefish (Stenodus leucichthys) and all other whitefish in Alaska belonging to genera Prosopium and Coregonus, Arctic char (Salvelinus alpinus), Dolly Varden (S. malma), brook trout (S. fontinalis), rainbow trout (Oncorhynchus mykiss), cutthroat trout (O. clarkia), burbot Lota, landlocked coho salmon (O.kisutch), Chinook salmon (O. tshawytscha), and sockeye salmon (O. nerka).

The mixing zone is authorized in the marine waters of Cook Inlet.18 AAC 70.240(f), which prohibits authorizing

mixing zones in streams, rivers or other flowing fresh waters used for anadromous or resident fish spawning, does not apply. Discharges to fresh waters are not authorized under the permit

ADF&G's Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes available at https://www.adfg.alaska.gov/static- sf/AWC/PDFs/2020int_CATALOG.pdf does not identify the Cook Inlet near the Nutrien KNO outfall as important for the spawning, rearing, or migration of anadromous fishes.

4.5.6 Human Health

In accordance with 18 AAC 70.240(d)(1), the mixing zone must not contain bioaccumulating, bioconcentrating, or persistent chemicals above natural or significantly adverse levels. 18 AAC 70.240(d)(2), states that the mixing zone must not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by DEC and consistent with 18 AAC 70.025.

An analysis of the effluent data and the results of the RPA conducted on pollutants of concern indicated that the level of treatment at the Nutrien KNO is protective of human health. The effluent data was used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all water quality criteria are met in the waterbody at the boundary of the mixing zone.

4.5.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, mixing zones authorized in the permit shall be protective of aquatic life and wildlife. The mixing zones do not form a barrier to migratory fish species or fish passage, nor will it result in a reduction of fish population levels. A toxic effect will not occur in the water column, sediments, or biota outside the boundaries of the mixing zones. The CORMIX mixing zone modeling conducted for this discharge incorporated the most stringent water quality criteria in the models for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife, and all water quality criteria will be met at the boundary of the authorized mixing zone.

4.5.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zones will not cause an adverse effect on threatened or endangered species. The United States Fish and Wildlife Service (USFWS) did not identify any threatened or endangered species under their jurisdictions in the vicinity of the Nutrien KNO outfall.

DEC contacted Jodi Pirdle of the National Oceanic and Atmospheric Administration (NOAA) on March 6, 2024, to inquire about whether a discharge from the outfall of the Nutrien KNO would impact any threatened or endangered species. Jodi responded the same day and referred me to the Alaska EFH website that could assist DEC with EFH in the project area. After reviewing the website and dischargers within the same are, DEC concluded that the following are in an EFH in the Cook Inlet.

- Beluga whale, Cook Inlet Distinct Population Segment (DPS) (E)
  - Cook Inlet Beluga Critical Habitat, Area 2
- Humpback whale, Mexico DPS (T) & Western North Pacific DPS (E)
- Fin whale (E)
- Steller sea lion, Western DPS (E)

She also said that she had forwarded my request to their generic email at nmfs.akr.habitat@noaa.gov .

DEC will provide a copy of the permit and fact sheet to the USFWS and NMFS. Any comments received from the agencies regarding endangered species will be considered prior to issuance of the permit.

See Section 8.1 of the fact sheet for more information regarding endangered species.

5.0 ANTIBACKSLIDING

18 AAC 83.480 requires that "interim effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changed since the permit was issued, and the change in circumstances would cause for permit modification or revocation and reissuance under 18 AAC 83.135." 18 AAC 83.480(c) also states that a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made. EPA's Interim Guidance for Performance-Based Reduction of NPDES Monitoring Frequencies (EPA, 1996), states that monitoring requirements are not considered effluent limitations under the CWA, and therefore Antibacksliding prohibitions would not be triggered by reductions in monitoring frequencies.

The effluent limitations in this permit reissuance are consistent with 18 AAC 83.480. Therefore, the permit effluent limitations, standards, and conditions in AK0000507 are as stringent as in the previously issued permit. Accordingly, no further backsliding analysis is required for this permit reissuance.

6.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for water bodies 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. The State's Antidegradation policy is found in the 18 AAC 70 WQS regulations at 18 AAC 70.015. The Department's approach to implementing the Antidegradation policy is found in 18 AAC 70.016 Antidegradation implementation methods for discharges authorized under the federal Clean Water Act. Both the Antidegradation policy and the implementation methods are consistent with 40 CFR 131.12 and approved by EPA. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation policy and implementation methods.

Using the policy and corresponding implementation methods, the Department determines a Tier 1 or Tier 2 classification and protection level on a parameter-by-parameter basis. A Tier 3 protection level applies to a designated water. At this time, no Tier 3 waters have been designated in Alaska.

18 AAC 70.015(a)(1) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected (Tier 1 protection level).

The Cook Inlet is not listed as impaired (Category 4 or 5) in Alaska's 2018 Integrated Water Quality Monitoring and Assessment Report; therefore, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

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

The Department may allow a reduction of water quality only after the specific analysis and requirements under 18 AAC 70.016(b)(5)(A-C), 18 AAC 70.016(c), 18 AAC 70.016(c)(7)(A-F), and 18 AAC 70.016(d) are met.

The Department's findings are as follows:

18 AAC 70.016(b)(5)

(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;

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

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

18 AAC 70.020 and 18 AAC 70.050 specify the protected water use classes for the State; therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (DEC 2008) apply and were evaluated. This will ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected.

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 restrictive of these limits. The water quality criteria, upon which the permit effluent limits are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. WQBELs are set equal to the most stringent water quality criteria available for any of the protected water use classes. This also ensures that the resulting water quality at and beyond the boundary of any authorized mixing zone will fully protect all existing and designated uses of the receiving waterbody as a whole.

