ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – DRAFT

Permit Number: AK0021890

Lowell Point Wastewater Treatment Facility

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

Public Comment Period Start Date: May 27, 2022

Public Comment Period Expiration Date: June 27, 2022

Alaska Online Public Notice System

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

CITY OF SEWARD

For wastewater discharges from

Lowell Point Wastewater Treatment Facility
13910 Lowell Point Road
Seward, AK, 99664

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to reissue an APDES individual permit (permit) to the City of Seward. 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 Lowell Point 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 limitations 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, on the basis of requests, a significant degree of public interest in a draft permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision or for other good reason, in the Department's discretion. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. The public may also submit written testimony in lieu of or in addition to providing oral testimony at the hearing. A hearing will be tape recorded. If there is sufficient public interest in a hearing, the comment period will be extended to allow time to public notice the hearing. Details about the time and location of the hearing will be provided in a separate notice.

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

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

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

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

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
555 Cordova Street
Anchorage AK, 99501

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 preliminary draft APDES permit for the following entity:

Permittee:	City of Seward
Facility:	Lowell Point WWTF
APDES Permit Number:	AK0021890
Facility Location:	13910 Lowell Point Road, AK
Mailing Address:	P. O. Box 167 Seward, AK 99664
Facility Contact:	Mr. Doug Schoessler (907) 224-4005

The map in Part 2.1, Figure 1 shows the location of the treatment plant and the location of the outfall. The process flow diagram in Part 2.1, Figure 2 illustrates the treatment process.

1.2 Authority

Section 301(a) of the Clean Water Act (CWA) and 18 AAC 83.015 provide that the discharge of pollutants to waters of the United States (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 U.S. Environmental Protection Agency (EPA) issued the first National Pollutant Discharge Elimination System (NPDES) permit in 1974 for the Lowell Point WWTF to the City of Seward (City) authorizing domestic wastewater discharge from the facility. The permit required that the treatment facility meet the secondary treatment limitations described in 40 Code of Federal Regulations (CFR) Part 133 by July 1, 1977. The City applied for a CWA §301(h) waiver on June 29, 1978, as provided for in the CWA amendments of 1977. During 1979 – 1980 timeframe, while the second NPDES permit for Lowell Point WWTF was being developed, the City withdrew its CWA §301(h) waiver request and committed to building a secondary treatment facility. The second permit, effective from 1980 to 1985, contained a compliance schedule for attaining secondary treatment by 1981. The facility began operation as a secondary treatment facility in 1981 and operated under an administrative extension until 1996 when EPA reissued the Lowell Point WWTF NPDES permit. EPA reissued the final NPDES discharge permit in 2002 and the facility again operated under an administrative extension following the expiration of the NPDES permit in January 2007.

In October 2008, DEC received approval from EPA to administer the NPDES Program in the State of Alaska. The City was authorized to discharge from the Lowell Point WWTF under the new APDES individual permit on August 1, 2011, that expired on July 31, 2016. The City operated the Lowell Point WWTF under an administrative extension, per state regulations at 18 AAC 83.155(c) until a new individual permit was reissued on April 21, 2017. The City submitted an incomplete application for a reissuance of AK0021890 on December 3, 2021. Included in the documents submitted by the City were APDES Form 2A, a supplement to Form 2A, APDES Form 2M, a supplement to Form 2M that did not include mixing zone modeling, APDES Form 2G, including supplements discussing a Tier 2 analysis of

practicable alternatives analyses for ammonia as an expanded discharge with newly regulated effluent limits, a discharge monitoring report (DMR) information summary, a summary of receiving water monitoring, including mixing zone monitoring for bacteria conducted from June 2017 through October 2021, and the results of three expanded monitoring events. Also included in the submission by the City were a Disinfection Analysis Report, an Industrial User Survey, a Seward customer questionnaire, and a request for permit changes. The City completed the application for reissuance of the permit by submitting supplemental information required by DEC for Form 2M on September 7, 2021. The application was determined to be administratively complete on September 9, 2021. The permit was administratively extended on September 24, 2021.

2.0 BACKGROUND

2.1 Facility Information

The City owns, operates, and maintains the Lowell Point WWTF, which is a publicly owned treatment works (POTW) in Seward, Alaska. The facility collects and treats domestic wastewater for approximately 2,700 Seward residents, an incorporated home rule city in Alaska. The facility's population served during the summer months increases significantly due to the influx of visitors and seasonal workers. The facility does not receive significant contributions from industrial users nor is the collection system combined with a storm water sewer system. Since the previous APDES permit issuance, there have been no major modifications to the facility.

Wastewater is treated to secondary treatment and equivalent to secondary treatment of domestic wastewater. In the previous permit issuance, 5-day biochemical oxygen (BOD_5) demand, including BOD_5 removal was treated to equivalent to secondary standards during the summer months between July and October and to secondary standards during the other months of the year. Treatment is provided by a two-cell aerated lagoon system. The treated effluent is pumped away from the lagoon approximately 3,350 feet (ft) north to a manhole in the Lowell Point Road. From there a 14-inch diameter outfall line runs 170 ft into Resurrection Bay, perpendicular to the shore, to a depth of approximately 120 ft below mean lower low water (MLLW), where a 200 ft diffuser extends into deeper water at a latitude of 60º 04' 54" North and a longitude of 149º 26' 20" West.

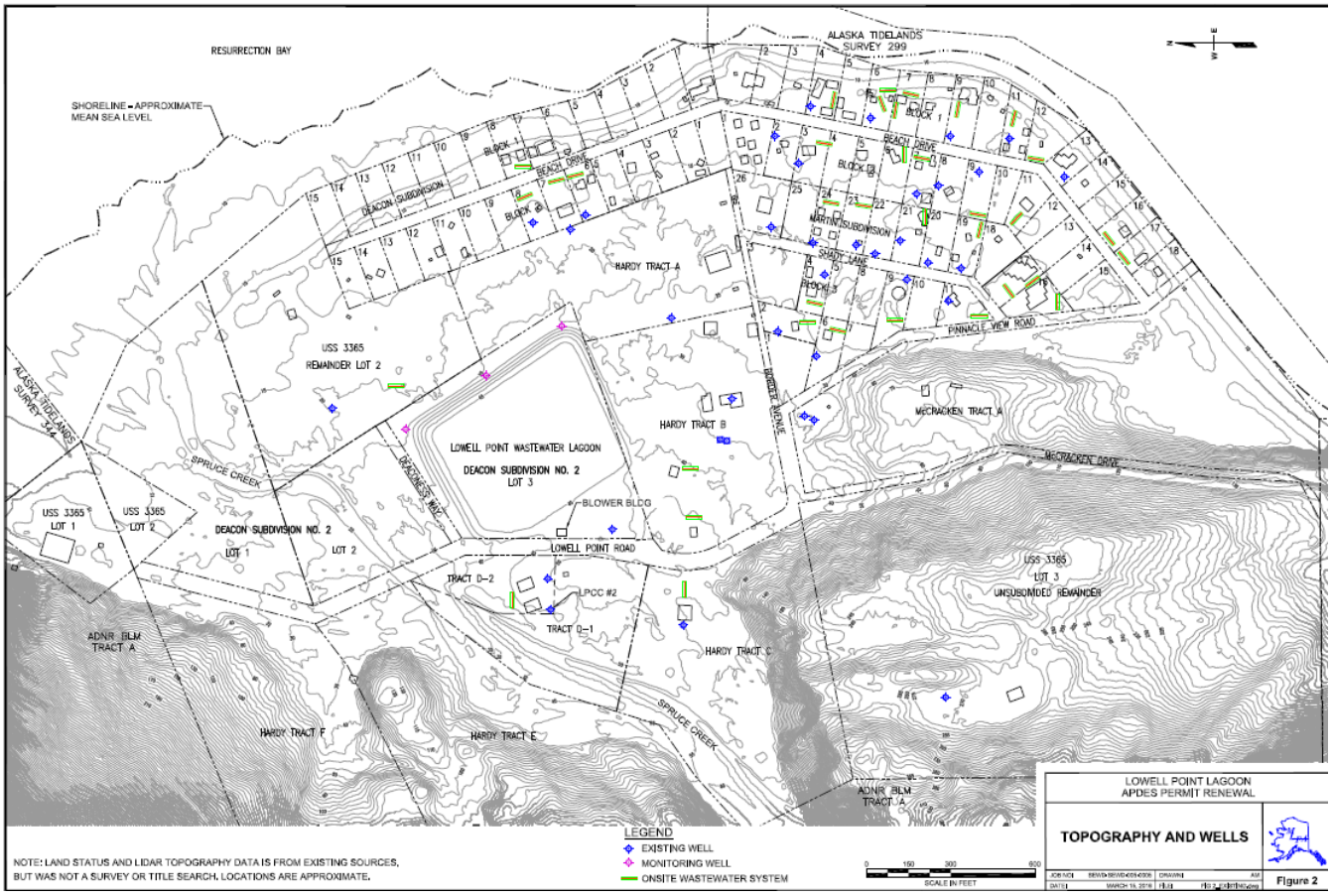
Table 1 provides information about average plant performance at the Lowell Point WWTF.

