ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PRELIMINARY DRAFT

Permit Number: AK0023213

Juneau-Douglas Wastewater Treatment Facility

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

CITY & BOROUGH OF JUNEAU

For wastewater discharges from

Juneau-Douglas Wastewater Treatment Facility
1540 Thane Road
Juneau, AK, 99801

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to reissue an APDES individual permit (permit) to the City and Borough of Juneau (CBJ). The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Juneau-Douglas Wastewater Treatment Facility (WWTF) 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/.

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program **Mail**: P.O. Box 111800 **In Person**: 410 Willoughby Avenue, Suite 303 Juneau, AK 99811-1800 (907) 465-5180

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1.0 INTRODUCTION

1.1 Applicant

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

Permittee:	City and Borough of Juneau
Facility:	Juneau-Douglas WWTF
APDES Permit Number:	AK0023213
Facility Location:	1540 Thane Road, Juneau, AK 99801
Mailing Address:	2009 Radcliffe Road, Juneau, AK 99801
Facility Contact:	Mr. Brian McGuire, Engineering and Public Works Operations Superintendent

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 Juneau-Douglas WWTF was originally permitted under National Pollutant Discharge Elimination System (NPDES) in 1974 by the Environmental Protection Agency (EPA). EPA reissued the permit again in 1985 and 2001. The 2001 permit expired in 2006 but was administratively extended until June 1, 2015 when DEC issued an APDES permit. 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 CBJ in December 2019; therefore, the 2015 permit is administratively extended until such time a new permit is reissued.

2.0 BACKGROUND

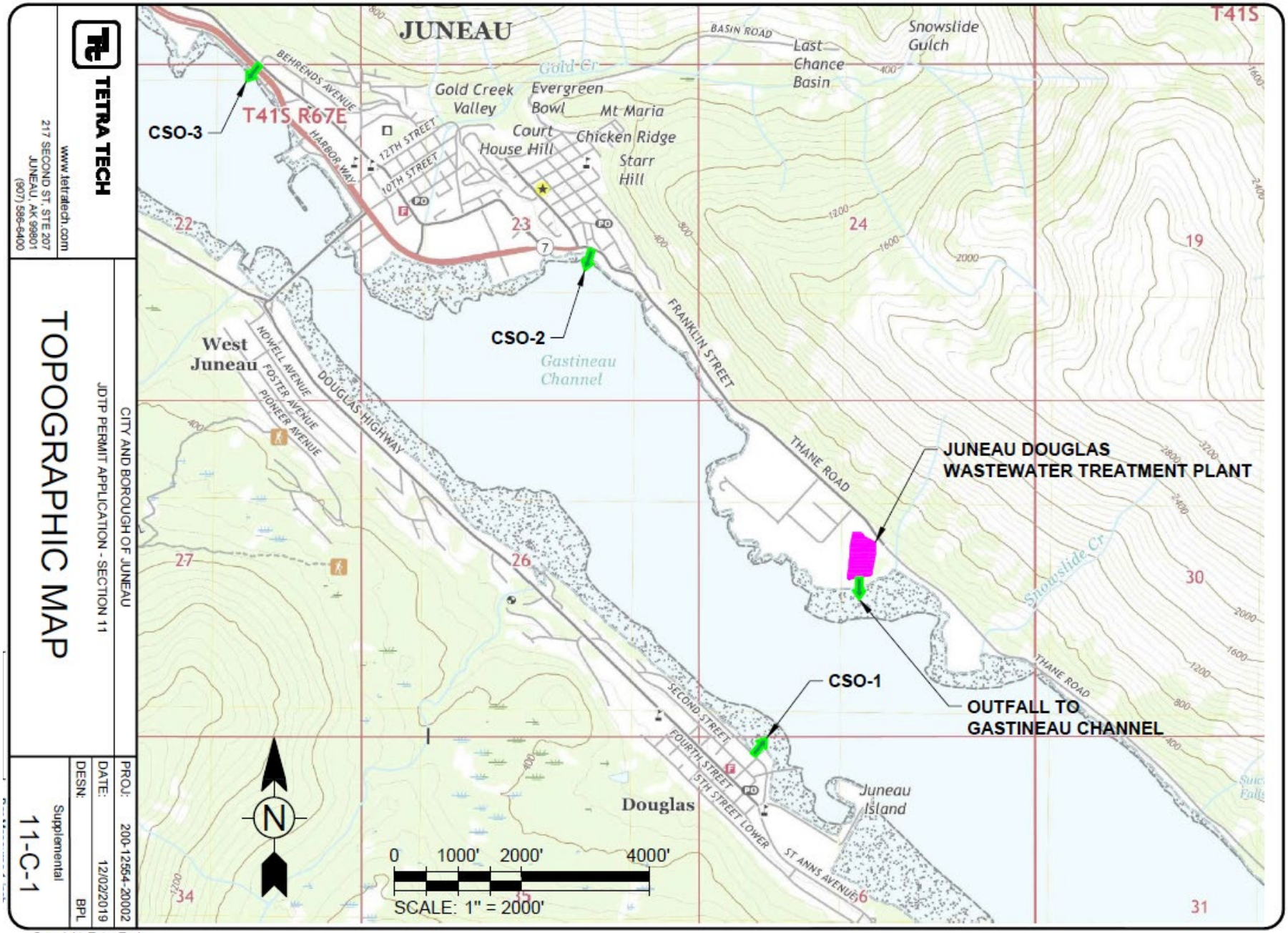
2.1 Facility Information

The Juneau-Douglas WWTF, owned and operated by the CBJ, is located approximately 2 miles south of the City of Juneau. The facility collects and treats primarily domestic wastewater from downtown Juneau, West Juneau, and the City of Douglas. The collection system consists of a combination separate and combined sewer system and is the only combined sewer system in the State of Alaska. CBJ is in the process of separating the storm water system from the sewer system. The last combined sewer overflow (CSO) discharge event occurred in 2019, the first since 2005. See Permit Section 1.6 for details on the CSOs. Loading to the WWTF is typically higher during the tourist season when cruise ships dock in Juneau and offload domestic wastewater for treatment. There are no significant industrial users discharging to the WWTF.

The secondary treatment process at the Juneau-Douglas WWTF, is mostly automated and includes grit removal, comminution, aeration (dual basins), secondary clarification (dual tanks), conventional activated sludge digestion and ultraviolet (UV) disinfection. Waste sludge is dewatered and shipped to Oregon for final disposal. The treated effluent discharges to Gastineau Channel via a buried 295-foot-long, 30-inch diameter outfall line.

Figure 1 depicts the location of the Juneau-Douglas WWTF effluent outfall and the three CSOs.

Figure 1- Juneau-Douglas WWTF Topographic Map



2.2 Wastewater Treatment

The facility is designed to provide secondary treatment of domestic wastewater using activated sludge. Treatment includes primary treatment by fine screening and grit removal in the headworks followed by secondary biological treatment in aeration basins, clarification, and UV disinfection. Table 1 summarizes the facility's design criteria.

Table 1- Juneau-Douglas WWTF Design Criteria

Average Daily Flow Rate	2.76 million gallons per day (mgd)
Maximum Daily Flow Rate	7.23 mgd
Average 5-Day Biochemical Oxygen Demand (BOD_5) Plant Loading	3,290 pounds per day (lbs/day)
Maximum Daily BOD_5 Plant Loading	5,980 lbs/day
Average Daily Total Suspended Solids (TSS) Plant Loading	4,259 lbs/day
Maximum Daily TSS Plant Loading	7,739 lbs/day
BOD_5 and TSS Percent (%) Removal	85%

Wastewater enters the facility by gravity via a siphon inlet manhole at the edge of the property. The influent passes through a low velocity grit chamber that allows large debris and grit to settle. Settled grit is collected via a mechanical rake that pushes the material into a small sump opening in the conveyor. Grit is washed and dewatered, deposited to a hopper and disposed to landfill.

Following grit removal, two Parkson perforated travelling plate influent screens remove rags and other large unsettled debris. As solids are removed dual wash water zones clean off fecal material and the perforated plate screens allow water to flow through while the undesired material is collected, rinsed, compacted and deposited into a hopper and disposed to landfill.

Flow may be redirected at any point; the grit chamber is equipped with a manually operated bypass channel to direct flow to the influent screens if the collector or flight conveyor is offline. Should the influent screens be offline, flow may be directed to a manually cleaned bar rack without any interruption of influent flow to secondary treatment.

Screened influent wastewater enters one (or both) of the aeration basins where it mixes with returned activated sludge (RAS) from the secondary clarifiers for biological treatment. Constant mixing is provided by two surface aerators. The fully mixed and aerated solution of mixed liquor flows by gravity from the aeration basins to a distribution splitter box where it is evenly distributed between two clarifiers. Larger activated sludge particles settle to the bottom of the tank; a portion is pumped back to the aeration basin as RAS via a distribution box, located on the side wall of each aeration basin. Pumping rates are adjustable to maintain the optimum concentration of activated sludge in the aeration tank. The remaining settled sludge is pumped to the sludge holding tank for solids processing as waste activated sludge.

The clarified effluent flows over 90-degree V-notch weirs along the circumference of the tanks and continues to disinfection. Disinfection of the treated effluent is achieved using a medium intensity UV3000B system. Effluent flows through a UV channel containing two banks of lights consisting of fifteen modules, each holding eight individual lamps. This system may be manually or automatically controlled to increase or decrease UV intensity, dosage, and/or detention time as indicated by flow rate, effluent quality, and actual bulb intensity. Following UV disinfection, the effluent flows by gravity through Outfall 001A to Gastineau Channel. The Site Plan in Figure 2 and the process flow diagram in Figure 3 illustrate the Juneau-Douglas WWTF treatment process.