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

***18 AAC 70.016(c)(7)(A –F)** if, after review of available evidence, the department finds that the proposed discharge will lower water quality in the receiving water, the department will not authorize a discharge unless the department finds that*

***18 AAC 70.016(c)(7)(A)** the reduction of water quality meets the applicable criteria of 18 AAC 70.020(b),18 AAC 70.030, or 18 AAC 70.236(b), unless allowed under 18 AAC 70.200, 18 AAC 70.210, or 18 AAC 70.240;*

Permit Section 1.3.2 requires that the discharge shall not cause contamination of surface or ground waters or a violation of the WQS at 18 AAC 70 except if excursions are allowed in the permit and the excursions are authorized in accordance with applicable provisions in 18 AAC 70.200 – 70.240 (e.g., variance, mixing zone). As a result of the facility's reasonable potential to exceed water quality criteria for ammonia, TRC, pH, temperature, and WET, a mixing zone is authorized in the Nutrien KNO permit in accordance with 18 AAC 70.240. The resulting effluent end-of pipe limitations and monitoring requirements in the permit (See Table 2) protect WQS, and therefore, will not violate the water quality criteria found at 18 AAC 70.020.

Alaska WQS at 18 AAC 70.030 requires that an effluent discharged to a waterbody may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TUc, at the point of discharge, or if the Department authorizes a mixing zone in a permit, approval, or certification, at or beyond the mixing zone boundary, based on the minimum effluent dilution achieved in the mixing zone.

The Department has authorized a chronic mixing zone for this permit with a dilution of 278:1, and subsequently assigned 278 TUc as the chronic toxicity trigger. If the WET trigger is not exceeded, the Nutrien KNO will not violate the WET limit in 18 AAC 70.030. Should the WET trigger be exceeded, the permittee is required to initiate accelerated testing. If the permittee demonstrates through an evaluation of the facility operations that the cause of the exceedance is known and corrective actions have been implemented, only one accelerated test is required. Should any of test results exceed 278 TUc, the permittee must initiate a TRE which is designed to

identify the cause of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and confirm effluent toxicity reduction as a part of a TRE (see Permit Section 1.4 for further details). These permit requirements shall ensure that the effluent will not impart toxicity at or beyond the mixing zone boundary.

There are no site-specific criteria associated with 18 AAC 70.236(b). The permit does not authorize short term variances or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210.

DEC determined that the reduction in water quality will not violate the criteria of 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b) and that the finding is met.

18 AAC 70.016(c)(7)(B) *each requirement under (b)(5) of this section for a discharge to a Tier 1 water is met;*

See 18 AAC 70.016(b)(5) analysis and findings above.

18 AAC 70.016(c)(7)(C) *point source and state-regulated nonpoint source discharges to the receiving water will meet requirements under 18 AAC 70.015(a)(2)(D); to make this finding the department will (i) identify point sources and state-regulated nonpoint sources that discharge to, or otherwise impact, the receiving water;* and *(ii) consider whether there are outstanding noncompliance issues with point source permits or required state-regulated nonpoint source best management practices, consider whether receiving water quality has improved or degraded over time, and, if necessary and appropriate, take actions that will achieve the requirements of 18 AAC 70.015(a)(2)(D); and (iii) coordinate with other state or federal agencies as necessary to comply with (i) and (ii) of this subparagraph;*

The requirements under 18 AAC 70.015(a)(2)(D) state:

(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; and

(ii) for nonpoint sources, all cost-effective and reasonable best management practices;

The highest statutory and regulatory requirements are defined at 18 AAC 70.015(d):

(d) For purposes of (a) of this section, the highest statutory and regulatory requirements are

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

(2) any minimum treatment standards identified in 18 AAC 72.050;any treatment requirements imposed under another state law that is more stringent than arequirement of this chapter; and

(3) 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)).

The first part of the definition includes all federal technology-based effluent limit guidelines (ELGs) including "fertilizer manufacturing", at 40 CFR §418, adopted by reference 18 AAC 83.010(g)(3) which are incorporated in this permit.

The second part of the definition references the minimum treatment standards found at 18 AAC 72.050 which states are for domestic wastewater dischargers only. The Nutrien KNO discharges process wastewater or nondomestic wastewater, therefore the treatment standards of 18 AAC 72.050(d) have been applied and met in this permit.

The third part of the definition refers to treatment requirements imposed under another state law that are more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that apply to this permitting action include 18 AAC 15 and 18 AAC 72. Neither the regulations in 18 AAC 15 and 18 AAC 72, nor another state law that the Department is aware of impose more stringent requirements than those found in 18 AAC 70.

The fourth part of the definition refers to WQBELS. WQBELs are designed to ensure that the WQS of a waterbody are met and may be more stringent than TBELs. Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet WQS by July 1, 1977. WQBELs included in APDES permits are derived from EPA-approved 18 AAC 70 WQS. APDES regulation 18 AAC 83.435(a)(1) requires that permits include WQBELs that can "achieve WQS established under CWA §303, including state narrative criteria for water quality."

After review of the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge from the Nutrien KNO meets the highest applicable statutory and regulatory requirements and that the finding is met.

18 AAC 70.016(c)(7)(D)(i-ii) *the alternatives analysis provided under (4)(C-F) of this subsection demonstrates that*

(i) a lowering of water quality under 18 AAC 70.015(a)(2)(A) is necessary; when one or more practicable alternatives that would prevent or lessen the degradation associated with the proposed discharge are identified, the department will select one of the alternatives for implementation; and

(ii) the methods of pollution prevention, control, and treatment applied to all waste and other substances to be discharged are found by the department to be the most effective and practicable.

18 AAC 70.016(c)(7)(E) *except if not required under (4)(F) of this subsection, the social or economic importance analysis provided under (4)(G) and (5) of this subsection demonstrates that a lowering of water quality accommodates important social or economic development under 18 AAC 70.015(a)(2)(A);*

Based on Nutrien KNO's Antidegradation Form 2G, and DEC's review and analysis of the Nutrien KNO monitoring data, identification of a proposed practicable alternative under 18 AAC 70.016(c)(4)(F) is not required as the discharge is neither new nor expanded; therefore, 18 AAC 70.016(c)(7)(D)(i-ii) and 18 AAC 70.016(c)(7)(E) do not apply to the Nutrien KNO discharge.