Table 1: Average Monthly Plant Performance

Parameter	Average Value 2017-2021
Flow	0.48 million gallons per day (mgd)
BOD_5 concentration (November - June)	14 milligrams per liter (mg/L)
BOD_5 concentration (July - October)	52 mg/L
BOD_5 Loading/Mass (November - June)	102 pounds per day (lbs/day)
BOD_5 Loading/Mass (July – October)	382 lbs/day
BOD_5 percent removal (November - June)	91.5%
BOD_5 percent removal (July - October)	78.8%

Parameter	Average Value 2017-2021
Total Suspended Solids (TSS) concentration	9 mg/L
TSS loading/mass	66 lbs/day
TSS percent removal	96.3%
5-Day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) concentration (November - June)	13 mg/L
$CBOD_5$ concentration (July - October)	9.5 mg/L
$CBOD_5$ Loading Mass (November - June)	95 lbs/day
$CBOD_5$ Loading Mass (July – October)	70 lbs/day
$CBOD_5$ percent removal (November - June)	88.3%
$CBOD_5$ percent removal (July – October)	91.3%
pH (average pH minimum and pH maximum)	7.19 Standard Units (S. U.)
Dissolved Oxygen (DO) (average DO minimum and DO maximum)	9.77 mg/L
Monthly Geomean Fecal coliform (FC) bacteria	12,236 fecal coliform bacteria per 100 milliliters (FC/100 mL)
Monthly Geomean Enterococci bacteria	3,583 colony forming units per 100 milliliters (cfu/100mL)
Total Ammonia, as Nitrogen	12.1 mg/L

Figure 1: Lowell Point Wastewater Treatment Facility Map



2.2 Wastewater Treatment

The facility provides secondary treatment and equivalent to secondary treatment of domestic wastewater prior to discharge into the west side of Resurrection Bay. Lowell Point WWTF has a flow design capacity of 0.88 mgd.

The Lowell Point WWTF provides secondary treatment of domestic wastewater for the community of Seward. In the present system, influent is collected from a network of approximately 23 miles of sewer lines and mains located throughout Seward from Forest Acres Subdivision on the north side of the city to Lowell Point on the south side of the city. There are four pump stations located within the sewer system network and all influent passes through screens and grinder pumps located in each pump station. The pump station closest to the WWTF is Pump Station (PS) 3. All influent flows are combined at PS 3, location of the influent sampler, and discharged from there by force main to the Lowell Point WWTF lagoon. The lagoon site is at Lowell Point, a peninsula having a total area of 11.9 square miles, located about three miles south of the community of Seward. The WWTF lagoon is a two-cell aerated system with a water surface area of 6.5 acres and is 22.5 ft at its deepest point.

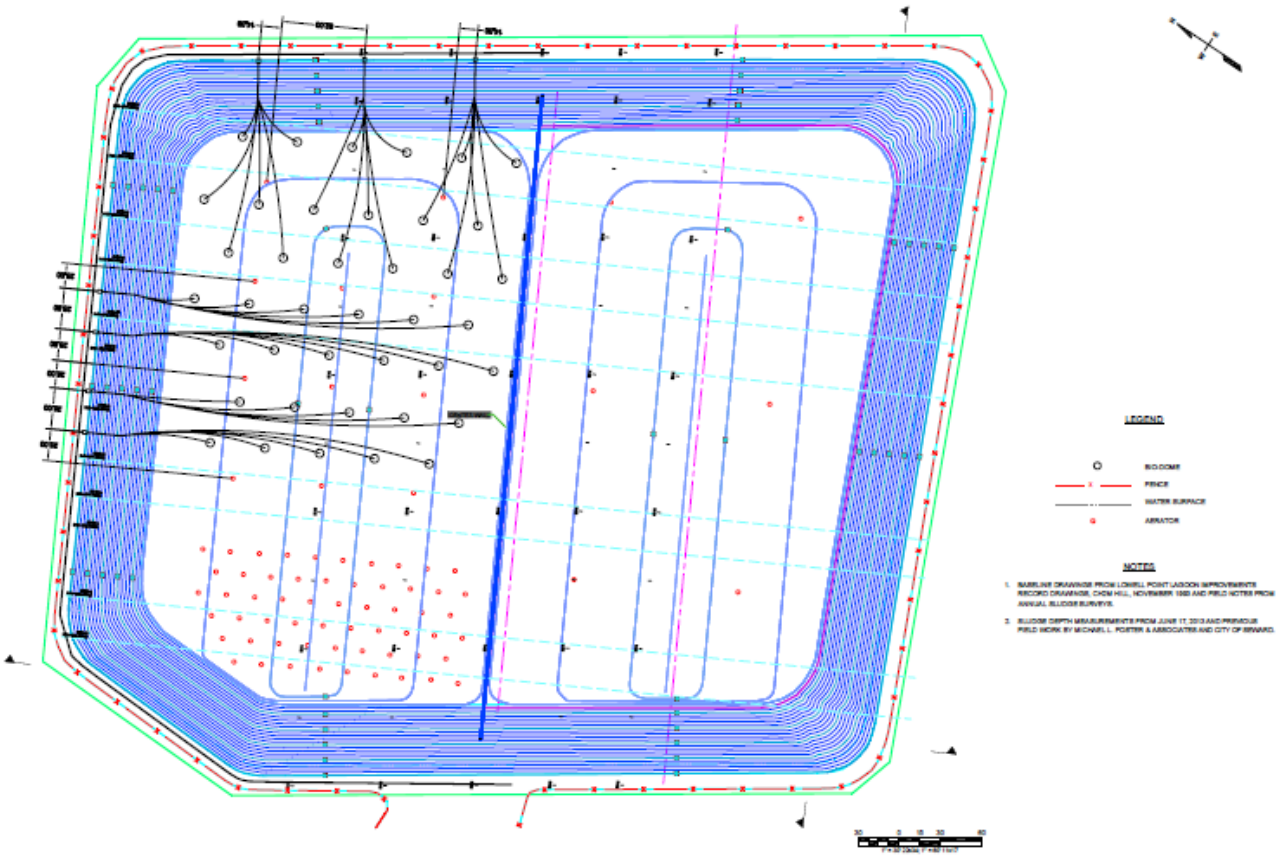
Construction of the Lowell Point lagoon was completed in 1980 and originally included a lined, aerated, 30-million-gallon lagoon consisting of six cells with earthen dikes sloped 2:1 horizontal to vertical. In 1991 the lagoon system suffered catastrophic failure that was attributed to upward pressure from air pockets that developed beneath the flat lagoon bottom. In 1993, a concrete partitioning wall and Hypalon curtain were constructed to convert the lagoon from six cells to two cells. As part of the same construction project, the lagoon bottom was re-contoured and a new liner and static tube aerators were installed. The system is designed to operate with two cells under normal conditions, however a single cell can be utilized in the event that one cell requires maintenance or repair. In May 2015, the City began sludge removal for the first time in the 22-year history of operations at Lowell Point WWTF and also undertook lagoon and aeration header maintenance. Forty Bio-Domes were placed in Cell #1 to provide supplemental treatment by fixed media to assist with BOD_5 removal, reduce odors, aid in sludge digestion during winter operations, and reduce power consumption in the fall and winter when the larger blowers are not needed.

Influent enters Cell #1 of the treatment lagoon for primary aeration. Aeration is supplied to the lagoon by way of two Hoffman blowers, directed primarily to Cell #1 to maintain mixing and aerobic conditions. Most organic decomposition occurs in this first cell. Wastewater flow is directed from Cell #1 to Cell #2 to cycle between continued aeration and settling. Cell #2 provides additional treatment and serves as a polishing pond with minimal aeration to maintain the wastewater aerobics and meet the minimum dissolved oxygen requirements. Settling of total suspended solids provides the majority of the reduction capability of the second cell. Wastewater is retained in the lagoon for an overall detention time of 50 to 60 days. Following biological treatment, the effluent discharges by way of a 14-inch (in) diameter force main for 3,350 ft to a manhole in the Lowell Point Road. From there, an outfall pipe extends away from the shoreline for 170 ft into Resurrection Bay, eventually terminating at Outfall 001A at an elevation of approximately -210 ft MLLW.

In October 2020, operators identified an air leak from an air header in Cell 1 of the Lowell Point lagoon. Cell 1 was taken out of service and drained below the level of the pony wall, in an effort to allow contractors to make the necessary repairs. Due to delays in construction repairs caused by the 2019 Covid pandemic, before an early winter freeze-up. When Cell 1 was out of service, the facility operated at approximately 40% capacity. The City completed the repairs on Cell 1 and started refilling it on May 20, 2021. Discharge to Resurrection Bay ceased for the remainder of the month of May and June of 2021. The first recorded day of continuation of discharge was July 22, 2021.

No other major modifications to the facility have been implemented since the previous APDES permit.