Figure 2- Juneau-Douglas WWTF Site Plan

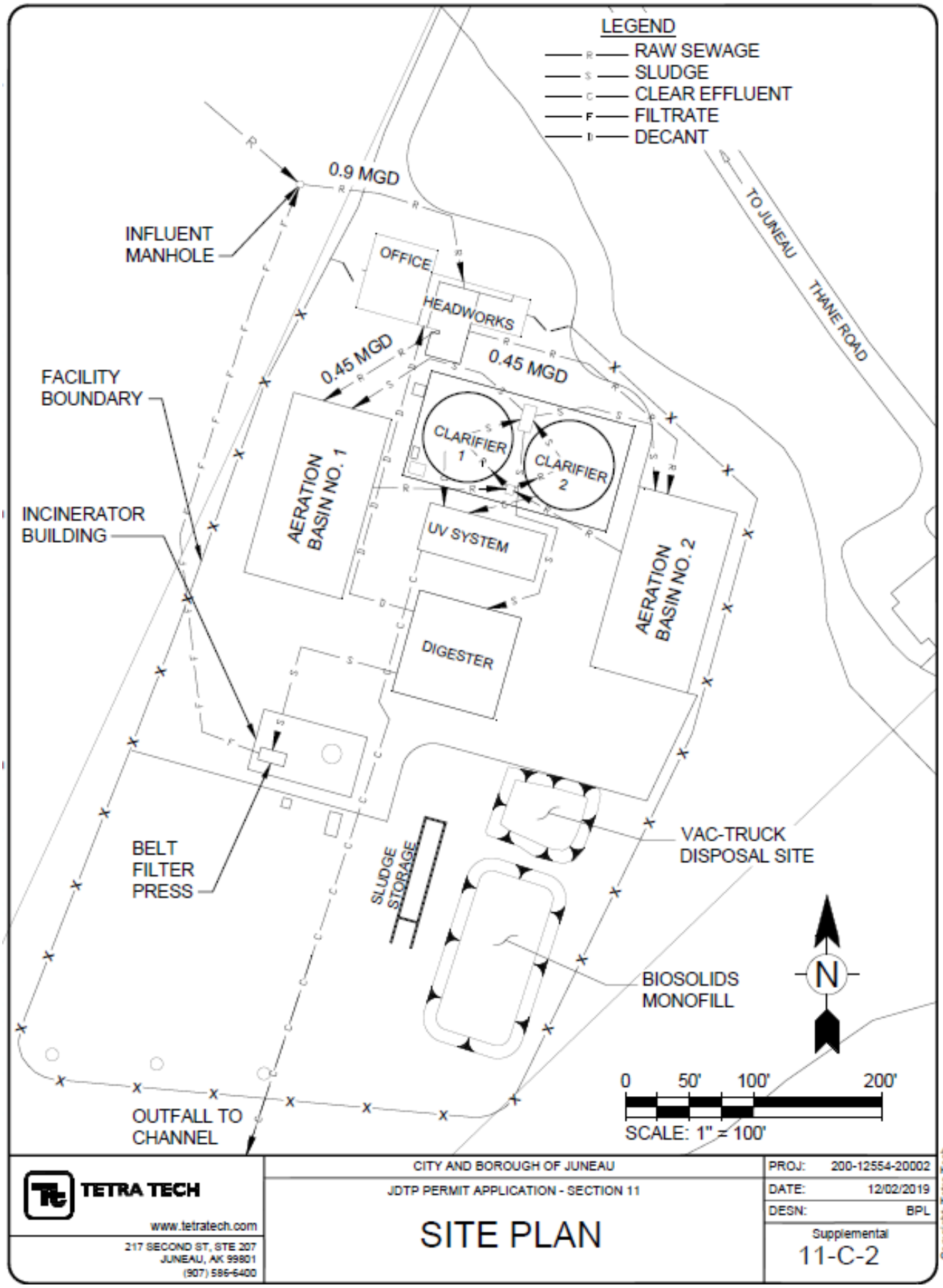
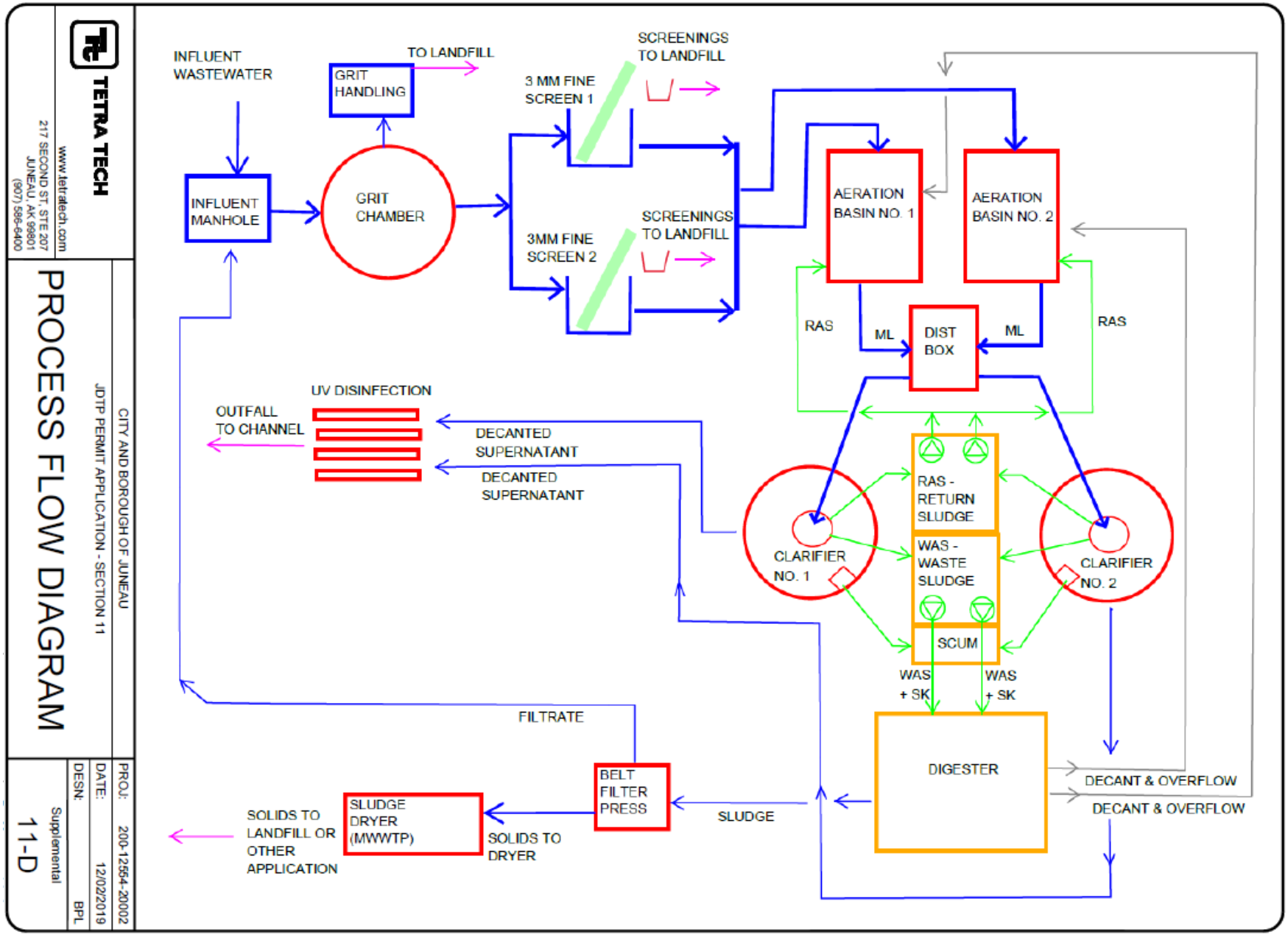


Figure 3- Juneau-Douglas WWTF Process Flow Diagram



2.3 Pollutants of Concern

Pollutants of concern in treated domestic wastewater include the conventional pollutants: BOD_5 , TSS, pH, fecal coliform (FC) bacteria and oil and grease. Ammonia, copper, enterococci bacteria, whole effluent toxicity (WET), and temperature were detected in the effluent above water quality criteria. Dissolved oxygen (DO) was detected in the effluent below water quality criteria; therefore, in addition to the conventional pollutants listed above, DEC identified these additional pollutants as pollutants of concern. The monitoring results submitted with the permit reissuance application did not indicate any other pollutants of concern. Pollutants observed in the effluent at least once that did not meet water quality criteria or permit limits between June 2015 and May 2020 are depicted in Table 2, below.

Table 2- Pollutants of Concern in the Juneau-Douglas WWTF Effluent

Pollutant	Units	Maximum Observed Concentration	Water Quality Criteria or Permit Limit
BOD_5	milligrams per liter (mg/L)	120	60 daily maximum
TSS	mg/L	290	60 daily maximum
pH	Standard Units (SU)	5.6 (daily minimum)	6.5 (daily minimum) 8.5 (daily maximum)
DO	mg/L	2.2 (daily minimum)	6 (daily minimum) 17 (daily maximum)
Temperature	Degrees Celsius (°C)	21.6	15 daily maximum
FC Bacteria	FC/100 mL	320	43 acute, 14 chronic
Enterococci Bacteria	colony forming units per 100 milliliter (cfu/100 mL)	100	130 acute, 35 chronic
Ammonia	mg/L	24	11.4 acute, 1.7 chronic
Copper	micrograms per liter (µg/L)	31	5.8 acute, 3.7 chronic
WET	chronic toxic units (TUc)	10	1.0 daily maximum

2.4 Compliance History

DEC reviewed Discharge Monitoring Reports (DMRs) submitted by CBJ for monitoring periods from June 2015 to May 2020 to determine the facility's compliance with effluent limits, as well as discharge from the three CSOs. Effluent limit exceedances for Outfall 001A are summarized in Table 3.