18 AAC 70.016(c)(7)(F) *18 AAC 70.015 and this section have been applied consistent with 33 U.S.C. 1326 (Clean Water Act, sec. 316) with regard to potential thermal discharge impairments.*

Discharges authorized under the permit are not associated with a potential thermal discharge impairment; therefore, the finding is not applicable.

7.0 OTHER PERMIT CONDITIONS

7.1 Quality Assurance Project Plan

The permittee is required to update, implement, and maintain the facility QAPP. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing, and shipping samples; laboratory analysis; precision and accuracy requirements; data reporting, including method detection/reporting limits; and quality assurance/quality control criteria. The permittee is required to amend the QAPP whenever any procedure addressed by the QAPP is modified. The plan shall be retained either electronically or physically at the facility's office of record and made available to DEC upon request.

7.2 Best Management Practices Plan

In accordance with AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed of. The permittee must review, update as necessary, and implement its BMP Plan within 180 days of the effective date of the permit. The BMP Plan shall prevent or minimize the potential for the release of pollutants to waters and lands of the State of Alaska through plant site runoff, spillage or leaks, or erosion.

The permit contains certain BMP conditions that must be included in the BMP Plan. The BMP Plan shall be retained electronically or physically at the facility's office of record and made available to the Department upon request.

7.3 Operations and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limitations, monitoring requirements, and all other permit requirements at all times. The permittee is required to review and update the O&MP that was required under the previous permit within 180 days of the effective date of the final permit to ensure that it includes appropriate best management practices and pollution prevention measures. The plan shall be retained on site and made available to the Department upon request.

7.4 Electronic Discharge Monitoring Report

The permittee must submit DMR data electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127) upon the effective date of the permit. Authorized persons may access permit information by logging into the NetDMR Portal (https://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., mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website at https://dec.alaska.gov/water/compliance/electronic-reporting-rule that contains general information about this new reporting format. Phase II of the E-Reporting rule will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to occur during the term of the permit. The permittee should monitor DEC's E-Reporting Information website (http://dec.alaska.gov/water/compliance/electronic-reporting-rule) 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.

7.5 Standard Conditions

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

8.0 OTHER LEGAL REQUIREMENTS

8.1 Ocean Discharge Criteria

Section 403(a) of the CWA, Ocean Discharge Criteria, prohibits the issuance of a permit under Section 402 of the CWA 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 of the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation (ODCE). Interactive nautical charts depicting Alaska's baseline plus additional boundary lines are available at:

https://www.charts.noaa.gov/ChartCatalog/Alaska.html and interactive maps at https://alaskafisheries.noaa.gov/mapping/arcgis/rest/services/NOAA_Baseline/MapServer.

The charts and maps are provided for information purposes only. The U.S. Baseline committee makes the official determinations on baseline. Ocean Discharge Criteria are not applicable for marine discharges to areas located landward of the baseline of the territorial sea.

A review of the baseline line maps revealed that the KNO outfall terminus is positioned landward of the baseline of the territorial sea; therefore, Section 403 of the CWA does not apply to the permit, and an ODCE is not required to be completed for this permit reissuance. Further, the permit requires compliance with WQS such that 40 CFR 125.122(b) is met and therefore the discharge is presumed not to cause unreasonable degradation of the marine environment.

8.2 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the USFWS and NMFS to determine whether their actions could beneficially or adversely affect any threatened or endangered species or habitats. NMFS is responsible for administration of the ESA for listed cetaceans, seals, sea lions, sea turtles, anadromous fish, marine fish, marine plants, and corals. All other species (including polar bears, walrus, and sea otters) are administered by the USFWS.

As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions; however, DEC voluntarily contacted the agencies to notify them of the proposed permit issuance and to obtain listings of threatened and endangered species near the discharge. DEC contacted USFWS and NMFS on March 6, 2024, to provide them an early opportunity to notify DEC of any concerns.

The fact sheet and the permit will be submitted to the agencies for review during the public notice period and any comments received from these agencies will be considered prior to issuance of the permit.

8.3 Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) designates EFH in waters used by anadromous salmon and various life stages of marine fish under NMFS jurisdiction. EFH refers to those waters and associated river bottom substrates necessary for fish spawning, breeding, feeding, or growth to maturity—including aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish. Spawning, breeding, feeding, or growth to maturity covers a species' full life cycle necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Section 305(b) of the Magnuson-Stevens Act 916 USC 1855(b)) requires federal agencies to consult NMFS when any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated EFH as defined by the Act. As a State agency, DEC is not required to consult with NMFS regarding permitting actions, but voluntarily contacts NMFS to notify them of the proposed permit issuance and to obtain listings of EFH in the area.

DEC contacted NMFS on March 6, 2024, to provide them with early notification of DEC's intent to reissue AK0000507 and to provide them the opportunity to share concerns with DEC regarding EFH.

This fact sheet and the permit will be submitted to the agencies for review during the public notice period and any comments received from these agencies will be considered prior to issuance of the permit.

8.4 Permit Expiration

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

9.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2022. Integrated water quality monitoring and assessment report. https://dec.alaska.gov/water/water-quality/integrated-report#2018 Accessed February 6, 2024.

ADEC, 2020. 18 AAC 70, Water Quality Standards, as amended through March 5, 2020.

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Alaska Department of Fish and Game. 2022. Catalog of waters important for spawning, rearing, or migration of anadromous fishes-coastal region, effective June 15, 2022.

Doneker, Robert and Jirka, Gerhard. 2007. CORMIX user manual, U.S. Environmental Protection Agency, EPA-823-K-07-001, December 2007.