Figure 2: Lowell Point WWTF Aeration Configuration Diagram



2.3 Pollutants of Concern

Pollutants of concern known to be present in the effluent of the Lowell Point WWTF consist of domestic wastewater conventional pollutants regulated in the technology-based effluent limits (TBELs) via the secondary and equivalent to secondary treatment standards, including BOD_5, TSS, $CBOD_5$, and pH. For more information about secondary and equivalent to secondary treatment standards, see Fact Sheet Appendix A. Additional domestic wastewater pollutants known to be in the discharge are ammonia, fecal coliform bacteria (FC bacteria), enterococci bacteria (enterococci), and phosphorus. DEC adopted regulations that required facilities that discharge to marine water to monitor enterococci during the previous permitting period. More information about ammonia, FC bacteria, and enterococci can be found in Fact Sheet Part 3.3 and Appendix A. More information about phosphorus can be found in Fact Sheet Part 3.3. As the Lowell Point WWTF has a design flow less than 1.0 mgd, Whole Effluent Toxicity (WET) is not a pollutant of concern as required under 18 AAC 83.335(b)(1). More information about WET requirements can be found in Fact Sheet Part 3.4.

The parameters monitored in the previous APDES permit cycle were BOD_5, TSS, $CBOD_5$, pH, ammonia, temperature, DO, FC bacteria, and enterococci. Based on monitoring results from 2017 - 2021, monitoring data for the same parameters will continue to be collected in the permit cycle. Total residual chlorine (TRC) is included in the permit as a parameter to be monitored in the effluent, if the

City installs disinfection treatment containing chlorine when it has fulfilled the requirements of the compliance schedule to install disinfection treatment to meet final FC bacteria effluent limits. More information about the compliance schedule requiring the City to install disinfection treatment can be found in Fact Sheet Part 7.4. Pollutants monitored in the three additional effluent monitoring events were Total Kjeldahl nitrogen, total nitrate-nitrite (NO_2/NO_3), total dissolved solids, and oil & grease. Phosphorus was also included in the additional monitoring events and exceeded the marine water quality criterion in all three events and will be monitored as a new parameter of concern in the permit cycle.

2.4 Compliance History

DEC reviewed DMRs and other sampling data submitted by the City from June 2017 to December 2021 to determine the facility's compliance with effluent limits. Effluent limit exceedances identified from the DMR review for Outfall 001A are summarized in Table 2.

Table 2: Outfall 001A: Effluent Limit Exceedances June 2017 – August 2021

Month	Pollutant	Value Reported in DMR	Effluent Limitation	Limit Type
September 2017	BOD, 5-day, 20 deg. C	103 mg/L	45 mg/L	Monthly Average
September 2017	BOD, 5-day, 20 deg. C	103 mg/L	65 mg/L	Weekly Average
September 2017	BOD, 5-day, 20 deg. C	687 lb/day	330 lb/day	Monthly Average
September 2017	BOD, 5-day, 20 deg. C	687 lb/day	477 lb/day	Weekly Average
September 2017	BOD, 5-day, percent removal	47 %	65 %	Minimum Percent Removal
September 2017	Coliform, fecal general	38,144 #/100 mL	25,000 #/100mL	Monthly Geometric Mean
September 2017	Coliform, fecal general	38,144 #/100 mL	37,500 #/100mL	Weekly Geometric
September 2017	Coliform, fecal general	97,000 #/100 mL	50,000 #/100mL	Daily Maximum
November 2018	BOD, 5-day, percent removal	82 %	85 %	Minimum Percent Removal
July 2019	BOD, 5-day, 20 deg. C	79.4 mg/L	45 mg/L	Monthly Average
July 2019	BOD, 5-day, 20 deg. C	79.4 mg/L	65 mg/L	Weekly Average
August 2019	BOD, 5-day, 20 deg. C	95.4 mg/L	45 mg/L	Monthly Average
August 2019	BOD, 5-day, 20 deg. C	95.4 mg/L	65 mg/L	Weekly Average
August 2019	BOD, 5-day, 20 deg. C	350 lb/day	330 lb/day	Monthly Average
September 2019	BOD, 5-day, 20 deg. C	129.8 mg/L	45 mg/L	Monthly Average
September 2019	BOD, 5-day, 20 deg. C	129.8 mg/L	65 mg/L	Weekly Average
September 2019	BOD, 5-day, 20 deg. C	554.3 lb/day	330 lb/day	Monthly Average

September 2019	BOD, 5-day, 20 deg. C	554.3	lb/day	477	lb/day	Weekly Average
September 2019	Coliform, fecal general	27,111	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
October 2019	BOD, 5-day, 20 deg. C	57	mg/L	45	mg/L	Monthly Average
November 2019	BOD, 5-day, percent removal	79	%	85	%	Minimum Percent Removal
July 2020	BOD, 5-day, 20 deg. C	92	mg/L	45	mg/L	Monthly Average
July 2020	BOD, 5-day, 20 deg. C	92	mg/L	65	mg/L	Weekly Average
August 2020	BOD, 5-day, 20 deg. C	68	mg/L	45	mg/L	Monthly Average
August 2020	BOD, 5-day, 20 deg. C	68	mg/L	65	mg/L	Weekly Average
September 2021	BOD, 5-day, 20 deg. C	83	mg/L	45	mg/L	Monthly Average
September 2021	BOD, 5-day, 20 deg. C	83	mg/L	65	mg/L	Weekly Average
December 2020	BOD, 5-day, percent removal	83	%	85	%	Minimum Percent Removal
December 2020	Coliform, fecal general	58,428	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
December 2020	Coliform, fecal general	58,428	#/100 mL	37,500	#/100mL	Weekly Geometric
December 2020	Coliform, fecal general	101,000	#/100 mL	50,000	#/100mL	Daily Maximum
March 2021	Coliform, fecal general	37,000	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
May 2021	Coliform, fecal general	33,000	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
May 2021	Oxygen, dissolved	2.3	mg/L	6	mg/L	Minimum
July 2021	Coliform, fecal general	43,828	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
July 2021	Coliform, fecal general	43,828	#/100 mL	37,500	#/100mL	Weekly Geometric
July 2021	Coliform, fecal general	57,000	#/100 mL	50,0000	#/100mL	Daily Maximum
August 2021	Coliform, fecal general	37,470	#/100 mL	25,000	#/100mL	Monthly Geometric Mean
August 2021	Coliform, fecal general	52,000	#/100 mL	50,000	#/100mL	Daily Maximum
September 2021	Coliform, fecal general	28,205	#/100 mL	25,000	#/100mL	Monthly Geometric Mean

Two inspections have been conducted on the Lowell Point WWTF since the previous permit issuance. An inspection on May 16, 2019 reported that the facility exceeded the weekly average, monthly average, and percent removal for BOD_5 and exceeded the monthly geometric mean, daily maximum, and weekly geometric mean for FC bacteria in September 2017. The facility did not report the exceedances of FC bacteria to the 24-hour noncompliance hotline. The facility also exceeded the BOD_5 percent removal in November 2018. An inspection on March 30, 2021 found that the facility records indicated 20 instances of effluent limit non-compliance occurring during the

review period of February 1, 2019 and February 28, 2021. Also, a review of records indicated 16 instances of non-compliance from February 1, 2019 to February 28, 2021 for failing to report results related to monitoring of the shoreline location and west boundary of the mixing zone location and 20 instances of non-compliance for failing to report influent and effluent $CBOD_5$ results that occurred from June 1, 2020 to February 28, 2021.

2.4.1 Lowell Point WWTF Citizen Complaints

DEC received numerous odor complaints about the facility between July 1, 2017 and December 31, 2021 from citizens in the community.

Other than the non-compliance events reported, the Lowell Point WWTF routinely produces secondary and equivalent to secondary treatment effluent with $CBOD_5$, BOD_5 and TSS removal rates usually greater than 85%.

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 particular pollutant be the more stringent of either TBELs or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the water quality standards of a water body 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 POTWs are derived from the secondary treatment standards and/or treatment equivalent to secondary treatment found in 40 CFR §133.102 and 40 CFR §133.105, adopted by reference at 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 Fact Sheet Appendix A.

The effluent limits imposed in the previous permit for BOD_5 and BOD_5 percent removal in the months from November - June, year-round TSS, and TSS percent removal were based on secondary treatment standards and the effluent limits imposed for BOD_5 and BOD_5 percent removal in the months of July - October were based on equivalent to secondary treatment standards. To be eligible for discharge limitations based on equivalent to secondary treatment standards, a facility must demonstrate: that effluent concentrations, despite proper operation and maintenance, consistently exceed the secondary standards at 40 CFR§ 133.102(a) and (b); the principal treatment process is a trickling filter or waste stabilization pond; and the treatment works provide significant biological treatment of municipal wastewater.

3.2 Basis for Effluent and Receiving Water Monitoring

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

The permit also requires the permittee to perform the additional effluent monitoring required by the APDES application Form 2A for POTWs, so that this data will be available when the permittee applies to reissue the APDES permit. The permittee is responsible for conducting the monitoring and submitting the results with the application for renewal of the APDES permit. The permittee should consult and review Form 2A upon permit issuance to ensure that the required monitoring in the application will be completed prior to submitting a request for permit renewal. A copy of Form 2A can be found at http://dec.alaska.gov/water/wastewater/permit-entry/domestic-and-municipal/.