Table 3- Outfall 001A Effluent Limit Exceedances

Parameter	Units	Basis	Permit Limit	Number of Exceedances	Maximum Reported Value	Date of Maximum Reported Value
BOD_5	mg/L	Daily maximum	60	3	120	August 2017
BOD_5	mg/L	Weekly average	45	1	57	August 2017
BOD_5	mg/L	Monthly average	30	1	35	August 2017
TSS	mg/L	Daily maximum	60	6	290	August 2017
TSS	mg/L	Weekly average	45	5	101	August 2017
TSS	mg/L	Monthly average	30	2	61	August 2017
TSS	%	Minimum monthly % removal	85	1	74 (lowest)	August 2017
pH	SU	Daily minimum	6.5	10	5.6 (lowest)	January 2020
Ammonia	mg/L	Monthly average	14	5	18	June 2017

The operating conditions of the facility were affected during the summer of 2017 due to headworks construction that required the facility to operate on one aeration basin. Non-compliance notifications were submitted for permit condition deviations associated with a sewage decant drain overflow in August 2017, as well as multiple permit limit exceedances for BOD_5, TSS and ammonia.

A CSO diversion event occurred in October 2019. Heavy rainfall overwhelmed the sanitary sewer system pumping capabilities and it was necessary to open diversion valve Diversion Structure N-11.2 at City Hall. Approximately 168,000 gallons of untreated wastewater was discharged to Gastineau Channel. The diversion valve was closed as soon as the flow rate allowed normal operating conditions.

DEC Compliance Program conducted a facility inspection on April 20, 2018 and January 23, 2020. The inspection reports on both dates indicated that the facility was not operating within the permit requirements. DEC's Compliance and Enforcement Program issued a Notice of Violation (NOV) to the permittee on May 17, 2018 and February 20, 2020. The 2018 NOV addressed non-compliance with effluent limits and deficiencies in the implementation of best management practices for chemical storage and requested updated copies of the facility Quality Assurance Project Plan (QAPP) and Operation and Maintenance Plan (O&M Plan) be submitted as these documents were not available on site at the time of inspection. The 2020 NOV addressed non-compliance with effluent limits and deficiencies in the monitoring and reporting of combined sewer overflow events, and failure to annually review the O&M Plan.

As required by the NOVs, the permittee provided a response to DEC's Compliance and Enforcement Program on June 11, 2018. The response included a process control strategy to meet effluent limits, submission of an updated QAPP and updated details of onsite chemical storage. The response to the 2020 NOV was received on March 6, 2020 and included an updated standard operating procedure for CSO event reporting and documentation of the annual O&M Plan review.

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 CWA requires that the limits for a 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 WQS are met. WQBELs may be more stringent than TBELs.

The permit contains a combination of both TBELs and WQBELs. The Department first determines if TBELs are required to be incorporated into the permit. TBELs for publicly owned treatment works (POTWs), which apply to the Juneau-Douglas WWTF, are derived from the secondary treatment standards found in Title 40 Code of Federal Regulations (CFR) §133.102 and 40 CFR §133.105, adopted by reference 18 AAC 83.010(e). The following section summarizes the proposed effluent limits. A more expansive technical and legal basis for the proposed effluent limits is provided in Appendix A Basis for Effluent Limitations.

3.2 Basis for Effluent and Receiving Water Monitoring

In accordance with Alaska Statute 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. Fact Sheet Sections 3.3 through 3.5 summarizes monitoring requirements DEC has determined necessary to implement in the permit.

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 secondary treated domestic wastewater effluent that is discharged through Outfall 001A for flow, BOD_5, TSS, FC bacteria, enterococci bacteria, ammonia, copper, pH, DO, temperature, and WET. BOD_5, TSS, FC bacteria, ammonia, pH, and DO all have associated effluent limits. See Appendix A for details regarding the basis of effluent limits for these parameters.

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. Permittees have 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.

Enterococci bacteria, temperature, and copper contain reporting only monitoring requirements. The following summarizes the monitoring requirements for enterococci bacteria, temperature, and copper.

3.3.1 Enterococci Bacteria

Enterococci bacteria are indicator organisms of harmful pathogens recommended by the EPA to protect primary contact recreation for marine waters. The EPA Beaches Environmental Assessment and Coastal Health Act (BEACH Act) requires states and territories with coastal recreation waters to adopt enterococci

bacteria criteria into their WQS. The WQS at 18 AAC 70.020(b)(14)(B) for contact recreation specifies that the enterococci bacteria concentration shall not exceed 35 enterococci cfu/100mL, and not more than an 10% of the samples may exceed a concentration of 130 enterococci cfu/100mL. Contact recreation is defined as activities in which there is direct and intimate contact with water. These activities typically only take place during the summer season, May to September.

DEC reviewed enterococci bacteria monitoring data from June 2015 to May 2020. The results ranged from 1.0 cfu/100 mL to 110 cfu/100 mL. It is reasonable to assume that enterococci bacteria, as demonstrated by the monitoring results from the prior permit, will continue to exceed water quality criteria; therefore, enterococci bacteria are included in the mixing zone. Monitoring, as in the prior permit will be conducted monthly May-September, months in which Gastineau Channel is most likely to be used for primary contact recreation.

3.3.2 Temperature

Alaska WQS at 18 AAC 70.020(b)(22) states that temperature for marine water for seafood processing, growth and propagation of fish, shellfish, other aquatic life, wildlife, and harvesting for consumption of raw mollusks or other raw aquatic life may not exceed 15 degrees Celsius (º C). DEC reviewed temperature monitoring data for from June 2015 to May 2020. During this period the temperature ranged from a minimum of 10.1 ºC to a maximum of 21.6 ºC. It is reasonable to assume that the discharge will continue to exceed water quality criteria. Temperature effluent limits are not included; however, DEC determined that temperature will meet water quality criteria at approximately 1.6 meters and fits within the mixing zone sized for ammonia. Monitoring for temperature will continue as in the prior permit, five times per week.

3.3.3 Copper, total recoverable

Alaska WQS at 18 AAC 70.020(b)(23) states that 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. The acute aquatic life copper concentration (total recoverable) may not exceed 5.8 micrograms per liter (µg/L) and the chronic aquatic life copper concentration (total recoverable) may not exceed 3.7 µg/L.

DEC reviewed copper monitoring data from June 2015 to May 2020. The results ranged from 4.9 µg/L to 31 µg/L. The reasonable potential analysis conducted on the data and demonstrates that there is reasonable potential for copper to exceed water quality criteria. Copper requires less dilution to meet chronic copper water quality criteria than ammonia; therefore, copper fits in the authorized chronic mixing zone for ammonia. The permit requires monthly copper monitoring, an increase in monitoring frequency from the previous permit. Monthly monitoring will produce a robust dataset for completing a reasonable potential analysis in the next permit reissuance.

Table 4 contains Outfall 001A effluent limits and monitoring requirements and Table 5 contains effluent limits and monitoring requirement changes from the last permit issuance.

Table 4- 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	2.76	N/A	6.0	Effluent	Continuous	Recording
BOD_5	mg/L	N/A	30	45	60	Influent and Effluent [c]	1/Month	24-hour Composite [d]
	lbs/day [b]		691	1,036	1,381			Calculated
TSS	mg/L	N/A	30	45	60	Influent and Effluent	1/Month	24-hour Composite
	lbs/day		691	1,036	1,381			Calculated
BOD_5 & TSS Minimum Percent % Removal	%	N/A	85	N/A	N/A	Influent and Effluent	1/Month	Calculated [e]
pH	SU	6.5	N/A	N/A	8.5	Effluent	5/Week	Grab
Temperature	° C	N/A	N/A	N/A	Report	Effluent	5/Week	Grab
DO	mg/L	2.0	N/A	N/A	17	Effluent	5/Week	Grab
FC Bacteria	FC/ 100 mL	N/A	200 [f]	400 [f]	800	Effluent	1/Week	Grab
Enterococci Bacteria	cfu/ 100 mL	N/A	N/A	N/A	Report	Effluent	1/Month [g]	Grab
Total Ammonia, as Nitrogen	mg/L	N/A	12	18	29	Effluent	1/Month	24-hour Composite
	lbs/day		276	414	668			
Copper, total recoverable	µg/L	N/A	N/A	N/A	Report	Effluent	1/Month	24-hour Composite

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

c. Limits apply to effluent. Report average monthly influent concentration. Influent and effluent composite samples shall be collected during the same 24-hour period.

d. See Appendix C for definition.

e. Minimum % Removal = [(monthly average influent concentration in mg/L - monthly average effluent concentration in mg/L) / (monthly average influent concentration in mg/L)] x 100. The monthly average percent removal must be calculated using the arithmetic mean of the influent value and the arithmetic mean of the effluent value for that month.

f. All FC bacteria average results must be reported as the geometric mean. When calculating the geometric mean, replace all results of zero, 0, with a one, 1. The geometric mean of "n" quantities is the "nth" root of the product of the quantities. For example, the geometric mean of 100, 200, and 300 is (100 X 200 X 300)1/3 = 181.7.

g. One sample shall be collected each month, May through September, on the same day as a FC bacteria sample is collected.