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U.S. Environmental Protection Agency. USEPA, 1991. Technical support document for water quality-based toxics control, EPA/505/2-90-001, USEPA Office of Water, Washington D.C., March 1991.

USEPA, 1974. Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Basic Fertilizer Chemicals Segment of the Fertilizer Manufacturing Point Source Category.

USEPA Effluent Guidelines Division, Office of Air and Water Programs, Washington, DC, March 1974.
USEPA, 1993. Guidance Manual for Developing Best Management Practices (BMP), EPA 833-B-93-004, USEPA Office of Water, October 1993

APPENDIX A: BASIS FOR EFFLUENT LIMITATIONS

A.1 Statutory and Regulatory Basis

The Clean Water Act (CWA) requires fertilizer manufacturing facilities to meet effluent limits based on available wastewater treatment technology, specifically, technology-based effluent limits (TBELs). TBELs are national in scope and establish performance standards for all facilities within an industrial category or subcategory. The Department may find, by analyzing the effect of an effluent discharge on the receiving water body, that TBELs are not sufficiently stringent to meet water quality standards (WQS). In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBELs), which are designed to ensure that the WQS of the receiving water body are met. A WQBEL is designed to ensure that WQS are maintained, and the waterbody as a whole is protected. In cases where both TBELs and WQBELs have been generated for a particular parameter, the more stringent of the two limits will be selected as the final Permit limit for the parameter.

TBELs for fertilizer manufacturing facilities do not limit every parameter that may be present in the effluent. TBELs have only been developed for ammonia and organic nitrogen. Depending on where the facility draws its water and how it handles its wastewater, the effluent may contain other pollutants not regulated by TBELs. When TBELs do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a WQS for the water body. If a pollutant causes or contributes to an exceedance of a WQS, a WQBEL for the pollutant must be established in the permit.

A.2 Technology Based Effluent Limits

A.2.1 Effluent Limitation Guidelines

The CWA requires technology based controls on effluent from fertilizer manufacturing facilities. Section 301(b)(2) of the CWA requires that, by March 31, 1989, all permits contain effluent limitations which control toxic pollutants and nonconventional pollutants through the use of “best available technology economically achievable” (BAT) and “best conventional pollutant control technology” (BCT) for conventional pollutants. In no case may BCT or BAT be less stringent than “best practicable control technology currently available”, which is a minimum level of control required by section 301(b)(1)(A) of the CWA.

The effluent guidelines and standard for fertilizer manufacturing can be found at 40 CFR Part 418, as adopted by reference at 18 AAC 83.010(g)(3). Nutrien Kenai Nitrogen Operations (the facility) produces both ammonia and urea; therefore it is regulated under 40 CFR Part 418 Subpart B (Ammonia Subcategory) and Subpart C (Urea Subcategory). Subpart C is divided into two types of urea production, including the production of urea solutions and the production of prilled and granular urea. The facility is subject to the provisions applicable to prilled and granular urea production. Table 4 lists the ELG requirements for the Ammonia and Urea Subcategories to 40 CFR § 418 for the facility (40 CFR § 418.23 and 40 CFR § 418.33, respectively).

TABLE 6. Effluent limitations and guidelines representing the degree of effluent reduction attainable by the application of BAT for the Ammonia and Urea Subcategories to 40 CFR § 418

Effluent Characteristics	Effluent Limitations (Ammonia Subcategory mg/L)	
	Maximum for any one day	Average of daily values for 30 consecutive days shall not exceed:
Ammonia (as N), lbs/1,000 lbs of product	0.05	0.025
	Effluent Limitations (Urea Subcategory mg/L)	
	Maximum for any one day	Average of daily values for 30 consecutive days shall not exceed
Ammonia (as N), lbs/1,000 lbs of product	0.53	0.27
Organic Nitrogen (as N), lbs/1,000 lbs of product	0.86	0.46

No significant modification has been made to the facility since 1982, therefore, the facility is classified as an existing source and is subject to the most stringent standard for existing sources, which is BAT. TBELs are calculated from BAT standards listed in 40 CFR § 418.23 and § 418.33(b) which are based on the facility's rate of production; in the prior permit, historical production rates from when all four production plants were operational were used to calculate BAT TBELs (2000 – 2004). For this permit, historical production rates from Plants #1 ,#4, and #5 were used to calculate BAT TBELs supplied by the Nutrien KNO as well as WQBELs were calculated by the DEC using the RPA and it was found that the WQBEL's for Ammonia (as N) was more stringent of the two . The development of the TBELs and WQBELs in the Permit are summarized in the sections that follow. Table 9 lists the Technology-Based Effluent Limits applied in this permit.

TABLE 7. Outfall 001A Technology-Based Effluent Limits

Parameter	Units	Monthly Average	Daily Max
pH	SU	Within the range of 6.0- 9.0	
Organic Nitrogen, as N	mg/L	127	238
	lbs/day	796	1492

A.3 Mass-Based Limitations

Alaska Pollutant Discharge Elimination System (APDES) regulations at 18 AAC 83.540 require that effluent limits be expressed in terms of mass unless they cannot appropriately be expressed by mass, if it is infeasible, or if the limits can be expressed in terms of other units of measurement. Expressing limitations in terms of concentration as well as mass encourages the proper operation of a facility at all times. In order to calculate the mass based limits in this permit cycle, their actual anticipated actual flow from prior production years is used as taken from their Water Balance Sheet supplied with their July 17, 2023 application in the amount of 0.752 MGD.
The mass-based limits are expressed in pounds per day (lbs/day) and are calculated as follows:

mass-based limit (pounds (lbs)/day) = concentration limit (milligrams per liter (mg/L)) × actual flow (million gallons per day (mgd)) × 8.34 (lbs/gallon)

A.4 Water Quality Based Effluent Limitations

A.4.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS. 18 AAC 15.090 requires that permits include terms and conditions to ensure criteria are met, including operating, monitoring, and reporting requirements.