3.3 Effluent Limits and Monitoring Requirements

The permit contains a combination of both TBELs and WQBELs. The following summarizes the proposed effluent limits. A more expansive technical and legal basis for the proposed effluent limits is provided in Fact Sheet Appendix A. The effluent limits and monitoring changes in the permit from those imposed in the 2017 permit are as follows: the permit contains new or changed TBELs for BOD_5 and $CBOD_5$ and new WQBELs for ammonia and TRC. The permit has new monitoring requirements for BOD_5, $CBOD_5$, ammonia, and phosphorus. The WQBELs and monitoring frequency for DO and pH and monitoring requirements for enterococci are carried forward from the previous permit. The WQBELs for FC bacteria will be carried forward, until the requirements of the compliance schedule for the installation of a disinfection system have been met and the facility can meet final FC bacteria limits. More information about the disinfection compliance schedule and WQBELs for FC bacteria can be found in Fact Sheet Part 7.4. The monitoring frequency for FC bacteria will be carried forward from the previous permit. Monitoring data will be used to conduct future reasonable potential analyses to determine if discharges of these parameters might cause an exceedance of the WQS in the receiving water body.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than are required under the permit. These additional samples must be used for averaging (for pollutants results reported on a monthly or weekly average) if they are conducted using the Department – approved test methods (found in 18 AAC 70 and 40 CFR Part 136, adopted by reference in 18 AAC 83.010).

For all effluent monitoring, the permittee must use a sufficiently sensitive EPA approved test method that quantifies the pollutants to a level lower than applicable limits or water quality standards or use the most sensitive test method available, per 40 CFR §136, adopted by reference in 18 AAC 83.010(f).

The permit requires pretreatment influent monitoring and effluent monitoring at Outfall 001A. Effluent limits are based on the secondary treatment standards adopted in 18 AAC 83.010(e). This includes the permit requirement to monitor the influent for BOD_5, $CBOD_5$, and TSS and to calculate monthly removal rates for $CBOD_5$ and TSS.

The permit carries forward the previous permit's monthly flow limit of 0.88 mgd and requires the City to report the maximum daily flow. The design flow for the facility is 0.88 mgd and is assigned as the

Average Monthly Limit (AML) in the permit to be consistent with previous permits, starting with the first APDES permit, issued in 2011. According to the application received in January 2007 from the City, the design flow rate for the Lowell Point WWTF was listed as 0.88 mgd. The 2011 permit assigned the AML to the facility design flow rate of 0.88 mgd to coincide with the information submitted on the permittee's application. The flow rate of 0.88 mgd was used to calculate the mass load limits in the 2011 permit and subsequent permits, including the current permit, so this change affects no other limit or condition imposed on limits for other parameters. The current permit carries forward the flow AML of 0.88 mgd, because the monthly limit is more stringent than the daily maximum limit (DML) and more in line with the facility's actual flow rate. During the previous permitting period, the flow rate AML ranged from 0.18 mgd to 0.79 mgd.

The permit requires the City to use $CBOD_5$ instead of BOD_5 as a parameter used to determine oxygen demand. In a document submitted with the application for reissuance of AK0021890, Request for permit changes, the City proposed using $CBOD_5$ instead of BOD_5. The City made the case that BOD_5 exceedances, typically reported in late summer or fall, are caused by nitrogenous oxygen demand interfering with the 5-day BOD test, caused by high temperatures in the lagoon. The City stated that $CBOD_5$ is a more reliable parameter than BOD_5 to measure oxygen demand in the Lowell Point WWTF. To provide data to support this request, the City collected influent and effluent DML and AML $CBOD_5$ data and reported $CBOD_5$ removal rates from June 2020 through the end of the previous permit period, to compare with the required BOD_5 monitoring results. DEC reviewed the data from the Lowell Point WWTF, along with $CBOD_5$ and BOD_5 monitoring results from the nearby Spring Creek WWTF and literature provided by the City to support their case. DEC accepted the City's justification to use $CBOD_5$ instead of BOD_5. The permit requires the City to report effluent DMLs, AWLs, and AMLs for $CBOD_5$, based on secondary treatment standards and calculate $CBOD_5$ removal rates on a monthly basis, also according to secondary treatment standards. $CBOD_5$ effluent limits will remain the same throughout the year, unlike the seasonal BOD_5 limits imposed in the previous permit. In the current permit, BOD_5 DMLs will be report only and the City will not have to calculate BOD_5 removal rates. The monitoring frequency for both $CBOD_5$ and BOD_5 will be once per month and the sampling type will be 24-hour composite sampling. More information about DEC's decision to require $CBOD_5$ as a parameter to measure oxygen demand at the Lowell Point WWTF can be found in Fact Sheet Appendix A.

The permit requires monthly monitoring for temperature, a requirement carried over from the previous permit. Temperature in the lagoon affects the relative rate of nitrogenous oxygen demand. Nitrogenous and carbonaceous oxygen demand are the components of biochemical oxygen demand. Carbonaceous oxygen demand is measured by $CBOD_5$ concentrations. By monitoring temperature, the rate of nitrogenous oxygen demand and $CBOD_5$ levels can be predicted.

A new condition in the permit requires monthly monitoring for TRC when and if chlorine is used in a disinfection treatment process installed in order to fulfill the requirements of the compliance schedule imposed by the permit to reduce high concentrations of FC bacteria and enterococci and to comply with final FC bacteria effluent limits. Some disinfection methods use chlorine as a disinfection agent. If the permittee selects a process using chlorine, TRC will be a pollutant of concern and will be monitored. More information about the compliance schedule to install disinfection treatment at the facility can be found in Fact Sheet Part 7.4.

A new condition in the permit requires quarterly monitoring for phosphorus. Phosphorus is a parameter of concern based on results of extended effluent testing undertaken in the previous permit cycle. Additional effluent testing events conducted at the facility in September 2017, December 2018, and

August 2020 yielded phosphorus results of 3.5 mg/L, 2 mg/L and 3.75 mg/L, respectively; all results exceeding the most stringent WQS for phosphorus at 0.1 micrograms per liter (µg/L) for marine water, listed in the *2008 Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances* (Toxics Manual). The frequency of phosphorus monitoring is once per quarter and will provide a sufficiently robust dataset to determine if phosphorus has reasonable potential to exceed WQS.

The permit requires continued monitoring of pH. pH concentrations in the effluent are based on the requirements of 18 AAC 70.010(18). A review of effluent pH results submitted from June 2017 – December 2021 indicate that pH levels never fell below the minimum daily concentration of 6.5 S.U. or exceeded the maximum daily concentration of 8.5 S.U., so the effluent limits for pH and requirement for weekly monitoring of pH has been carried forward from the previous permit. More information about pH can be found in Fact Sheet Appendix A.

The permit requires continued weekly monitoring of DO. DO concentrations in the effluent are based on the requirements of 18 AAC 70.010(15)(A)(i). DO is a parameter of concern in domestic wastewater treatment. A review of effluent DO results submitted from June 2017 – December 2021 indicate that DO fell below the minimum daily concentration of 6.0 mg/L on one occasion and never exceeded the maximum daily concentration of 17.0 mg/L. The effluent limit for DO and previous permit requirement to monitor DO once time per week has been carried forward in the permit. More information about DO can be found in Fact Sheet Appendix A.

The permit requires monitoring of FC bacteria and enterococci. Enterococci are indicator organisms of harmful pathogens in fresh water and are a better indicator of acute gastrointestinal illness than are FC bacteria. A review of effluent enterococci results from June 2017 – December 2021 showed an exceedance of the enterococci daily maximum Water Quality Criterion (WQC) of 130 cfu/100 mL in 20 of 20 results and the monthly geomean WQC of 35 cfu/100 mL in 20 of 20 results. No effluent limits have been imposed in the permit for enterococci, however enterococci concentrations are expected to exceed WQC at the end of the pipe and will be included in both the interim and final mixing zones authorized in the permit. DEC anticipates a reduction in effluent enterococci concentrations following the installation of a disinfection system following the facility's fulfillment of the disinfection treatment compliance schedule to the extent that when the facility has met the final effluent limits for FC bacteria, enterococci will meet WQS at the edge of the mixing zone sized for FC bacteria. More information about the compliance schedule for the installation of disinfection treatment can be found in Fact Sheet Part 7.4. Effluent monitoring requirements for enterococci are carried forward from the previous permit and required to be performed in conjunction with FC bacteria monitoring during the months of May – September, when contact recreation is most likely to occur. More information about enterococci can be found in Fact Sheet Appendix A.

FC bacteria is the parameter found in greatest concentration in the effluent and was the driver of the chronic mixing zone in the previous permit. Lack of disinfection treatment at the Lowell Point WWTF is the reason for high FC bacteria concentrations, as well as for high enterococci concentrations. A review of effluent FC bacteria sampling results from June 2017 – December 2021 ranged from 368 FC/100 mL to 120,000 FC/100 mL. DEC anticipates that when the requirements to install a disinfection system is in place at the WWTF, as required by the compliance schedule in the permit, FC bacteria concentrations in the effluent will be reduced and the facility will be able to meet final FC bacteria effluent limits. After the requirements of the compliance schedule have been met and the facility can meet final FC bacteria effluent limits, the interim chronic mixing zone will no longer be authorized and FC bacteria will be a parameter included in the final chronic mixing zone authorized in the permit and will also be the

parameter driving the mixing zone size. Until the time when the facility can meet final FC bacteria limits, the interim limits for FC bacteria are the same as the final limits carried forward from the previous permit and are as follows: the DML for FC is 50,000 FC/100 mL, the Average Weekly Limit (AWL) for FC is 37,500 FC/100 mL, and the AML for FC is 25,000 FC/100 mL. The final effluent limits for FC are 800 FC/100 mL (DML), 400 FC/100 mL (AWL), and 200 FC/100 mL (AML). More information about the compliance schedule for disinfection and FC bacteria interim effluent limits can be found in Fact Sheet Part 7.4. More information about the interim and final mixing zones can be found in Fact Sheet Part 4.5. The minimum monitoring frequency requirement for FC bacteria of twice-monthly monitoring will be carried forward from the previous permit. More information about FC bacteria can be found in Appendix A.