Table 5- Outfall 001A Effluent and Monitoring Changes from Prior Permit

Parameter	Units	Monthly Average		Weekly Average		Daily Maximum	
		2015 Permit	2020 Permit	2015 Permit	2020 Permit	2015 Permit	2020 Permit
BOD_5	lbs/day	690	691	1,035	1,036	1,380	1,381
TSS	lbs/day	690	691	1,035	1,036	1,380	1,381
Total Ammonia, as Nitrogen	mg/L	14	12	20	18	30	29
	lbs/day	N/A	276	N/A	414	N/A	668
Copper, total recoverable	µg/L	N/A	N/A	N/A	N/A	Report 1/Quarter	Report 1/Month

3.4 Whole Effluent Toxicity Monitoring

Alaska WQS at 18 AAC 70.030 require that an effluent discharge 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. 18 AAC 83.435 requires that a permit contain limitations when a discharge has reasonable potential to cause or contribute to an exceedance of a WQS. 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 testing for dilution factors between 100:1 and 1000:1 at the boundary of the mixing zone.

WET tests are laboratory tests that measure 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. WET testing is included in the permit to demonstrate any potential toxicity resulting from the WWTF discharge. The two different durations of toxicity tests are 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.

The previous permit required that CBJ conduct annual chronic toxicity tests using the following organisms: for the larval development test, a bivalve species, either *Crassostrea gigas* (pacific oyster) or *Mytulis galloprovincialis* (blue mussel) depending on the availability of the bivalve, and for purposes of the sperm fertilization test, and depending on availability, an echinoderm, either *Strongylocentrotus purpuratus* (purple seas urchin) or *Dendraster excentricus* (sand dollar). The organisms were tested at 1.25%, 2.5%, 5%, 10%, and 20% effluent.

The highest reported result, 10 TUc, occurred in August 2015 on a test conducted on *Dendraster excentricus.* All other test results, one other for *Dendraster excentricus*, four for Mytulis galloprovincialis and three for *Strongylocentrotus purpuratus* were reported as 5 TUc, corresponding to 20% effluent.

In order to reassess the toxicity of the effluent and to ensure compliance with 18 AAC 83.335, WET monitoring is required in the reissued permit. The WET monitoring dilution series must include the instream waste concentration (IWC), which corresponds to 5% effluent concentration at the boundary of the mixing zone. Two dilutions above, and two dilutions below the IWC must be included, with no concentrations greater than two times that of the next lower concentration. The permit requires accelerated WET testing if toxicity is greater than 20 TUc in any test. If toxicity exceeds 20 TUc, six biweekly WET tests (every two weeks over a 12-week period) is required. If CBJ 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 20 TUc in any of the accelerated tests, CBJ must initiate a Toxicity Reduction Evaluation (TRE). A TRE is a site-specific process 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. The permittee may initiate a toxicity identification evaluation (TIE) as a part of the TRE. A TIE is a set of procedures that characterize, identify, and confirm the specific chemicals responsible for effluent toxicity. TREs and TIEs must be performed in accordance with EPA guidance manuals (see Permit Section 1.3 for further details).

3.5 Receiving Waterbody Monitoring

The permit requires monitoring of Gastineau Channel for pH, temperature, salinity, and copper. Ammonia demonstrated RPA to exceed water quality criteria. It required the most dilution to meet water quality criteria; therefore, WQBELs established for ammonia ensures water quality criteria for ammonia will be met at the boundary of the mixing zone. Ammonia WQBELs ensure that the other pollutants that demonstrated reasonable potential to exceed water quality criteria and that require less dilution than ammonia to meet water quality criteria, will meet water quality criteria prior to the boundary of the mixing zone. Therefore, DEC is not requiring that the permittee monitor at the boundary of the mixing zones in this permit.

Marine ammonia water quality criteria are dependent upon pH, temperature, and salinity; therefore, pH, temperature, and salinity monitoring of Gastineau Channel is required to determine appropriate water quality criteria for ammonia. Receiving waterbody monitoring for ammonia is not required as DEC has determined that enough data was collected during the last permit cycle to characterize ambient ammonia concentrations in Gastineau Channel.

Copper demonstrated reasonable potential to exceed water quality criteria. Receiving waterbody monitoring for copper will characterize copper concentrations in Gastineau Channel and will be used in the next RPA for copper.

Table 6 contains Gastineau Channel ambient monitoring requirements.

Table 6-Gastineau Channel Ambient Monitoring Requirements

Parameter	Units	Sampling Frequency	Sample Type
pH	SU	2/Year (once between June and September, once between October and May)	Grab
Temperature	^{o} C		
Salinity	grams/kilogram		
Copper, total recoverable	µg/L		

3.6 Additional Effluent Monitoring Requirements

The permittee must perform the additional effluent testing in the APDES application Form 2A, Section 11 as well as all applicable supplemental monitoring listed in Section 12. The permittee must submit the results of this additional testing with their application for renewal of this APDES permit. Monitoring results must be included with the application for permit reissuance and will be used as a screening tool to identify pollutants that may exceed State WQS.

4.0 RECEIVING WATERBODY

4.1 Description of Receiving Waterbody

Gastineau Channel is a tidal channel between the mainland of Juneau, Alaska and Douglas Island in the Alexander Archipelago of southeast Alaska. The area surrounding the channel is mountainous and largely

forested. The predominant orientation of the channel is from northwest, which opens onto Fritz Cove, to southeast which opens onto Stephens Passage.

The channel is a long, narrow tidal inlet approximately 15 miles long with a width varying from 75 feet (ft) at its narrowest to 6,000 ft at its widest. The depth averages approximately 90 ft, varying from 240 ft at the entrance to exposed intertidal wetlands at the northwestern end. No major freshwater tributaries discharge to the channel. Circulation in the channel is driven by a semidiurnal tide with a mean tidal range of 13.8 ft and a diurnal range of 16.4 ft. Peak ebb and flood tide current speeds can reach two knots.

4.2 Outfall Description

The Juneau-Douglas WWTF continually discharges treated effluent into Gastineau Channel through Outfall 001A; a 28.67-foot-long submerged multiport diffuser. The terminus of Outfall 001A is positioned approximately 33.5 ft below the mean lower low water and is anchored to the bottom of Gastineau Channel. The diffuser is 30 inches in diameter and contains four 10-inch diameter orifices. The diffuser is orientated perpendicular to the direction of tidal flow. Geographic coordinates of the outfall are 58°17'2" North latitude and 134°23'13" West longitude.

4.3 Water Quality Standards

Section 301(b)(1)(C) of the CWA required the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with 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.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site-specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The receiving water for this discharge, Gastineau Channel, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, existing uses and designated uses are the same and Gastineau Channel must be protected for all marine use classes as per 18 AAC 70.020(a)(2) and 18 AAC 70.050. The designated use classes for marine water include (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, intrinsically meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. For an impaired waterbody Section 303(d) of the CWA requires states to develop a total maximum daily load (TMDL) management plan for the waterbody. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's WQS and allocates that load to known point sources and nonpoint source. Gastineau Channel is not included on the *Alaska's Final 2014/2016 Integrated Water Quality Monitoring and Assessment Report,* November 2, 2018.

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.

DEC received CBJ's application for reissuance of the permit on December 2, 2019. In the application, CBJ requested re-authorization of the previously authorized mixing zone for ammonia.

As a part of the mixing zone application and modeling review process, DEC also modeled the acute and chronic mixing zones using Cornell Mixing Zone Expert System (CORMIX) version 11.0 modeling software. 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.

Inputs to CORMIX included the maximum expected effluent concentration, acute and chronic water quality criteria, receiving water characteristics at the outfall such as depth of the receiving water at the outfall, wind velocity, and outfall and diffuser specifications, such as size, direction, and number of ports.

DEC's models yielded different results than those proposed by CBJ in their application. CBJ conducted the RPA using a smaller range of data and with different ammonia acute and chronic water quality criteria for ammonia. In DEC's analysis ammonia required the most dilution of the parameters that demonstrated reasonable potential to exceed water quality criteria. The chronic mixing zone for this discharge is therefore, driven by ammonia, and has a dilution of 19.6:1 and is defined as a rectangular area centered over the diffuser 29 meters long and 8.8 meters wide. Water quality criteria for ammonia, temperature, DO, FC bacteria, enterococci bacteria, copper, and WET may be exceeded within the authorized chronic mixing zone.

There is a smaller, initial, acute mixing zone surrounding the outfall and contained within the larger chronic mixing zone. Based on the maximum expected effluent concentrations and acute water quality criteria, copper required the most dilution of the parameters that demonstrated reasonable potential to exceed water quality criteria. The acute mixing zone for this discharge has a dilution of 10.9:1 and is defined as a rectangular area centered over the diffuser 13 meters long and 6.9 meters wide.

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 criteria 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 the acute criterion. DEC determined that the travel time of an organism drifting through the acute mixing zone to be approximately 18 seconds; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Appendix D outlines 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 this analysis:

4.5.1 Size

In accordance with 18 AAC 70.240, the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, DEC used CORMIX version 11 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 Juneau-Douglas WWTF effluent monitoring data from June 2015 through May 2020 to determine which parameters had reasonable potential to exceed water quality criteria and then which parameter required the most dilution to meet water quality criteria for the chronic and acute mixing zones. Ammonia required the most dilution to meet chronic aquatic life water quality criteria; therefore, ammonia was modeled in CORMIX to determine the smallest practicable chronic mixing zone. Similarly, copper required the most dilution to meet acute aquatic life water quality criteria and was modeled in CORMIX to obtain the smallest practicable acute mixing zone size.

The prior permit authorized an 83-meter radius chronic mixing zone for ammonia and a 9-meter radius acute mixing zone also based on ammonia. The chronic mixing zone in the reissued permit is 29 meters by 8.8 meters and the acute mixing zone is 13 meters by 6.9 meters. The shape of the mixing zone has changed from a circular area to a rectangular area to reflect high and low tidal fluctuations.

Table 7 summarizes basic CORMIX inputs that DEC used to model the chronic and acute mixing zones for ammonia.