The regulations require the permitting authority to make this evaluation using procedures that account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving waterbody. The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

The CWA requires that the effluent limit for a particular pollutant be the more stringent of either TBELs or WQBELs. TBELs are established by the Environmental Protection Agency (EPA) for many industries in the form of Effluent Limitation Guidelines (ELGs), are based on available pollution control technology and are adopted by reference in 18 AAC 83. The Department adopts the subject ELGs by reference in 18 AAC 83.010.

As previously described, the CWA requires that the effluent limit for a pollutant be the more stringent of either TBELs or WQBELs. The discharge from end of pipe Outfall 001 is required to meet WQBELs set equal to applicable water quality criteria for Ammonia (as N), TRC, and oil and grease.

A.4.2 Reasonable Potential Analysis

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration for each pollutant of concern downstream of where the effluent enters the receiving waterbody. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the receiving waterbody concentration. If the projected concentration of the receiving waterbody exceeds the numeric criterion for a limited parameter, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a WQBEL must be developed.

According to 18 AAC 70.990(38), a mixing zone is an area in a waterbody surrounding, or downstream of, a discharge where the effluent plume is diluted by the receiving water within which specified water quality criteria may be exceeded. Water quality criteria and limits may be exceeded within a mixing zone. A mixing zone can be authorized only when adequate receiving waterbody flow exists, and the concentration of the pollutant of concern in the receiving waterbody is below the numeric criterion necessary to protect the designated uses of the waterbody.

The Department evaluated ammonia, total residual chlorine (TRC), arsenic, chromium, copper, manganese, nickel, and zinc, for reasonable potential using the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (APDES RPA Guide, DEC 2014) in the prior permit issuance. For this permit, only ammonia and TRC had sufficient sample data to make reasonable potential and effluent limit decisions. Therefore, the Department (in accordance with Section 2.4.1 of the APDES RPA Guide) is requiring the permittee continue to sample: arsenic, copper, manganese,

nickel, and zinc twice per year to establish a baseline data set which would inform future permitting decisions regarding these parameters.

A.4.3 Procedure for Deriving Water-Quality Based Effluent Limitations

The *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (Environmental Protection Agency (EPA), 1991) and the WQS recommend the flow conditions for use in calculating WQBELs using steady-state modeling. The first step in developing a water quality-based effluent limits is to develop a WLA for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of WQS or a TMDL in the receiving water body. If a mixing zone is authorized in the permit, the WQS apply at all point outside the mixing zone.

The first step in developing a WQBEL is to develop a WLA for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of the WQC or a total maximum daily load (TMDL) in the receiving waterbody. If a mixing zone is authorized in the permit, the WQC apply at all points outside the mixing zone.

In cases where a mixing zone is not authorized, either because the receiving water body already exceeds the criterion , the receiving water body flow is too low to provide dilution, or for some other reason one is not authorized, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion.

A.4.4 Specific Water-Quality Based Effluent Limitations

A.4.4.1 *Toxic Substances*

The WQS for toxic and other deleterious organic and inorganic substances for freshwater uses are codified in 18 AAC 70.020(b)(11). Individual criteria are summarized in the Department's, *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008. In the WQS, the most stringent criteria for metals, other than arsenic, is the chronic criteria for the protection of aquatic life.

As discussed in Fact Sheet section A.4.1, the Department evaluated ammonia and TRC to determine if there was reasonable potential to exceed water quality criteria in the receiving water body. Table 6 presents the water quality criteria for ammonia and TRC. A summary of the reasonable potential analysis is provided in APPENDIX B.

TABLE 8- Water Quality Criteria

Parameter		Criterion (mg/L)
Ammonia [a]	Acute	9.38
	Chronic	1.4
Total Residual Chlorine	Acute	0.013
	Chronic	0.0075

a. DEC used a receiving water temperature of 13 °C, a pH of 8.0, and a receiving water salinity of 20 g/kg to establish acute and chronic criteria for ammonia.

A.4.4.2 *Petroleum Hydrocarbon, Oils and Grease, for Marine Water Uses*

The WQS for floating, suspended or submerged matter, including oil and grease, are narrative. The most stringent standard, water supply/aquaculture, found at 18 AAC 70.020(b)(17)(A)(i), require that for marine waters, "Total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 µg/L. Total aromatic hydrocarbons (TAH) in the water column may not exceed 10 µg/L. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils 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." Sheen is defined in 18 AAC 70.990(53) as an iridescent appearance on the water surface. TAqH is defined as "collective dissolved and water-accommodated monoaromatic and polynuclear aromatic petroleum hydrocarbons that are persistent in the water column; does not include floating surface oil and grease". TAH is defined as "…the sum of the following volatile monoaromatic hydrocarbon compounds: benzene, ethylbenzene, toluene, and the xylene isomers, commonly called BTEX."

The previous permit issuance contained monitoring for TAH and TAqH and a limit of 15 mg/L for Oil and Grease. DEC retains monitoring for TAH and TAqH and the 15 mg/L limit for Oil and Grease

A.4.4.3 *Total Residual Chlorine*

The WQS at 18 AAC 70.020(b)(23)(C) defines TRC concentrations for aquatic life for marine water, as the concentration of substances in water may not exceed the numeric criteria for aquatic life for marine water shown in the *Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances* (Toxics Manual) which corresponds to a TRC chronic limit of 0.0075 mg/L, and the acute limit of 0.013 mg/L.

Even with the installation of a dechlorination system, it was determined that the Nutrien KNO would still not meet any end of pipe limits and therefore TRC had reasonable potential to violate WQS at the boundary of the authorized mixing zone. WQBEL's were then developed for TRC using the ammonia acute and chronic dilution factors. A reasonable potential analysis was conducted based on the WQS of 13 µg/L for protection from acute effects on aquatic life and 7.5 µg/L for protection from chronic effects on aquatic life. The maximum projected effluent concentration of the calculation of the WQBEL for chlorine, detailed in APPENDIX B, produces an average monthly limitation of 0.26 mg/L and a maximum daily limitation of 0.53 mg/L. These WQBELs will be protective of the waterbody at the boundary of the mixing zone and put forth is this permit issuance.