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving water body concentration (RWC) for each pollutant of concern outside the mixing zone of where the effluent enters the water body. The chemical-specific concentration of the effluent and receiving water body and, if appropriate, the dilution available from the receiving water body, are factors used to project the RWC. The operation used to calculate WQBELs is called a reasonable potential analysis (RPA). The RPA is an assessment by which a limited parameter's maximum observed effluent concentration (MOC) is statistically multiplied to obtain a maximum expected concentration (MEC). If the MEC, the projected concentration of a limited parameter in the receiving water body, exceeds the numeric criterion for the parameter, then there is reasonable potential (RP) that the discharge may cause or contribute to an excursion above the applicable WQS, and a WQBEL must be developed. If the projected concentration of the receiving water body is lower than the numeric criterion for a limited parameter, then there is not RP that the discharge may cause or contribute to an excursion above the applicable WQS, and it is expected that the effluent will meet WQS at the point of discharge. The effluent limits that would be applied are the WQS for the limited parameter.

The permit includes new effluent limits for ammonia and requires continued monitoring for ammonia. Ammonia is not the driver of the final chronic mixing zone size, but the dilution required to meet ammonia WQS is nearly the same as the dilution required to meet FC bacteria WQS at the edge of the final mixing zone, so new effluent limits for ammonia have been included in the current permit. The previous permit included an acute mixing zone with ammonia as the driving parameter and the current permit also includes an acute mixing zone with ammonia as the driving parameter. More information about mixing zone calculations can be found in Part 4.5. DEC derived ammonia criteria from the Toxics Manual. Consistent with the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (RPA Guide), the 85th percentile of the pH, salinity, and temperature of the year-round receiving water monitoring data provided by the City were used to calculate the ammonia criteria from tables contained in Appendices F and G of the Toxics Manual. The toxicity of ammonia is dependent on pH, temperature, and salinity; therefore, the criteria are also pH, temperature, and salinity dependent. The 85th percentile receiving water pH was 8.2 S.U., the 85th percentile of receiving water body temperature was 13.3 degrees Celsius (^{o} C), and the 85th percentile of receiving water body salinity was 30.5 grams per kilogram (g/kg). The acute ammonia numeric WQC was calculated to be 6.2 mg/L and the chronic WQC for ammonia was determined to be 0.93 mg/L. Consistent with the RPA Guide, the Department determined the ammonia effluent DML to be 47 mg/L, the ammonia effluent AWL to be 35 mg/L and the AML to be 23 mg/L. The bi-monthly monitoring frequency for ammonia has been changed from the previous permit to monthly monitoring in the permit. The sampling type is carried forward from the previous permit as a 24-hour composite sampling type. More information about ammonia can be found in Appendix A. More information about the effluent limits calculated for ammonia using the RPA Guide can be found in Appendices B and C.

The permit does not require monitoring for other parameters because additional effluent testing required during the previous permitting period did not identify other parameters of concern.

Table 3: 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	0.88	N/A	Report	Effluent	Continuous	Recorded
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	N/A	N/A	N/A	Report	Influent and Effluent [c]	1/Month	24-hour Composite [d]
5-Day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	N/A	25	40	55	Influent and Effluent [c]	1/Month	24-hour Composite
	lbs/day [b]		183	294	404			Calculated
Total Suspended Solids (TSS)	mg/L	N/A	30	45	60	Influent and Effluent [c]	1/Month	24-hour Composite
	lbs/day [b]		220	330	440			Calculated
TSS Minimum Percent (%) Removal	%	N/A	85 [e]	N/A	N/A	Influent and Effluent [c]	1/Month	Calculated
$CBOD_5$ Minimum % Removal	%	N/A	85 [e]	N/A	N/A	Influent and Effluent [c]	1/Month	Calculated
pH	S. U.	6.5	N/A	N/A	8.5	Effluent	3/Week	Grab
Temperature	° C	N/A	Report	N/A	Report	Effluent	1/Month	Grab
Dissolved Oxygen (DO)	mg/L	6.0	N/A	N/A	17	Effluent	1/Month	Grab
Total Residual Chlorine (TRC) [f, g]	mg/L	N/A	0.0075	N/A	0.013	Effluent	1/Month	Grab
Fecal Coliform Bacteria (FC)	FC/ 100 mL	N/A	200 [h]	400 [h]	800 [i]	Effluent	1/Month	Grab
Enterococci Bacteria (enterococci)	cfu/ 100 mL	N/A	N/A	N/A	Report	Effluent	1/Month [j]	Grab

Parameter	Effluent Limits					Monitoring Requirements		
	Units [a]	Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Phosphorus	mg/L	N/A	N/A	N/A	Report	Effluent	1/Quarter [k]	Grab
Total Ammonia, as Nitrogen	mg/L	N/A	23	35	47	Effluent	1/Month	24-hour Composite
	lbs/day [b]	N/A	169	257	345			

Footnotes:

a. Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, S. U. = standard units, ° C = degrees Celsius,
FC/100 mL = fecal coliform colonies per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters.

b. Loading in 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 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. Monitoring for TRC is not required if chlorine is not used as a disinfectant or introduced elsewhere in the treatment process.

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

h. If more than one FC bacteria sample is collected within the reporting period, the average result 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 $(100 \text{ X } 200 \text{ X } 300)^{1/3}$ = 181.7.

i. If fewer than ten samples are collected within a 30-day period, the effluent limit cannot be exceeded. If ten or more samples are collected within a 30-day period, not more than 10% of the samples may exceed the effluent limit.

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

k. Once per quarter means once every three months based on the calendar year beginning with January: Jan–March, April–June, July–Sept, and Oct–Dec.

3.4 Whole Effluent Toxicity (WET) Monitoring

18 AAC 83.335 requires that an applicant must submit, with a permit application, WET test results if the facility has a design flow rate greater than or equal to 1.0 mgd; has an approved pretreatment program or is required to develop a pretreatment program; or the Department requires WET monitoring. Lowell Point WWTF was not required to submit WET data with the permit application. The facility has a design flow rate of less than 1.0 mgd, does not have a pretreatment program, and the facility's coverage under the previous permit did not require WET monitoring.

The discharge from the Lowell Point WWTF is consistent with other lagoon systems in Alaska, consisting solely of domestic wastewater. The Department does not consider WET to be a concern at this facility. Therefore, WET testing is not required in this permit.

3.5 Receiving Water Body Limits and Monitoring

Resurrection Bay is protected for all marine designated use classes per 18 AAC 70.020(a): water supply for aquaculture, seafood processing and industry; 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. The City monitored the receiving water in Resurrection Bay outside the authorized Lowell Point WWTF mixing zone during the previous permit cycle at the Public Works mid-Bay monitoring station for ambient ammonia concentrations, temperature, salinity, and pH. The City also monitored the receiving water for temperature, salinity, and pH near the entrance to Resurrection Bay at the Alutiiq Pride Hatchery Bay mouth monitoring station. Receiving water monitoring events were required to take place during varying tidal stages each month. In addition to monitoring the physical characteristics of the receiving water, the City monitored bacteria concentrations at the shoreline and boundary of the mixing zone. FC bacteria was sampled six times per year at the western boundary of the mixing zone. FC bacteria samples were collected on a monthly basis between May and September and one additional time between December and March. The City conducted monthly shoreline monitoring, adjacent to the south side of the chronic mixing zone boundary, for FC bacteria and enterococci between May and September in the previous permitting period. Additionally, the City monitored the shoreline location once during the months between December and March for FC. More information about the results from receiving water body monitoring can be found in Fact Sheet Parts 3.3 and 4.5.

3.5.1 Receiving Water Body Monitoring Requirements

The 2017 permit authorized a chronic mixing zone for FC bacteria and ammonia defined as the area within a rectangle with a length of 800 meters (m) and a width of 100 m, centered on the diffuser and extending from the marine bottom to the surface. The previous permit included a receiving water body monitoring requirement to monitor FC bacteria and enterococci at the western edge of the mixing zone and a requirement to monitor the shoreline adjacent to the south side of the mixing zone for enterococci and FC bacteria. Receiving water body and shoreline monitoring data conducted during the previous permitting period were used to develop the current permit. The current permit continues to require shoreline and western edge of mixing zone monitoring for FC bacteria and enterococci at the same locations and at the same frequency as previously identified in the 2017 permit until the requirements of the compliance schedule to install disinfection treatment at the Lowell Point WWTF have been met and the facility can meet final FC bacteria effluent limits. Receiving water body monitoring for bacteria must start within 120 days of the effective date of the permit and continue for the duration of the permit. The current permit requires ambient receiving water monitoring for pH, temperature and salinity twice per calendar year at one location, one time in the months between November 1 and April 30 and once between the months of May 1 and October 31. The ambient receiving water monitoring location for pH, temperature and salinity must be approved by the Department (see permit Section 1.5). Ambient receiving water body monitoring results must be submitted to DEC with the application for permit reissuance. The previous permit required the City to sample the receiving water for ambient ammonia concentrations, but this is not a requirement in the current permit because ammonia was not detected in any receiving water sample reported in the previous five years. The reduction of the frequency of ambient receiving water monitoring for pH, temperature, and salinity is changed from the previous permit because the City previously established a robust baseline dataset for these characteristics in the receiving water and DEC requires only periodic supplemental additional data to ensure that these characteristics have not changed significantly for calculations used in future permit issuances. Table 4 summarizes all of the receiving water body station monitoring requirements.