Table 7- CORMIX Model Inputs

Parameter Modeled	Maximum Expected Concentration	Ambient Concentration	Chronic Water Quality Criterion	Acute Water Quality Criterion
Ammonia	29.64 mg/L	0.194 mg/L	1.7 mg/L	11.4 mg/L
Copper	57 µg/L	0.604 µg/L	3.7 µg/L	5.8 µg/L
Outfall and Receiving Waterbody Characteristics				
Outfall Type	Submerged Multiport Diffuser Discharge			
Outfall Length	90 meters			
Diffuser Length	9.14 meters (with 4 openings, 4 risers)			
Diffuser Type	alternating perpendicular			
Port Diameter	0.254 meters			
Depth at Discharge	9.14 meters			
Ambient Velocity	0.1 meters per second (m/s) low tidal current 0.9 m/s high tidal current			
Wind Velocity	2 knots			
Effluent Characteristics				
Flow Rate	2.76 mgd			
Temperature	14.9 ºC			

4.5.2 Technology

In accordance with 18 AAC 70.240(c)(1), the most effective technological and economical methods should be used to disperse, treat, remove, and reduce pollutants. The Juneau-Douglas WWTF wastewater treatment system provides secondary treatment of domestic wastewater using activated sludge. Treatment includes primary treatment by fine screening and grit removal in the headworks followed by secondary biological treatment in aeration basins, clarification, and UV disinfection. The treatment methods incorporated at the Juneau-Douglas WWTF are commonly employed and accepted for treatment of similar discharges throughout the United States.

4.5.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and18 AAC 70.240(c)(4)(B) and (C), the mixing zone has been appropriately sized to fully protect the existing uses of Gastineau Channel. Gastineau Channel'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 are developed to specifically protect the uses of the waterbody as a whole. Because water quality criteria for pollutants that demonstrated reasonable potential to exceed water quality criteria will be met prior to or at the boundary of the mixing zones, designated and existing uses in Gastineau Channel that are beyond the boundary of the mixing zones will be maintained and protected.

4.5.4 Human Consumption

In accordance with the conditions of the permit, an 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. Signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption 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 Juneau-Douglas WWTF mixing zones are not authorized in known spawning areas for anadromous fish or resident fish, spawning redds for chinook, coho, pink, chum and sockeye salmon. The Alaska Department of Fish and Game (ADF&G) Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes-Southeastern Region, Effective June 1, 2019, does not show any spawning or rearing areas in the vicinity of the Juneau-Douglas WWTF wastewater discharge outfall.

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 that was included with CBJ's application for permit reissuance, DMRs, and the results of the RPA conducted on pollutants of concern indicated that the level of treatment at the Juneau-Douglas WWTF 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, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife. The mixing zone does not form a barrier to migratory fish species or fish passage nor will does 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. CORMIX modeling conducted for this discharge to Gastineau Channel 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 zones.

4.5.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. Review of applicable endangered species mapping and databases, and information received from the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) in communications with DEC identified that the endangered humpback whale *(Megaptera novaengliae)* and the

threatened eastern Stellar sea lion *(Eumetopoas jubatus)* are present in the Gastineau Channel. EPA and DEC determined during the previous permit issuance in 2015 that with consideration of the nature of the discharge, mixing zone size and ambient critical conditions these species would not be affected by discharge from the Juneau-Douglas WWTF.

See Section 8.2 of the fact sheet for more information regarding endangered species.

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

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.

DEC corrected BOD_5 and TSS mass loading rounding errors that had occurred in the 2015 permit, a technical mistake. Fact Sheet Table 5 contains a summary of effluent and monitoring changes from the prior permit.

The effluent limitations in this permit reissuance are consistent with 18 AAC 83.480. Therefore, the permit effluent limitations, standards, and conditions in AK0023213 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).

Gastineau Channel is not listed as impaired (Category 4 or 5) in Alaska's 2014/2016 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 permit also requires receiving waterbody monitoring to establish facility-specific WQBELs.

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 1.2.2 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, copper, DO, FC bacteria, enterococci bacteria, temperature, and WET, a mixing zone is authorized in Juneau-Douglas WWTF's 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 20:1, and subsequently assigned a chronic toxicity trigger based on the minimum effluent dilution achieved in the mixing zone of 20 TUc. If the WET trigger is met, the Juneau-Douglas WWTF will not violate the WET limit in 18 AAC 70.030.

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;

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

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

The first part of the definition includes all federal technology-based effluent limit guidelines (ELGs) including "For POTWs, effluent limitations based upon…Secondary Treatment" at 40 CFR § 125.3(a)(1) defined at 40 CFR § 133.102, adopted by reference at 18 AAC 83.010(e). The ELGs set standards of performance for existing and new sources and are incorporated in the permit.

The second part of the definition references the minimum treatment standards for domestic wastewater discharges found at 18 AAC 72.050. The conditions of this permit require the permittee to meet or exceed the minimum treatment standards described in 18 AAC 72.050. The Juneau-Douglas WWTF provides secondary

treatment of domestic wastewater using activated sludge with UV disinfection. The Department finds that this requirement is met.

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 water quality standards 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 water quality standards established under CWA §303, including state narrative criteria for water quality." The permit requires compliance with the 18 AAC 70 and includes WQBELs developed for ammonia that are protective of water quality criteria at the boundary of the mixing zone.

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 Juneau-Douglas WWTF 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.*

Form 2G Sections 1 and 2 (Questions 1 and 2) - Facility Information (18 AAC 70.16(a)(5)(A-G)) and Baseline Water Quality Provisions and 2 (18 AAC 70.16(a)(6)(A-C)):

The receiving waterbody, Gastineau Channel should have a Tier 2 protection level. Ammonia and copper are the pollutants of concern in need of a Tier 2 analysis. CBJ submitted data for the parameters that may alter the effects of the discharge to the receiving water. Data includes the maximum observed and average concentrations, background concentrations, persistence, and expected increase or decrease to background concentrations due to the discharge. Ammonia and copper are not expected to persist in the receiving water, but the discharge of ammonia and copper are both expected to significantly increase background concentrations of ammonia and copper in Gastineau Channel.

Form 2G Section 4 (Questions 1-3) – Tier 2 analysis of existing use protection (18 AAC 70.16(c)):

The antidegradation application is for an existing, expanded discharge (an increase in a permitted parameter load, concentration, or other change in discharge characteristics that could lower water quality or have other adverse environmental impacts) that requires a Tier 2 analysis for parameters as defined under 18 AAC 70.16(c)(2)(A)-(E). In collaboration with DEC, ammonia and copper, the drivers of the mixing zones were identified as pollutants of concern requiring practicable alternatives analyses (analysis of a range of practicable alternative that have the potential to prevent or lessen the degradation associated with the proposed discharge).

Ammonia Practicable Alternatives Analysis:

Ammonia is a natural product of domestic wastewater and is a critical nutrient in biological wastewater treatment. The average ammonia concentration in the Juneau-Douglas effluent (6.1 mg/L) was calculated from 58 samples collected from 2015-2019. The average receiving water background concentration was 0.16 mg/L and was calculated from 9 ambient station samples collected from 2015-2019.

Operational adjustments may be possible to control nitrification (ammonia oxidation) and reduce ammonia concentration in the effluent. However, increasing nitrification to reduce ammonia in the effluent could lead to an alkalinity deficit which could cause undesirable pH reductions in the effluent. On/off aeration cycles could be used to periodically promote anoxic conditions and denitrification (nitrate reduction) throughout the day, recovering a portion of the alkalinity consumed by nitrification. Another approach would be to create an anoxic swing zone within each activated sludge basin and provide mixed liquor recycle pumps to recirculate nitrate for the end of the oxic zone to the beginning of the anoxic zone to foster nitrate reduction. If neither of these is possible, then chemical addition may be an option to help correct the alkalinity deficiency and raise the pH as an immediate solution while removing ammonia. Common chemicals used to increase alkalinity and pH include calcium oxide or calcium hydroxide (as lime slurry), sodium hydroxide (caustic soda), sodium carbonate (soda ash) or sodium bicarbonate and magnesium hydroxide or magnesium bicarbonate. Prior to supplementing the system with chemicals, an alkalinity study is recommended to determine concentration and feed rate required.

Although operational adjustments may be a low-cost way to increase ammonia removal, it is not realistic to assume a waste activated sludge treatment facility will be able to achieve anything lower than 1 mg/L of ammonia in the effluent. After implementing operational adjustments and chemical addition, a tertiary treatment such as breakpoint chlorination or ion exchange would need to be used as a polishing effort to remove ammonia to below receiving water concentrations. Table 8 provides relative capital and operations and maintenance (O&M) costs of ammonia removal options at the Juneau-Douglas WWTF.

Table 8- Ammonia Removal Options

Removal Option	Estimated Capital Cost	Estimated O&M Cost
On/Off Aeration Cycles	Low	Low
Anoxic Swing Zone	Low	Low
Chemical Feed System	Medium	High
Breakpoint Chlorination	Moderate	High
Ion Exchange	High	Moderate

At this time, none of these options can be deemed practicable. Before a formal practicable alternative can be selected, more research must be conducted to determine whether operational changes can improve ammonia removal and to what degree. This may require an alkalinity study to ensure pH of the effluent remains within permitted limits. Only then can CBJ determine if the identified tertiary treatment options (breakpoint chlorination or ion exchange) are necessary or feasible for their site and treatment requirements.

Copper Practicable Alternatives Analysis:

Copper is an element naturally occurring in the water supply from corrosion of metals. Copper may also be drawn into the water supply through copper pipes during distribution. The average copper concentration in the Juneau-Douglas WWTF effluent (10.8 µg/L) was calculated using 21 samples from 2015-2019. The average receiving water background concentration was calculated at 0.56 µg/L from 12 sample results taken between 2015 and 2017 as provided by the DEC Commercial Passenger Vessel Environmental Compliance Program.