A.4.5 Selection of Most Stringent Limitations

A.4.5.1 *Total Ammonia (as Nitrogen)*

Total ammonia is the sum of ionized (NH_4^+) and un-ionized ammonia (NH_3). Temperature, pH, and salinity affect which form, NH_4^+ or NH_3 is present. NH_3 is more toxic to aquatic organisms than NH_4^+ and predominates with higher temperature and pH. Biological wastewater treatment processes reduce the amount of total nitrogen in domestic wastewater; however, without advanced treatment, wastewater effluent may still contain elevated levels of ammonia as nitrogen. Excess ammonia as nitrogen in the environment can lead to dissolved oxygen depletion, eutrophication, and toxicity to aquatic organisms.

As stated above in the Fact Sheet section A.1, both TBELs and WQBELs were generated for ammonia and the more stringent of the two limits were chosen. In the prior issuance, it was decided that a water temperature of 15° C, a pH of 8, and a receiving water salinity of 20 g/kg would be used as default inputs in order to determine a reasonable worst-case scenario to establish water quality criteria for ammonia. Current temperature data was taken from the NKTA2 bouy referenced in the Nutrien KNO Technical Revision Doc 2, however DEC used the data from May-October only as per our ELGs, which resulted in an 85th percentile of 13° C for temperature. Using our RPA guidance, the DEC then used a pH of 8, Salinity of 20 g/kg and temperature of 13° C in order to establish the acute criterion of 9.38 mg/L and chronic criterion of 1.4 mg/L. These were then used in the reasonable potential analysis which resulted in WQBELs of 181 mg/L for the AML and 376 mg/L for the MDL. The TBELs were calculated at 189 mg/L for the AML and 395 mg/L for the MDL. Selecting the more stringent, the DEC is using WQBELs in this permit issuance. See Table 11 for selection of ammonia limits.

TABLE 9. Selection of Calculated ammonia permit limits

Ammonia (as N)	Average Monthly (mg/L)	Maximum Daily (mg/L)	Average Monthly (lbs/day)	Maximum Daily (lbs/day)
TBELs	189	395	1185	2477
WQBELs	181	376	1135	2358
Selected Limits	181	376	1135	2358

APPENDIX B. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Alaska Department of Environmental Conservation (the Department or DEC) used to determine if the discharge authorized in the draft permit has the reasonable potential to cause or contribute to a violation of Alaska Water Quality Standards (WQS). The Department used the process described in the *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) (RPA Guide) to determine the reasonable potential for any pollutant to exceed a water quality numeric criterion.

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the Department compares the maximum projected receiving waterbody concentration to the criteria for that pollutant. Reasonable potential to exceed exists if the projected receiving waterbody concentration exceeds water quality criteria, and a water quality-based effluent limit (WQBEL) must be included in the permit (18 Alaska Administrative Code 83.435).

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the discharge. For criteria that are expressed as maxima, the 85th percentile of the ambient data is generally used as an estimate of the worst case. If ambient data is not available, DEC uses 15% of the most stringent given pollutant's criteria as a worst-case example. Ammonia is used as an example to demonstrate the reasonable potential determination process.

B.1 MASS BALANCE

For a discharge to a flowing waterbody, the maximum projected receiving waterbody concentration is determined using a steady state model represented by the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \qquad \text{(Equation B-1)}$$

Where,

C_d = Receiving waterbody concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = Assumed receiving waterbody ambient concentration

Q_d = Receiving waterbody flow rate = $Q_e + Q_u$

Q_e = Effluent flow rate (set equal to the design flow of the wastewater treatment facility)

Q_u = Receiving waterbody flow rate

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_e Q_e + C_u Q_u}{Q_e + Q_u} \qquad \text{(Equation B-2)}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with the receiving waterbody. If a mixing zone based on a percentage of the critical flow in the receiving waterbody is authorized based on the assumption of incomplete mixing with the receiving waterbody, the equation becomes:

$$C_d = \frac{C_e Q_e + C_u(Q_U \times MZ)}{Q_e + (Q_u \times MZ)} \quad \text{(Equation B-3)}$$

Where, MZ = the fraction of the receiving waterbody flow available for dilution. Where mixing is rapid and complete, MZ is equal to 1 and equation C-2 is equal to equation C-3 (i.e., all of the critical low flow volume is available for mixing). If a mixing zone is not authorized, dilution is not considered when projecting the receiving waterbody concentration, and

$$C_d = C_e \quad \text{(Equation B-4)}$$

In other words, if a mixing zone is not authorized, the Department considers only the concentration of the pollutant in the effluent regardless of the upstream flow and concentration. If the concentration of the pollutant in the effluent is less than the WQS numeric criteria, the discharge cannot cause or contribute to a water quality violation for that pollutant. In this case, the mixing or dilution factor (% MZ) is equal to zero and the mass balance equation is simplified to $C_d = C_e$.