The permit authorizes a mixing zone for FC bacteria, enterococci, and ammonia. Results of monitoring outside the influence of the facility's discharge will provide information about water quality in the receiving water. There is no reasonable potential for DO or pH to exceed water quality criteria at the

boundary of the mixing zone. Chronic WET will not be monitored in the receiving water as the Department has determined that WET is not a concern at this facility.

To the extent practicable, receiving water sample collection must occur on the same day as effluent sample collection for parameters specified in Table 4.

3.5.2 Shoreline and Edge of Mixing Zone Monitoring Requirements

The previous permit required monthly monitoring for FC bacteria at the western edge of the chronic mixing zone and FC bacteria and enterococci at the shoreline, adjacent to the south end of the chronic mixing zone. The results of the 2017 - 2021 shoreline monitoring indicated that FC bacteria was present above minimum detection levels in 12 of 26 samples and did not exceed the daily maximum WQC of 43 FC/100 mL in any sample. Enterococci, a bacteria known to be more specific to humans than FC bacteria, was found above the minimum detection level in 11 of 21samples and was not found above the daily maximum WQC of 130 cfu/100 mL. Although not required by the 2017 permit, additional bacteria samples were collected at the northern, eastern, and southern boundaries of the mixing zone and also outside the mixing zone during the 2017 – 2020 sampling events. Eight of 18 FC bacteria and seven of 18 enterococci samples were present above the minimum detection level at the southern boundary of the mixing zone and one FC bacteria sample exceeded the daily maximum detection level of 43 FC/100 mL. No enterococci samples exceeded the daily maximum detection level of 130 cfu/100 mL at the southern boundary of the mixing zone. Five of eight FC bacteria samples were present above the minimum detection level at the northern boundary of the mixing zone and none exceeded the FC bacteria daily maximum detection level. Three of seven FC bacteria samples were present above the minimum detection level at the eastern boundary of the mixing zone and none exceeded the FC bacteria daily maximum detection level. Eleven of 19 FC bacteria samples were present above the minimum detection level in the ambient water outside of the mixing zone and none exceeded the FC bacteria daily maximum detection level. These results possibly indicate that FC bacteria and enterococci were exceeding WQS in the receiving water outside the boundary of the mixing zone authorized in the 2017 permit and contacting the shoreline, but the source of the bacteria found in the shoreline sampling could not be conclusively determined. Due to the uncertainty of the origin of any FC bacteria results reported above minimum detection threshold levels in shoreline monitoring events, the permit requires Microbial Source Tracking (MST) tests to be performed, if the City believes the FC bacteria source to be non-human.

Monitoring requirements for FC bacteria and enterococci at the shoreline and western edge of the chronic mixing zone locations have been retained in the permit until the City has fulfilled the requirements of the compliance schedule to install disinfection treatment and can meet the final effluent limits for FC bacteria. More information about the compliance schedule for the facility to install disinfection treatment can be found in Fact Sheet Part 7.4. The requirements for shoreline and edge of mixing zone receiving water monitoring of FC bacteria and enterococci will be in effect, beginning in the summer following permit reissuance and continuing each summer season until the facility can meet final FC bacteria effluent limits. The monitoring of enterococci at the shoreline and western edge of the mixing zones from May - September is intended to coincide with the time when the receiving water would most likely be used for primary contact recreation. FC bacteria and enterococci samples are required to be taken on the same day in sampling events conducted during May - September. Results from the shoreline and edge of mixing zone monitoring for the current permit cycle must be submitted to DEC with the application for permit reissuance. If the facility installs disinfection treatment and fulfills the requirements of the compliance schedule imposed by the permit, the City may submit a written

request for DEC's approval to end the shoreline and edge of mixing zone monitoring program at the time they have met final FC bacteria effluent limits, if installation of disinfection treatment occurs before the end of the permit period.

Table 4 is a summary of the shoreline and receiving water body monitoring requirements required by the permit until the facility has met final FC bacteria effluent limits and has received approval from DEC to end shoreline and edge of mixing zone monitoring requirements and also lists ambient receiving water monitoring requirements to be conducted throughout the current permitting period.

Table 4: Receiving Water Body and Shoreline Monitoring Requirements

Parameter	Units [a]	Location	Sample Frequency	Sample Type
Fecal Coliform Bacteria (FC bacteria)	FC/100 mL	Shoreline	1/Month (May – September) [b]	Grab
			Once between December and March	
Enterococci bacteria (enterococci)	cfu/100 mL	Shoreline	1/Month (May – September)	
Fecal Coliform Bacteria	FC/100 mL	Boundary of Mixing Zone – West Side	1/Month (May – September)	
			Once between December and March	
pH	S.U.	Ambient Receiving Water	2/Year [c]	
Temperature	^{o} C			
Salinity	ppt			

Footnotes:

a. Units: FC/100 mL = fecal coliforms per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, S. U. = standard units, °C = degrees Celsius, ppt = parts per thousand.

b. Shoreline sampling to take place during the months of May through September. FC bacteria and enterococci samples must be taken on the same day.

c. Two times per year means: one sample taken in one month during the period April 1 – October 31 and one sample taken in one month during the period November 1 through March 31.

The permit authorizes a mixing zone for FC bacteria, enterococci, and ammonia. Results of monitoring outside the influence of the facility's discharge will provide information about water quality in the receiving water. Receiving water body monitoring data submitted with the application for permit reissuance will be used for future permit issuances. In future permit issuances, calculation of acute and chronic aquatic life criteria will depend on having recent data on receiving water pH, temperature, and salinity, so the permit will require these physical characteristics to be monitored over the permit period. There is no reasonable potential for DO or pH to exceed water quality criteria at the boundary of the mixing zone. Chronic WET will not be monitored in the receiving water as the Department has determined that WET is not a concern at this facility.

4.0 RECEIVING WATER BODY

4.1 Description of Receiving Water Body

The Lowell Point WWTF discharges treated effluent into Resurrection Bay at 60º 04’ 54” North latitude and 149º 26’ 20” West longitude. Resurrection Bay is a fjord on the eastern side of the Kenai Peninsula. The bay has a maximum length of 18 miles and a maximum width of five miles. Resurrection Bay is surrounded by mountains in the Chugach Range on three sides and opens to the North Pacific Ocean to the south. The bay has a maximum depth of 972 ft and is ice-free throughout the year. The primary fresh water inflows to the bay are the Resurrection River and Fourth of July Creek, although there are many smaller tributaries. The seafloor of the bay is composed of glacial sediments overlying metasedimentary bedrock. The community of Seward is the main settlement in Resurrection Bay and is located at the head of the bay, on the northwest side.

4.2 Outfall Description

The Lowell Point WWTF continually discharges treated effluent into Resurrection Bay. The 370-foot outfall pipe runs perpendicular to the shoreline with the last 200 feet of the outfall line fitted with a diffuser. The outfall terminates at a depth of approximately 210 ft below MLLW. Geographic coordinates of the outfall are 60º 04’ 54” North latitude and 149º 26’ 20” 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 water body use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system identifies the designated uses that each water body 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 water body. The antidegradation policy ensures that the existing uses and the level of water quality necessary to protect the uses are maintained and protected.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under18 AAC 70.236(b). The receiving water for this discharge, Resurrection Bay, has not been reclassified, nor have site-specific water quality criteria in the vicinity of the Lowell Point WWTF been established. Therefore, existing uses and designated uses are the same and Resurrection Bay must be protected for all marine use classes listed in 18 AAC 70.020(a)(2). Marine water designated uses consist of the following: (A) water supply (aquaculture, seafood processing, and industrial), (B) water recreation (contact and secondary), (C) growth and propagation of fish, shellfish, other aquatic life, and wildlife, and (D) harvesting for consumption of raw mollusks or other raw aquatic life.

4.4 Water Quality Status of Receiving Water

Any part of a water body for which the water quality does not, or is not, expected to meet applicable WQS is defined as a “water quality limited segment” and placed on the State’s impaired water body list. Resurrection Bay is classified in Category 2 (as a water with water quality information that is

insufficient to determine an appropriate decision recommendation) in *Alaska's Final 2020 Integrated Water Quality Monitoring and Assessment Report*, May 17, 2021 (Alaska's 2020 Integrated Report).