The majority of the wastewater received by the Juneau-Douglas WTTF originates from one of two water supplies; the wellfield in Last Chance Basin (LCB) and a smaller component from Salmon Creek Reservoir (SC). SC waters are source from snow melt and rainwater, while LCB wells draw from a confined aquifer recharged by Gold Creek. Typically, corrosion inhibitors are used to control copper levels in water supply. The

water treatment facility serving SC utilizes carbonate passivation as a corrosion inhibitor. The alkalinity and pH of LCB provide a natural carbonate passivation and no supplementation is presently used as a corrosion inhibitor. Because corrosion control measures had previously been addressed in the Lead and Copper Rule Corrosion Control Study, it became necessary to evaluate whether copper in the effluent was derived from another source.

CBJ stated in their analysis, that source water may be an order of magnitude higher than ambient marine conditions and that a significant component of copper background concentration in Gastineau Channel may be supplied by Gold Creek. However, source water copper data is limited, and the data does not include seasonal or other variations.

If it is determined that a source of some copper in the Juneau-Douglas WWTF effluent is corrosion in the distribution system, one possible means for reducing corrosion would be the addition of phosphoric acid as a corrosion inhibitor, particularly for LCB. Depending on the water chemistry of the source, zinc orthophosphate or othro-and polyphosphate may be used instead. Phosphoric acid produces a low cost, effective passivation film for copper piping. If current well buildings could not accommodate the chemical feed system, this would require investment in a chemical feed building situated at the LCB well field.

Reverse osmosis (RO) is also a possible means for removing copper at the downstream end of the Juneau-Douglas WWTF treatment process. After treatment, the effluent could be directed through a RO separation process. However, RO systems are costly and RO brine (waste) typically contains high levels of toxic heavy metals which may make disposal difficult.

Table 9 provides relative capital and O&M costs of copper removal options at the Juneau-Douglas WWTF.

Table 9- Copper Removal Options

Removal Option	Estimated Capital Cost	Estimated O&M Cost
Phosphoric Acid Addition	Low	Moderate
Reverse Osmosis	Ultra-High	High

CBJ states that at this time that neither of these options can be deemed practicable or even necessary. Before a formal practicable alternative can be selected, more research must be conducted to determine the source of copper in the effluent. If plumbing system corrosion comprises most of the headworks loading, then enhancing corrosion control in the distribution system may be the answer or part of the answer to achieve compliance with anti-degradation based effluent limits. However, there is every indication the raw water source copper concentrations exceed ambient receiving water concentrations. Juneau-Douglas may be simply redirecting the flow of Gold Creek. Though the copper concentration in the Juneau-Douglas WWTF effluent is five times that of the Gold Creek samples, Gold Creek discharges nearly twenty-five times the volume to Gastineau Channel. In conclusion, more data is needed to determine how much copper is contributed from distribution prior to taking any action to control concentration at the Juneau-Douglas WWTF.

The Department has determined that based on the analysis provided by CBJ regarding ammonia and copper reduction in the Juneau-Douglas WWTF effluent, and CBJ's assessment that more data is needed prior to their making a most practicable alternative determination, that a practicable alternative for ammonia or copper reduction cannot be identified or implemented at this time. The Department has also determined that 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. The Juneau-Douglas WWTF uses a variety of measures to prevent, control and treat the pollution that may be generated as a result of the facility's wastewater treatment operations. These measures include an O&M Plan that establishes standard operational procedures and regular maintenance schedules for the prevention, control, and treatment of all wastes and other substances discharged from the facility. CBJ must comply with specific technology and water-quality based requirements, including the implementation of a pollution prevention program. The permit also

requires accelerated WET testing if toxicity is greater than 20 TUc in any test. If toxicity is greater than 20 TUc in any of the accelerated tests, the permittee must initiate a TRE. The TRE is required so that the specific cause of the toxicity can be identified and mitigated. Permit Section 3.3 requires that pollutants removed in the course of treatment such as screenings and grit be disposed of in accordance with Alaska Solid Waste Management Regulations at 18 AAC 60. Therefore, the finding, 18 AAC 70.016(c)(7)(D)(i-ii) is met.

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);*

Form 2G Section 4 (Question 4) - Social or Economic Importance (18 AAC 70.16(c)(5))

The Juneau-Douglas WWTF is the sole wastewater treatment plant serving a population of approximately 9,000 people as well as State of Alaska offices and businesses. This WWF is vital to those living in downtown Juneau and Douglas. Lack of sanitation for residents and businesses would be detrimental to human and environmental health.

All commercial activities conducted in downtown Juneau and Douglas are dependent upon the operation of the Juneau-Douglas WWTF including State of Alaska offices, the Capitol, and the State Courthouse.

The water quality within the mixing zone (as submitted in DEC form 2M) is expected to be adequate to fully protect existing uses of the water. All discharges from the facility will be treated and controlled to achieve the highest statutory and regulatory requirements. Further study is required to determine the extent to which suggested treatment options or enhancements can remove pollutants of concern.

The Department has determined that the operation of the WWTF and the discharges authorized by the permit demonstrates that a lowering of water quality accommodates important social or economic development; therefore, 18 AAC 70.016(c)(7)(E) finding is met.

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 develop procedures to ensure that the monitoring data submitted is accurate and to explain data anomalies if they occur. The permittee is required to update, implement and maintain their 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 Operations and Maintenance Plan

The permittee is required to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance are essential to meet discharge limitations, monitoring requirements, and all other permit requirements. The permittee is required to update, implement and maintain the O&M Plan and ensure that it includes appropriate best management practices and pollution prevention measures. The plan shall

be retained either electronically or physically at the facility's office of record and made available to DEC upon request.

7.3 Industrial User Survey

18 AAC 83.340 requires POTWs to identify and locate all significant industrial users that discharge process wastewaters and associated pollutants to their wastewater treatment system. General and specific pretreatment prohibitions at 40 CFR 403.5, adopted by reference at 18 AAC 83.010(g)(2), contain prohibitions that apply to each industrial user introducing pollutants into a POTW, whether or not the industrial user is subject to other National Pretreatment Standards, or any national, State, or local Pretreatment Requirements. Therefore, in order to assess whether an industry or business has the potential to violate any general or specific pretreatment prohibition, and to determine if a pretreatment program should be developed and/or if pretreatment requirements should be included in the Juneau-Douglas WWTF wastewater discharge permit, the permittee is required to submit with their permit reissuance application, Form 2A, a list of those industries or businesses that discharge and/or have the potential to discharge non-domestic wastewater to the Juneau-Douglas WWTF's collection system. DEC may request further information on specific industries or business to assist in this evaluation.

7.4 Combined Sewer Overflow

EPA's CSO Policy, adopted by reference at 18 AAC 83.010(h) contains both technology and water quality-based permit monitoring requirements for Post-Phase II CSOs. During Phase I, a facility is expected to develop a Long-Term Control Plan (LTCP) and achieve an interim level of control. During Phase II, the facility is required to implement the controls identified in the LTCP. A Post-Phase II CSO permit is one in which the CSO controls have been implemented. CBJ has implemented CSO controls; therefore, the Juneau-Douglas WWTF permit contains the Post-Phase II CSO technology and WQ-based permit monitoring requirements found in EPA's CSO Policy.

The technology-based requirements found in the permit consist of nine minimum controls that can reduce CSOs and their effects on waterbodies. The CSO water quality-based requirements prohibit the discharge of any pollutant at a level that causes or contributes to an instream excursion above numeric or narrative criteria adopted as part of Alaska WQS at 18 AAC 70. CSO water quality-based requirements also limit the number of annual overflow events not receiving minimum treatment and establishes numeric water quality-based minimum treatment levels for FC bacteria and TRC.

The Juneau-Douglas WWTF collection system originally contained six CSO diversion structures that were manually operated and opened by an operator in the field in response to high tide and precipitation events. As a result of capital improvements over the past 35 years, three of the CSOs have been eliminated. The three remaining diversions are located at the High School, City Hall, and Douglas.

The only diversion to have been opened since 2005 was at City Hall. On October 6, 2019 approximately 168,000 gallons of untreated domestic wastewater was discharged to Gastineau Channel. Heavy rainfall (4.65-7.18 inches in 24 hours) overwhelmed the sanitary sewer system pumping capabilities which required the opening of the diversion valve. The diversion event monitoring results are summarized in Table 10.

Table 10- CSO City Hall Diversion Monitoring Results

Parameter	Result	
	Open	Close
Flow	N/A	0.168 million gallons per day
BOD_5	14 milligrams per liter (mg/L)	23 mg/L

	19.6 pounds per day (lbs/day)	32.2 lbs/day
TSS	90 mg/L	22 mg/L
	126.1 lbs/day	30.8 lbs/day
FC Bacteria	9,400 FC/100mL	29,000 FC/100mL
Enterococci Bacteria	Not reported	
Duration of opening	735 minutes	

It is anticipated that CBJ will continue its efforts to separate the storm and sewer system to further reduce the likelihood of CSO diversions. Continued efforts include identifying and correcting infiltration and inflow problems in order to reduce the flow of ground and storm water to the Juneau-Douglas WWTF collection system and implementing building codes that prohibit the connection of storm drain connections such as sump pumps, area drains, and roof leaders to the sewer system. CBJ also conducts periodic sewer system inspections with smoke, dye, and cameras to ensure that there are no new storm drain connections made to the sewer system.

The permit contains monitoring requirements and minimum controls that are consistent with EPA's CSO Policy, adopted by reference at 18 AAC 83.010(h). One of the minimum controls in the CSO Policy and permit requires public notification of CSO occurrences and periodic notices on utility bills, the local newspaper, and on the CBJ website. The permit, also consistent with the CSO Policy, requires the implementation, effective operation, and maintenance of the CSO controls identified in the LTCP that CBJ developed.