Equation B-2 can be simplified by introducing a dilution factor (D):

$$D = \frac{Q_e + Q_u}{Q_e} \quad \text{(Equation B-5)}$$

After the D simplification, this becomes:

$$C_d = \frac{(C_e - C_u)}{D} + cu \quad \text{(Equation B-6)}$$

B.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in section 3.3 of the TSD, "*Determining the Need for Permit Limits with Effluent Monitoring Data*" and the process described in section 2.4 of DEC's RPA Guide. In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving waterbody concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the maximum reported effluent concentration and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from sample estimates for the mean and standard deviation of the data set and associated normal cumulative distribution functions (equation B-8). When fewer than 10 data points are available, the TSD recommends making the assumption that the CV is equal to 0.6. A

CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

DEC used ProUCL, a statistical software program maintained by EPA, to determine that the monitoring data submitted for ammonia follows a Non-Parametric (Kaplan-Meier)distribution. Therefore, the RPM equation in Section 2.4.2.1 of the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* was used to determine the RPM for ammonia.

$$RPM = \frac{\mu_n + z_{99}\,\sigma}{\mu_n + p_n\,\sigma} \qquad \text{(Equation B-7)}$$

Where:

z_{99} = the z − statistic at the 99th percentile = 2.326

μ_{nn} = mean calculated by ProUCL = 109

σ = the standard deviation calculated by ProUCL = 70.27

p_n = the z − statistic at the 95 percent confidence level of $(1 - 0.95)nn = 0.991^{(1/n)}$

nn = number of valid data samples = 318

In the case of ammonia:

RPM= 1.0

The maximum projected effluent concentration is determined by multiplying the maximum reported effluent concentration (MOC) by the RPM:

$$MEC = (RPM) \times (MRC) \qquad \text{(Equation B-8)}$$

MOC = 401.56 milligrams per liter(mg/L) In the case of ammonia

MEC = (1.0) (401.56) = 401.56 mg/L

Comparison with ammonia water quality criteria

In order to determine if RP exists for this discharge to exceed water quality criteria, the highest projected concentration is compared with the most stringent water quality criteria.

MEC = 401.56 mg/L > 9.38 mg/L (acute ammonia criterion) and 1.4 mg/L (chronic ammonia criterion) YES, there is RP for ammonia to violate water quality criteria

Since there is RP for the effluent to cause an exceedance of water quality criteria for protection of aquatic life, and because ammonia is the parameter requiring the most dilution of pollutants that demonstrate reasonable potential to exceed water quality criteria, a WQBEL for ammonia is required in addition to the calculated TBELs supplied by the permittee and then compared in order to select the most stringent. See Appendix C for that calculation.

Table B-1 summarizes the data, multipliers, and criteria used to determine reasonable potential to exceed water quality criteria. For each parameter, the MEC equals the maximum observed effluent

concentration times the RPM producing a number based on wastewater treatment facility performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.

Table B-1- Reasonable Potential Determination at the End of Pipe

Parameter	Max Observed Effluent Conc.	Number of Samples	Coefficient of Variation (CV)	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)	Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
Ammonia as N (mg/L)	401.56	318	0.6	1.0	401.56	8.35 (acute) 1.25(chronic)	yes
TRC (µg/L)	2070	10	0.6	2.5	5252	13 (acute) 7.5 (chronic)	yes

APPENDIX C. SELECTION OF EFFLUENT LIMITS

If the Alaska Department of Environmental Conservation (the Department or DEC) does not authorize a mixing zone, water quality standards (WQS) numeric criteria are applied at the end of the pipe, and technology-based effluent limits (TBELs) are selected for those parameters that are solely technology based.

When DEC authorizes a mixing zone, parameters are identified in the mixing zone that will require dilution to meet WQS numeric criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and WQS numeric criteria for that parameter, apply at the boundary of the mixing zone. If the reasonable potential analysis (RPA) requires the development of water-quality based effluent limits (WQBELs) for specific parameters in order to protect human health criteria at the boundary of the mixing zone, WQBELs are applied as end-of-pipe effluent limits. Those parameters that are not identified in the authorized mixing zone, must meet applicable water quality numeric criteria at the end of pipe. In the absence of water quality criteria for a particular pollutant, such as for 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS), TBELs are applied as end-of pipe effluent limits.

In the case of the Nutrien KNO, ammonia demonstrated reasonable potential to exceed at the end of pipe and required the most dilution to meet water quality criteria at the boundary of the authorized mixing zone; therefore, the Department developed WQBELs for TRC and for ammonia.

C.1 Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed a WQS, a WQBEL for the pollutant is developed. The Department used the process described in the *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System RPA and Effluent Limits Development Guide* (June 30, 2014) (RPA Guide) to calculate WQBELs for ammonia. The first step in calculating WQBELs is the development of a wasteload allocation WLA for the pollutant.

C.2 Mixing Zone-Based WLAs

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the WQS. For human health criteria, the WLA is applied directly as an average monthly limit (AML). The maximum daily limit (MDL) is then calculated from the AML by applying a multiplier.

C.3 "End of Pipe" WLA's

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee's discharge does not contribute to an exceedance of the criterion. When a human health criterion applies to a pollutant, the chronic dilution factor is used to calculate a WLA.

C.4 Permit Limit Derivation

The Department applies the statistical approach described in Chapter 5 of the TSD to calculate the maximum daily limit (MDL) and average monthly limit (AML). This approach takes into account effluent variability (using the coefficient of variation (CV)) and sampling frequency. The MDL is based on the CV of the data and the probability basis, while the AML is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95% for the AML calculation and 99% for the MDL calculation. The following is a summary of the steps to derive WQBELs from WQS numeric criteria for pollutants that have reasonable potential to exceed water quality numeric criteria. These steps are found in the RPA Guide and the guidance's accompanying Microsoft Excel RPA Tool. The guidance and tool were used to calculate the MDL and AML for ammonia in the Nutrien KNO. Ammonia is illustrated below as an example:

Step 1- Determine the WLA

The first step in developing a WQBEL is to develop a wasteload allocation (WLA) for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality criteria or a total maximum daily load in the receiving waterbody.

In cases where a mixing zone is not authorized, either because the receiving waterbody already exceeds the criterion, the receiving waterbody flow is too low to provide dilution, or for some other reason one is not authorized, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion.