4.5 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, the Department may authorize a mixing zone in a permit. Determination of the mixing zone requires an evaluation of critical conditions of the flow regimes of the receiving water body, effluent characterization and concentration projections, and discharges rates. These critical conditions are addressed in the permit application. A chronic mixing zone is sized to protect the ecology of the water body as a whole and an acute mixing zone is sized to prevent lethality to passing organisms. The effluent from Lowell Point WWTF is treated to secondary and equivalent to secondary standards and discharges to the marine waters of Resurrection Bay. No disinfection treatment is used at the facility at the time of permit issuance. The 14-inch outfall pipe extends from a manhole adjacent to the lagoon and runs north, beneath the Lowell Point Road, approximately 3,350 ft to the shoreline, where it continues at an angle perpendicular to the shoreline 170 ft into the bay and terminates at the diffuser located 210 ft below MLLW.

The previous permit identified FC bacteria as the parameter that required the most dilution to determine the size necessary to achieve WQS at the boundary of the chronic mixing zone. The chronic dilution of 2,048 was verified from the previous permit issued in 2011 and was determined to be a conservative dilution available within the mixing zone. The previous permit defined the chronic mixing zone size as the area within a rectangle with a length of 800 m and a width of 100 m, centered on the diffuser extending from the marine bottom to the surface. FC bacteria and ammonia were the parameters identified within the chronic mixing zone and enterococci is also included in the chronic mixing zone, as enterococci samples reported in the previous permitting period exceeded WQC for enterococci at the end of the pipe. The acute mixing zone in the previous permit identified ammonia as the driving parameter with a dilution of 6. The acute mixing zone size was described as the area within a rectangle with a length of 10 m and a width of 1.1 m centered on the diffuser extending from the marine bottom to the surface.

Until such time as the City has fulfilled the requirements of the compliance schedule in the permit to install disinfection treatment and can comply with the permit's final FC bacteria effluent limits, the chronic mixing zone with FC bacteria as the driving parameter authorized in the previous permit will be retained as the interim chronic mixing zone for FC bacteria and enterococci. The chronic mixing zone sized for FC bacteria and the acute mixing zone sized for ammonia as described in this Fact Sheet Part will be authorized as the final mixing zones. Permit Sections 1.4.1 through 1.4.2 also describe the sizes of the final acute and chronic mixing zones. More information on the chronic mixing zone dilution and size authorized in the previous permit that remains in effect as the interim chronic mixing zone for FC bacteria and ammonia can be found in the previous permit documents for AK0021890, issued April 21, 2017, and in the current permit in Fact Sheet Part 7.4.

The City submitted an APDES Mixing Zone Application Form 2M on December 3, 2021, requesting a chronic mixing zone with FC bacteria as the driving parameter and the having the same mixing zone length of 800 m (2,235 ft), width of 100 m (328 ft) and 2,048:1 dilution as was authorized in the previous permit. The City requested an acute mixing zone with ammonia as the driver, having a length of 100 m (328 ft) and a width of 5 m (16 ft), centered over the diffuser. The pollutants for which a mixing zone was requested were FC bacteria and ammonia. The City did not submit mixing zone model

outputs, assumptions, or a mixing zone map with the original 2M form submittal. On January 13, 2022, DEC informed the City that Form 2M submitted on December 3, 2021, was incomplete and the City's application for reissuance of permit AK0021890 would not be considered until the City provided complete mixing zone modeling information as required by Form 2M. The city complied with DEC's requirement and provided additional mixing zone modeling information to DEC on April 6, 2022.

DEC independently conducted modeling for comparison with the City's submittal using effluent data reported on DMRs from June 2017 through December 2021 and other available effluent sampling data. From a review of the data and a RPA, DEC determined that the final effluent limits for FC bacteria will require the most dilution to reach chronic WQ criteria; therefore, FC bacteria is the parameter that will drive the final chronic mixing zone size and dilution factor (DF) authorized in the permit. Ammonia and enterococci are parameters also included in the chronic mixing zone. Water quality criteria for ammonia, FC bacteria, and enterococci may be exceeded within the authorized chronic final mixing zone, but these parameters must meet applicable water quality criteria at the boundary of the final chronic mixing zone. Ammonia is a parameter that requires almost as much dilution as FC to meet water quality criteria at the edge of the chronic mixing zone, so effluent limits for ammonia have been included in the permit. More information about effluent limits for ammonia can be found in Fact Sheet Part 3.3 and Appendix A – C. DEC determined that ammonia requires the most dilution to reach acute water quality criteria; therefore, ammonia is the parameter that will drive the final acute mixing zone size and DF authorized in the permit. DEC found that DO and pH can meet water quality criteria at the end of the pipe and will not be included in the final mixing zone. DEC modeled the final acute and chronic mixing zones driven by ammonia and calculated dilution factors using the Cornell Mixing Zone Expert System (CORMIX) version 12.0 modeling program. CORMIX 12.0 is the latest version of the widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. DEC based the CORMIX models on effluent performance data from the WWTF's discharge, input information for the CORMIX modeling program provided by the City and used in the previous permit.

New inputs to CORMIX included the final daily maximum effluent limit for FC bacteria, the MEC for ammonia and the acute and chronic ammonia water quality criteria, determined from effluent and ambient monitoring data collected during the previous five years, in accordance with the RPA Guide. More information about the MEC from the RPA for ammonia can be found in Appendix B. More information about receiving water monitoring can be found in Fact Sheet Part 3.5. More information about effluent monitoring results for ammonia can be found in Fact Sheet part 3.3 and Appendix A. The most stringent criterion for ammonia is the chronic criterion for the protection of aquatic life, given as 0.93 mg/L in Appendix G of the Toxics Manual. More information about the RPA calculations for ammonia can be found in Appendices B and C.

Receiving water monitoring data and calculated water quality criteria for ammonia are summarized in Table 5.

Table 5: Resurrection Bay Receiving Water Monitoring Results, 5/26/2017 to 01/17/2021

Parameter	Units [a]	Minimum Value	Maximum Value	Value Used in RPA Analysis	Calculated Ammonia Aquatic Life Acute Criterion	Calculated Ammonia Aquatic Life Chronic Criterion

Ammonia, as Nitrogen	mg/L	ND [b]		0	6.2	0.93
pH	S. U.	8.0	8.2	8.2		
Temperature	°C	5.6	14.8	13.3		
Salinity	ppt	9.6	30.9	30.5		

Footnotes:

a) Unit: mg/L= milligrams per liter; S. U. = Standard Units, °C = degrees Celsius, ppt = parts per thousand
b) ND = non-detect

The facility design flow rate of 0.88 mgd and other site-specific discharge and ambient data were also used in the CORMIX modeling program. Receiving water density and current speed information have not been updated since the previous permit issuance and remained the same in the current mixing zone modeling. Current speed is one of the most influential variables in mixing zone modeling and was the variable introducing the most uncertainty into the mixing zone model. Based on current speed information provided by the City, it was determined that the best estimates for 10^{th} and 90^{th} percentile current speeds in the vicinity of the Lowell Point WWTF outfall are 0.19 and 0.91 knots (kts), respectively. DEC inputs used in CORMIX modeling are provided in Table 7.

In accordance with 18 AAC 70.240, DEC modeled the acute and chronic mixing zones and calculated dilution factors using the CORMIX 2 modeling program. The results of the CORMIX modeling for the chronic mixing zone demonstrated that the chronic mixing zone sized for FC bacteria, the final chronic mixing zone, is defined as a rectangle, having a length of 75 m and a width of 5.5 m oriented with the length parallel to the shoreline, centered on the diffuser and extending from the marine bottom to the surface. The final chronic mixing zone has a dilution factor (DF) of 57.2. When the facility has installed disinfection treatment and can meet final effluent limits for FC bacteria all numeric WQ criteria will be met and apply at the boundary of the chronic final mixing zone.

In DEC's analysis, the acute mixing zone surrounds the outfall and is contained within the larger final chronic mixing zone, with ammonia as the driving parameter. The acute mixing zone has a DF of 7.6. The acute mixing zone is also defined as the area within a rectangle having a length of 62 m and a width of 1.0 m, oriented with the length parallel to the shoreline, centered on the diffuser and extending from the marine bottom to the surface. Acute aquatic life criteria for ammonia will be met and apply at and beyond the boundary of this smaller initial mixing zone surrounding the outfall.

After reviewing the CORMIX modeling results provided by the City, DEC chose to apply DEC's modeling results as the best-case scenarios for the basis of the authorized acute and chronic mixing zones. The City's modeling results differed in that the City's preferred model was based on a single port design (CORMIX 1) rather than a multi-port design (CORMIX 2). Both the City and DEC made independent assumptions using CORMIX guidance or MixZon Technical Support in order to run their respective models. The City's single port model design for ammonia produced very similar dilution factors and computed horizontal distances from ports to acute and chronic criteria. For example, the City obtained an ammonia acute dilution factor for of 7.6 and a distance to the ammonia acute water quality criterion as approximately 1.81 m. The City's preferred single port model was conducted with an ambient current velocity of 0.92 kts. For comparison, DEC conducted models for ammonia using low and high velocities of 0.19 kts and 0.91 kts. DEC also obtained an acute dilution factor for ammonia of 7.6 and a distance to the ammonia acute water quality criterion as approximately 0.69 m. The City had

also conducted some multi-port models and indicated that they produced some correlation with the single-port model, but that they were not as confident in their representation of near-field conditions as the single-port model. One of the City's multi-port models, that for FC, which was run with the assumption that FC is a toxic pollutant, with a maximum expected FC effluent concentration of 800 FC/100 mL, indicated that the FC concentration of 43 FC/100 mL would be met at approximately 2.54 m. For comparison, DEC's multi-port model for FC, run with the assumption that FC is not a toxic pollutant, and which undergoes a decay process, resulted in the more stringent water-quality criteria of 14 FC/100 mL met at approximately 7.27 m.