7.5 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. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

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. Permittees 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.

7.6 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 Evaluation

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 Juneau-Douglas WWTF Outfall 001A 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 analysis 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 the NMFS on January 16, 2020 and requested them to identify any threatened or endangered species under their jurisdiction in the vicinity of the Juneau-Douglas WWTF Outfall 001A.

USFWS, contacted DEC on January 16, 2020 and January 30, 2020 and stated that the USFWS online Information, Planning, and Conservation tool at https://ecos.fws.gov/ipac/ should be used to produce an endangered species list for Gastineau Channel.

NMFS contacted DEC on January 16, 2020 and stated that the ESA-listed threatened or endangered marine mammal species under NMFS jurisdiction present in Gastineau Channel are the western Distinct Population Segment (DPS) Steller sea lion and Mexico DPS humpback whales. Additionally, that there is currently no critical habitat for either species in Gastineau Channel.

ADF&G contacted DEC on January 30, 2020 and stated that information on state listed species can be found at: http://www.adfg.alaska.gov/index.cfm%3Fadfg=specialstatus.akendangered.

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

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 January 16, 2020 to provide them early notification of DEC's intent to reissue AK0023213 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 Sludge (Biosolids) Requirements

Sludge means any solid, semi-solid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. State and federal requirements regulate the management and disposal of sewage sludge (biosolids). The permittee must consult both state and federal regulations to ensure proper management of the biosolids and compliance with applicable requirements.

8.4.1 State Requirements

The Department separates wastewater and biosolids permitting. The permittee should contact the Department's Solid Waste Program for information regarding state regulations for biosolids. The permittee can access the Department's Solid Waste Program web page (https://dec.alaska.gov/eh/solid-waste) for more information and who to contact.

8.4.2 Federal Requirements

EPA is the permitting authority for the federal sewage sludge regulations at 40 CFR Part 503. Biosolids management and disposal activities are subject to federal requirements in Part 503. The Part 503 regulations are self-implementing, which means that a permittee must comply with the regulations even if no federal biosolids permit has been issued for the facility.

A POTW is required to apply for an EPA biosolids permit. The permittee should ensure that a biosolids permit application has been submitted to the EPA. In addition, the permittee is required to submit a biosolids permit application to the EPA for the use or disposal of sewage sludge at least 180 days before this APDES permit expires in accordance with 40 CFR §122.21(c)(2) and §122.21(q) (see also 18 AAC 83.110(c) and 18 AAC 83.310, respectively). The application form NPDES Form 2S can be found on the EPA website www.epa.gov under NPDES forms. The completed NPDES Form 2S should be submitted to:

U.S. Environmental Protection Agency,
Region 10, NPDES Permits Unit OWW-130,
Attention: Biosolids Contact,
1200 Sixth Avenue, Suite 900,
Seattle, WA 98101-3140.
The EPA Region 10 telephone number is 1-800-424-4372.

Information about EPA's biosolids program and CWA Part 503 is available at www.epa.gov and either search for 'biosolids' or go to the EPA Region 10 website link and search for 'NPDES Permits'.

8.5 Permit Expiration

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

9.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2018. State of Alaska 2014/2016 final integrated water quality monitoring and assessment report. November 2, 2018.

ADEC, 2018. 18 AAC 70, Water quality standards, as amended through April 6, 2018.

ADEC, 2014. Alaska Pollutant Discharge Elimination System permits reasonable potential analysis and effluent limits development guide.

ADEC, 2008. Alaska water quality criteria manual for toxic and other deleterious organic and inorganic substances, as amended through December 12, 2008.

Alaska Department of Fish and Game, 2019. Catalog of waters important for spawning, rearing, or migration of anadromous fishes-southeastern region, effective June 1, 2019.

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

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.

APPENDIX A. BASIS FOR EFFLUENT LIMITATIONS

A.1 Statutory and Regulatory Basis

18 Alaska Administrative Code (AAC) 70.010 prohibits conduct that causes or contributes to a violation of the water quality standards (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 Clean Water Act (CWA) requires a Publicly Owned Treatment Works (POTWs) to meet effluent limits based on available wastewater treatment technology, specifically, secondary treatment effluent limit standards found at Title 40 Code of Federal Regulations (CFR) 133, adopted by reference at 18 AAC 83.010(e). The Alaska Department of Environmental Conservation (Department or DEC) may find, by analyzing the effect of an effluent discharge on the receiving waterbody, that secondary treatment effluent limits are not sufficiently stringent to meet Alaska 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 waterbody are met.

Secondary treatment effluent limits for POTWs do not limit every pollutant that may be present in the effluent. Limits have only been developed for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Effluent from a POTW may contain other pollutants, such as bacteria, ammonia, or metals, depending on the type of treatment system used and the quality of the influent to the POTW. When technology-based effluent limits (TBELs) do not exist for a pollutant expected to be present in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a water-quality criterion for the waterbody. If a pollutant causes or contributes to an exceedance of a water-quality criterion, a WQBEL for the pollutant must be established in the permit. Table A-1 summarizes the basis for effluent limits contained in the permit. Further details for each effluent limit follow in this section.

Table A-1- Basis for Effluent Limits

Parameter	Units [a]	EFFLUENT LIMITS				
		Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Basis for Limit
Flow	mgd	---	2.76	---	4.9	18 AAC 72.245
BOD_5	mg/L	---	30	45	60	18 AAC 83.010(e) 18 AAC 83.540
	lbs/day	---	691	1,036	1,381	
TSS	mg/L	---	30	45	60	18 AAC 83.010(e) 18 AAC 83.540
	lbs/day	---	691	1,036	1,381	
BOD_5 & TSS Minimum Percent (%) Removal	%	85				18 AAC 83.010(e)
pH	SU	6.5	---	---	8.5	18 AAC 70.020(b)(6)
DO	mg/L	2.0	---	---	17	18 AAC 83.435(b) 18 AAC 83.480
Fecal Coliform Bacteria	FC/100 mL	---	200	400	800	18 AAC 72.990(21) 18 AAC 83.435(b)
Ammonia	mg/L	---	12	18	29	18 AAC 83.435(d) 18 AAC 83.530(2) 18 AAC 83.540
	lbs/day	---	276	414	668	
	lbs/day	---	---	---	1,380	

Footnote:

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

A.2 Secondary Treatment Effluent Limitations

The CWA requires a POTW to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," that all POTWs were required to meet by July 1, 1977. The secondary treatment standards in 40 CFR §133.102, which the Department has adopted in 18 AAC 83.010(e), are TBELs that apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133, the State of Alaska at 18 AAC 72.990(59) requires for BOD_5 and TSS maximum daily limitations. The secondary treatment limits are listed in Table A-2.

Table A-2- Secondary Treatment Effluent Limits

Parameter	Units	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Average Monthly Minimum Removal
BOD_5	mg/L	30	45	60	85%
TSS	mg/L	30	45	60	
pH	SU	6.0 – 9.0 SU at all times			

A.3 Water Quality-Based Effluent Limitations

WQBELs included in Alaska Pollutant Discharge Elimination System (APDES) permits are derived from WQS. APDES regulation 18 AAC 83.435(a)(2) requires that permits include WQBELs that can achieve WQS established under CWA Section 303, including state narrative criteria for water quality. The State's WQS are composed of 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. Designated uses are those uses specified in WQS for each waterbody or segment whether or not they are being attained [40 CFR Section 131.3(f)]. Existing uses are those uses actually attained in a waterbody on or after November 28, 1975, whether or not they are included in the WQS [40 CFR Section 131.3].

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b).

The receiving waterbody for the discharge, Gastineau Channel, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Gastineau Channel must be protected for all marine water designated uses. The marine water designated uses are: water supply for aquaculture, seafood processing and industrial; contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

A.3.1 Reasonable Potential Analysis

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, APDES *Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to evaluate the Juneau-Douglas Wastewater Treatment Facility (WWTF) effluent. Discharge monitoring reports (DMRs) from June 2015 to May 2020 and Form 2A Application to Discharge Effluent and Expanded Effluent Testing Data were reviewed to identify pollutants of concern. Pollutants of concern are those pollutants that already have a TBEL or WQBEL for a particular pollutant, pollutants with a total maximum load waste load allocation or watershed analysis, pollutants identified as present in the effluent through monitoring, or those pollutants that are likely to be present in the effluent based on the nature of the operation. The monitoring of the Juneau-Douglas WWTF's effluent as reported in the above documents, revealed the presence of ammonia and copper at levels above water quality criteria; therefore, these pollutants are pollutants of concern and were selected for further reasonable potential analysis (RPA).

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.

The Department may authorize a small volume of receiving water to provide dilution of the effluent; this volume is called a mixing zone. Mixing zone allowances will increase the allowable mass loadings of the pollutant to the waterbody. A mixing zone can be used only when there is adequate receiving waterbody

flow volume, and the concentration of the pollutant of concern in the receiving waterbody is below the numeric water quality criterion necessary to protect the designated uses of the waterbody.

A.3.2 Specific Water Quality-Based Effluent Limits in the Juneau-Douglas WWTF Permit

A.3.2.1 pH

Alaska WQS at 18 AAC 70.020(b)(18)(C) states that the pH water quality criteria for the growth and propagation of fish, shellfish, other aquatic life, and wildlife for marine water may not be less than 6.5 or greater than 8.5 SU.

DEC reviewed pH monitoring data from June 2015 to May 2020. During this time period the minimum pH value reported was 5.6 SU and the maximum pH value reported was 7.8 SU. The previous permit required a minimum of 6.5 SU and a maximum of 8.5 SU. Therefore, the pH limits of the prior permit are carried forward in the reissued permit.