The acute and chronic aquatic life criteria are converted to WLAs using the following equation:

$$WLA_{a,c,hh} = (WQC_{a,c,hh})(D_{a,c,hh}) + C_s(1 - D_{a,c,hh})$$

$$WLA_{a,c,hh} = WQC_{a,c,hh}\left(\frac{Q_d + Q_s}{Q_d}\right) + C_s\left(1 - \left[\frac{Q_d + Q_s}{Q_d}\right]\right)$$

Where: $D_{a,c} = Dilution = \frac{(Q_d + Q_s)}{Q_d}$

$D_{hh}(Dilution\ [Human\ Health]) = D_c\ (Dilution[Chronic\ Aquatic\ Life])$

$Q_s = Critical\ Upstream\ Flow$

$Q_d = Critical\ Discharge\ Flow$

$C_s = Critical\ Upstream\ Concentration$

$WLA_{a,c,hh} = Wasteload\ Allocation\ (acute, chronic, or\ human\ health)$

$WQC_{a,c,hh} = C_r = Water\ Quality\ Criterion(acute, chronic, or\ human\ health)$

For ammonia,

$D_a = 41$

$D_c = 278$

$C_s = 0.210$

$WLA_a = 376$

$WLA_c = 331$

$WQC_a = 9.4$ (rounded up)

$WQC_c = 1.4$

For TRC,

$D_a = 41$

$D_c = 278$

$C_s = 0$

$WLA_a = 533$

$WLA_c = 2085$

$WQC_a = 13$

$WQC_c = 7.5$

Step 2 - Determine the Long-Term Average (LTA)

The WLAs are converted to LTAs using multipliers that are derived from equations in section 5.4 of the TSD:

$$LTA_a = WLA_a * exp(0.5\sigma^2 - z_{99}\sigma)$$

$$LTA_a = WLA_a * exp(0.5\sigma^2 - z_{99}\sigma)$$

Where:

$z_{99} = the\ z - statistic\ at\ the\ 99^{th} percentile = 2.326$

$LTA_a\ only: \sigma = ln[CV^2 + 1]^{1/2}$

$LTA_a\ only: \sigma^2 = ln[CV^2 + 1]$

$$LTA_c\ only: \sigma_4 = ln\left[\left(\frac{CV^2}{4}\right) + 1\right]^{1/2}$$

$$LTA_c\ only: \sigma_4^2 = ln\left[\left(\frac{CV^2}{4}\right) + 1\right]$$

$CV = coefficient\ of\ variation$

For ammonia:

$LTA_a = 113.59$

$LTA_c = 167.39$

Step 3 – Choosing the More Limiting LTA

To protect a waterbody from both acute and chronic effects, the more limiting of the two LTAs is used to derive the effluent limits. In the case of ammonia, the LTA_a is more limiting.

The MDL and AML are calculated using the following equations that are found in Table 5-2 of the TSD:

$$MDL_{aquatic\ life} = LTA * exp(z_{99}\sigma - 0.5\sigma^2)$$

Where:

$z_{99} = the\ z - statistic\ at\ the\ 99^{th} percentile = 2.326$

$\sigma_n = ln[CV^2 + 1]^{1/2}$

$\sigma_n^2 = ln[CV^2 + 1]$

$\sigma_n^2 = lCV = coefficient\ of variation$

$$AML_{aquatic\ life} = LTA * exp(z_{95}\sigma_n\ - 0.5\sigma_n^2)$$

Where:

$z_{99} = the\ z - statistic\ at\ the\ 95^{th} percentile = 1.645$

$\sigma_n = \ ln\left[\left(\frac{CV^2}{n}\right) + 1\right]^{1/2}$

$\sigma_n^2 = ln\left[\left(\frac{CV^2}{n}\right) + 1\right]$

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

$n = number\ of\ samples\ per\ month$

For ammonia:

DML= 376 mg/L

AML = 181 mg/L

Appendix D. MIXING ZONE ANALYSISCHECKLIST

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 at 18 AAC 70.240 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollutant Discharge Elimination System permit. See Fact Sheet Section 4.5 for the Nutrien KNO mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable? **If yes, mixing zone may be approved as proposed or authorized with conditions.**	Technical Support Document for Water Quality-Based Toxics Control DEC's Reasonable Potential Analysis Guidance Environmental Protection Agency's Permit Writers' Manual CORMIX	**18 AAC 70.240 (k)**
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240 (c)(1)**
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters.		**18 AAC 70.240(l)**
Existing Use	Does the mixing zone… (1) maintain and protect designated and existing uses of the waterbody as a whole? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(2)**
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(3)**
	(3) create a public health hazard that would preclude or limit existing uses of the waterbody for water supply or contact recreation? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(B)**

Criteria	Description	Resources	Regulation
	(4) preclude or limit established processing activities or established commercial, sport, personal use, or subsistence fish and shellfish harvesting? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(C)**
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 not be approved.**		**18 AAC 70.240(d)(6)**
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 may not be approved.**		**18 AAC 70.240(f)**
Human Health	Does the mixing zone… (1) contain bioaccumulating, bioconcentrating, or persistent chemicals above natural levels to significantly adverse levels? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(1)**
	(2) contain chemicals expected to present a unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by the Department? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(2)**
	(3) occur in a location where the department determines that a public health hazard reasonably could be expected? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(k)(4)**

Criteria	Description	Resources	Regulation
Aquatic Life	Does the mixing zone… (1) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(A)**
	(2) result in a reduction in fish or shellfish population levels? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(D)**
	(3) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(E)**
	(4) form a barrier to migratory species or fish passage? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(G)**
	(5) result in undesirable or nuisance aquatic life? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(5)**
	(6) prevent lethality to passing organisms; or exceed acute aquatic life criteria at and beyond the boundaries of a smaller initial mixing zone surrounding the outfall, the size of which shall be determined using methods approved by the Department? **If no, mixing zone may not be approved.**		**18 AAC 70.240(d)(7)** **18 AAC 70.240(d)(8)**
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone? If yes, are there likely to be adverse effects to T/E spp based on comments received from the United States Fish and Wildlife Service or National Oceanic and Atmospheric Association. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(F)**