A.3.2.2 Dissolved Oxygen (DO)

Alaska WQS at 18 AAC 70.020(b)(15)(A)(i) Aquaculture states that surface marine DO concentrations for aquaculture, contact recreation, secondary recreation, the harvesting for consumption of raw mollusks or other raw aquatic life, and the growth and propagation of fish, shellfish, other aquatic life, and wildlife, must not be less than 6.0 mg/L and that in no case may DO levels exceed 17 mg/L.

The 2004 Recommended Standards for Wastewater Facilities recommends a minimum concentration of 2.0 mg/L of DO in the mixed liquor aeration tank in design requirements for a mechanical aeration system. Juneau-Douglas WWTF uses an activated sludge process with mechanical aeration. As such, a minimum DO concentration of 2.0 mg/L is required to ensure a healthy microorganism population and the successful treatment of biological wastes.

DEC reviewed DO monitoring data from June 2015 to May 2020. During this period the DO ranged from a minimum of 2.2 mg/L to a maximum of 9.9 mg/L. It is reasonable to assume that the discharge will continue to not consistently meet a minimum water quality criterion of 6.0 mg/L; therefore, DO will also continue to be included in the mixing zone. The previous permit required a DO daily minimum concentration of 2.0 mg/L and daily maximum concentration of 17 mg/L. These limits are carried over into the reissued permit.

A.3.2.3 Fecal Coliform (FC) Bacteria

Alaska WQS at 18 AAC 70.020(b)(14)(D) states that the FC bacteria criteria for the harvesting for consumption of raw mollusks or other raw aquatic life the geometric mean of samples may not exceed 14 FC/100 mL, and not more than 10% of the samples may exceed a FC most probable number (MPN) of 43 FC/100 mL.

DEC reviewed FC bacteria monitoring data for Outfall 001A from June 2015 to May 2020. The results ranged from 2.0 FC/100 mL to 320 FC/100 mL. The previous permit limits of an average monthly limit (AML) of 200 FC/100 mL, an average weekly limit (AWL) of 400 FC/100 mL, and a maximum daily limit (MDL) of 800 FC/100mL were never exceeded.

FC bacteria can be reasonably expected to exceed water quality criteria. A mixing zone is required to meet the water quality criteria of 14 FC/100 mL AML and 43 FC/100 mL MDL. At a maximum expected FC bacteria concentration of 800 FC/ 100 mL, FC bacteria requires a dilution factor of 18.6. Ammonia requires a higher dilution and drives the chronic mixing zone. FC bacteria is included in the chronic mixing zone sized for ammonia.

DEC multiplied the chronic mixing zone dilution factor by the FC bacteria WQ criteria and obtained an AML of 274 FC/100 mL and a MDL of 842 FC/100 mL. DEC then compared these limits with the previously discussed AML of 200 FC/100 mL and the MDL of 800 FC/100 mL and selected the more stringent limits for the permit. An AWL of 400 FC/100 mL is selected as there is not a comparable FC water quality criterion. The selected limits are protective of WQ criteria at the boundary of the mixing zone.

Therefore, based on the facility's consistent ability to produce an effluent capable of meeting the FC bacteria concentration limits required of the vast majority of secondary treatment facilities throughout the state, and compliance with the State's definition of disinfection at 18 AAC 72.990(21(A)(B), the FC bacteria limits are carried forward from the previous permit. Monitoring of FC bacteria concentrations will be assessed for compliance with Alaska water quality criteria at 18 AAC 70.020(b)(14)(D).

A.3.2.4 Total Ammonia (as Nitrogen)

Total ammonia is the sum of ionized (NH4+) and un-ionized ammonia (NH3). Temperature, pH, and salinity affect which form, NH4+ or NH3 is present. NH3 is more toxic to aquatic organisms than NH4+ 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.

DEC used the 85th percentile of the pH, temperature, and salinity receiving water data collected by CBJ from Gastineau Channel from June 2015 to October 2019 to establish an acute ammonia water quality criterion of 11.4 mg/L and a chronic ammonia water quality criterion of 1.7 mg/L. Effluent ammonia monitoring from June 2015 to May 2020 results ranged from 0.11 mg/L to 24 mg/L.

Because CBJ's ammonia monitoring results indicated exceedances for both acute and chronic water quality criteria; ammonia was selected for RPA which demonstrate that there is reasonable potential for ammonia to exceed water quality criteria at the end of pipe. Since there is reasonable potential for ammonia to exceed water quality criteria at the end of the pipe, and because ammonia is the driving parameter in the authorized mixing zone, WQBELs were developed for ammonia (MDL 29 mg/L, AML 12 mg/L) that are protective of water quality criteria at the boundary of the mixing zone.

18 AAC 83.530(d) requires effluent limits from a continuously discharging POTW to be stated as average weekly and average monthly limits unless impracticable. Secondary treatment standards at 18 AAC 83.605 establishes AWLs as being 1.5 times the AML. Following this precedent, the AWL for ammonia is derived by multiplying ammonia's AML of 12 mg/L 1.5 times to obtain an AWL of 18 mg/L. See Appendix B for details on reasonable potential determination and Appendix C for details on permit limit derivation.

APPENDIX B. REASONABLE POTENTIAL DETERMINATIONC

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:

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

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

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

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

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

After the D simplification, this becomes:

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

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 observed effluent concentration (MOC) by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the MOC and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean. When fewer than 10 data points are available, the TSD and DEC's RPA Guide 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. In the example of ammonia, the Department used ProUCL, a statistical software program, to determine a CV of 0.8255. ProUCL indicated that the data set follows a gamma statistical distribution. Therefore, the RPM equation in section 2.4.2.1 of the RPA Guide is 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_n = mean calculated by ProUCL = 6.197

σ = the standard deviation calculated by ProUCL = 5.230

p_n = the z − statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.951$

n = number of valid data samples = 60

$$RPM = 1.2$$

The maximum expected concentration (MEC) is determined by multiplying the MOC by the RPM:

$$MEC = (RPM)(MOC) \quad \text{(Equation B-8)}$$

MOC = 24 milligrams per liter (mg/L)

In the case of ammonia,

MEC = (1.235)(24) = 29.6 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 = 26.6 mg/L > 11.4 mg/L (acute ammonia criterion) and 1.7 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. 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)	24	60	0.8	1.2	29.6	11.4 (acute) 1.7 (chronic)	yes
Copper (µg/L)	31	22	0.6	1.9	57.4	5.8 (acute) 3.7 (chronic)	yes

APPENDIX D. 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 Juneau-Douglas Wastewater Treatment Facility (WWTF), 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 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 WLA

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" WLAs

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 Juneau-Douglas WWTF permit. 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: $D_{a,c} = Dilution = \frac{(Q_d + Q_s)}{Q_d}$

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

$Q_d = Critical\ Discharge\ Flow$

$C_s = Critical\ Upstream\ Concentration$

$WLA_{a,c} = Wasteload\ Allocation\ (\ acute, ammonia)$

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

For ammonia,

$D_a = 2.6$

$D_c = 19.6$

$C_s = 0.194\ milligrams\ per\ liter$ (mg/L)

$WLA_a = 29.2$ mg/L

$WQC_c = 30.2\ mg/L$

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:

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

$$LTA_c = WLA_c * exp(0.5\sigma_4^2 - z_{99}\sigma_4)$$

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:

$$LTA_a = 6.9\ mg/L$$

$$LTA_c = 12.8\ mg/L$$

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.

Step 4 - Calculate the Permit Limits

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:

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

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

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

$$CV = coefficient\ of variation$$

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

Where:

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

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

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

$$CV = coefficient\ of variation$$

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

For ammonia:

$$MDL = 29\ mg/L$$

$$AML = 12\ mg/L$$

C.5 Mass-Based Limits

Alaska Pollutant Discharge Elimination System regulations at 18 Alaska Administrative Code (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. In addition, 18 AAC 83.520 requires that effluent limits for a publicly owned treatment works be calculated based on the design flow of the facility. Expressing limitations in terms of concentration as well as mass encourages the proper operation of a facility at all times. The mass-based limits are expressed in pounds per day and are calculated as follows:

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

C.6 Flow

Flow is based on the hydraulic design capacity of the WWTF (flow rate as gallons or mgd) and is determined by a professional engineer and approved by the Department during the WWTF plan review process conducted per 18 AAC 72. A flow limit based on the design capacity ensures that the WWTF operates within its capabilities to receive and properly treat sustained average flow quantities and specific pollutants.

C.7 Effluent Limit Summary

Table C-1 provides a summary and reference to those parameters in the Juneau-Douglas WWTF that contain effluent limits at the point of discharge.

Table C-1- Summary of Effluent Limitations

Parameter	Fact Sheet Reference
Five-day Biochemical Oxygen Demand	Appendix A-Section A.2
Total Suspended Solids	Appendix A- Section A.2
pH	Appendix A- Section A.3.2.1
Dissolved Oxygen	Appendix A- Section A.3.2.2
Fecal Coliform Bacteria	Appendix A-Section A.3.2.3
Total Ammonia, as Nitrogen	Appendix A-Section A.3.2.4

APPENDIX E. MIXING ZONE ANALYSIS CHECKLIST

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 Juneau-Douglas Wastewater Treatment Facility mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable?	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?		**18 AAC 70.240(c)(1)**
Low Flow Design	**For streams, rivers or 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 be approved as proposed or authorized with conditions.**		**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, chinook, and sockeye salmon? **If yes, mixing zone prohibited.**		**18 AAC 70.240(f)**
Human Health	Does the mixing zone… (1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**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 be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(2)**
	(5) 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) 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)**
	(2) 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)**
	(3) result in undesirable or nuisance aquatic life? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(5)**
	(4) 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)**
	(5) 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)**
	(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 yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(7)** **18 AAC 70.240(d)(8)**
	(7) 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)**

Criteria	Description	Resources	Regulation
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)**