A mixing zone modeler may run a number of scenarios for a specific pollutant and adjust input assumptions to test models under various environmental conditions or it may be necessary for the modeler to make minor adjustments to assumptions to accommodate limitations of the software program. This can result in numerous variations of a given model. DEC selects model runs for the permit that are most representative of conditions and that meet mixing zone regulatory requirements.

Table 6 summarizes the chronic and acute dilution factors and sizes for the interim and final mixing zones.

Table 6: Mixing Zone Dilution Factors and Sizes

Chronic Mixing Zone Dimensions from Previous Permit for until Compliance Schedule Requirements have been met (Interim Mixing Zone)	**Chronic**			**Acute**		
	Driving Parameter	**DF**	**Length x Width (m)**	**Driving Parameter**	**DF**	**Length x Width (m)**
	FC bacteria	2048	800 (L) x 100 (W)	Ammonia	6	10 (L) x 1.1 (W)
Chronic and Acute Mixing Zone Dimensions in Current Permit (Final Mixing Zone)	**Chronic**			**Acute**		
	Driving Parameter	**DF**	**Length x width (m)**	**Driving Parameter**	**DF**	**Length x width (m)**
	FC bacteria	57.2	75.4 (L) x 5.5 (W)	Ammonia	7.6	62.3 (L) x 0.9 (W)

According to EPA (1991) and 18 AAC 70.240, 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 2 minutes; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Table 7: Summary of CORMIX Inputs Used by DEC to Model the Lowell Point WWTF Final Chronic Mixing Zone

Variables Required for CORMIX Modeling Program	DEC Inputs for Final Chronic Mixing Zone Model	
Driving Parameter	FC bacteria	
Discharge Excess Concentration	800 FC/100 mL	
Effluent Flow Rate (mgd)	0.88	
Fresh Water Effluent	Yes	
Effluent Average Temperature	10.8 ºC	
Non-Conservative Pollutant	Decay of Coefficient -4.6/day	
Unbounded	Yes	
Average Depth to Marine Bottom (m)	60.96	
Depth at Discharge (m)	45.72	
Wind Speed (m/s)	2.0	
Current Speed (kts)	0.19 and 0.91 kts	
Manning's n	0.04	
Non-Fresh Ambient Water	Yes	
Ambient Water Stratified – Type C	Yes	
Ambient water density (kg/m^3)	At surface – 1022.85	At bottom – 1024.8
Density Jump (kg/m^3)	1.85 (required to allow model algorithm to run)	
Pycnocline Height (m)	40	
Position of Bank	Right	
CORMIX 2 - Multiport	Yes	
Orientation of ports	Alternating – perpendicular	
Number of openings	19	
Diffuser Length (m)	60.96	
Distance to 1st Endpoint (m)	51.82	
Distance to 2nd Endpoint (m)	112.78	
Contraction Ratio	0.85	
Vertical Angle θ (degrees)	90	
Horizontal Angle σ (degrees)	0	
Alignment Angle γ (degrees)	90	

Variables Required for CORMIX Modeling Program	DEC Inputs for Final Chronic Mixing Zone Model
Relationship Orientational Angle β (degrees)	90
Nozzle Direction	Same
Port Diameter (m)	0.051
Port Height (m)	0.30
Required Dilution FC bacteria:	57.2
Chronic WQ Criterion for FC bacteria (FC/100 mL):	14

Fact Sheet Appendix D outlines criteria that must be met, in order for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the water body, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's mixing zone analysis, in accordance with state regulations at 18 AAC 70.240, as amended through June 26, 2003, the Department may authorize a mixing zone in a permit.

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 to model the chronic and acute mixing zones for seasonal flow rates, effluent temperatures, effluent flow rates and ambient density profiles. 18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed the most recent five years of DMRs from June 2017 through December 2021 and the City's wastewater discharge application forms, Form 2A and Form 2M, to determine which parameters had reasonable potential to exceed water quality criteria at the end of pipe, and which of the parameters required the most dilution to meet water quality criteria for the chronic and acute mixing zones. FC bacteria was the parameter that required the greatest dilution in the mixing zone for the previous permit and the dilution of 2048 determined the size of the interim chronic mixing zone. The interim chronic mixing zone size and dilution will remain the same size as authorized in the previous permit for FC bacteria and ammonia. The interim chronic mixing zone for FC bacteria is defined as a rectangle having a length of 800 m and a width of 100 m, centered on the diffuser, from marine bottom to surface. The permit contains a compliance schedule to install disinfection to reduce FC bacteria and enterococci levels. When the WWTF fulfills the requirements of the compliance schedule and can meet FC bacteria final effluent limits, the driving parameter of the final chronic mixing zone will remain as FC bacteria and ammonia and enterococci will fit within the final chronic mixing zone. More information about the compliance schedule requiring the facility to install disinfection treatment can be found in Fact Sheet Part 7.4.

FC bacteria was modeled in CORMIX to determine the smallest practicable final chronic mixing zone size and required the most dilution to meet water quality at the edge of the mixing zone. Ammonia required almost as much dilution as FC bacteria to meet water quality criteria at the edge of the chronic mixing zone as FC bacteria and is the parameter modeled in CORMIX to determine the smallest practicable acute mixing zone size. The MEC for FC bacteria used in the CORMIX models was the final

DML of 800 FC/100 mL. The MEC for ammonia was calculated, using the RPA Tool and the Department followed the RPA Guide to calculate water quality criteria for ammonia. More information about calculations used to obtain the MEC and water quality criteria for ammonia can be found in Fact Sheet Parts 3.3, 4.5, and Appendices A and B. In accordance with 18 AAC 70.240, the Department determined that the size of the mixing zone for the Lowell Point WWTF discharge is appropriate. In the permit, the final chronic mixing zone sized for FC bacteria will be defined as the area of a rectangle having a length of 75 m and a width of 5.5 m centered on the diffuser and extending from the marine bottom to the surface. The dilution factor for the final chronic mixing zone in the permit is 57.2. The final chronic mixing zone has the same driving parameter, FC bacteria, as the interim chronic mixing zone, a decreased area from the interim chronic mixing zone and also a lower dilution factor.

The acute mixing zone will be sized according to the dilution required by ammonia to meet acute aquatic life water quality criteria. The acute mixing zone is based on the most recent five years of receiving water and ammonia effluent monitoring data submitted by the permittee. The acute mixing zone surrounds the outfall and is contained within the larger final chronic mixing zone, with ammonia as the driving parameter and has a dilution factor of 7.6. The acute mixing zone is defined as a rectangle having a length of 62 m and a width of 1.0 m centered on the diffuser and extending from the marine bottom to the surface. CORMIX indicates that water quality criteria will be met relatively rapidly through the acute mixing zone. The mixing zone is sized to ensure: 1) the water quality criteria found in 18 AAC 70 are met at the boundary of the mixing zones, 2) the mixing zone is as small as practicable, and 3) compliance with all other applicable mixing zone regulations.

The relationship between dilution and factors and mixing zone sizes is predicted by CORMIX modeling. Per 18 AAC 83.135 (b)(2), the Department has cause to modify a permit when the Department receives new information that was not available at the time of permit issuance, and the new information would have justified the imposition of different permit conditions at the time of issuance.

4.5.2 Technology

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

Lowell WWTF is a two-cell aerated lagoon system that provides significant biological treatment of municipal wastewater and is eligible for equivalent to secondary treatment as listed in 40 CFR §133.105, as adopted by reference in 18 AAC 83.010(e) if secondary treatment standards cannot be achieved through proper operation and maintenance. Prior to the previous permit issuance, the lagoon at Lowell Point WWTF was drained to remove sludge from the bottom of the lagoon. The lagoon was refilled in 2015 and the City collected monitoring data following maintenance of the lagoon. DEC determined that a combination of secondary standards and equivalent to secondary standards were appropriate for the previous permit, corresponding to those required of similar aerated lagoon facilities throughout Alaska. In the previous permit, equivalent to secondary standards were imposed for BOD_5 limits during the summer months between July and October. $CBOD_5$ was monitored in the previous permit to build a robust data set to provide support for using $CBOD_5$ as a parameter measuring oxygen demand in the facility, in accordance with 40 CFR §133.102(a)(4), adopted by reference at 18 AAC 83.010(e), beginning in June 2020. Secondary standards were applied in the previous permit for $CBOD_5$, including $CBOD_5$ percent removal. A review of monitoring data from June 2017 through December 2021 confirmed the facility cannot generally meet the equivalent to secondary effluent limits, including

monthly removal rates for BOD_5 during the summer months, but can meet effluent limits, including secondary effluent limits, including removal rates for BOD_5, TSS, and $CBOD_5$ as imposed in the previous permit during other months of the year, and these conditions are carried forward in the permit. The City requested that the permit require $CBOD_5$ as the parameter of oxygen demand, instead of BOD_5. DEC reviewed the City's rationale for the request and the $CBOD_5$ and BOD_5 data provided by the City, including removal rates for $CBOD_5$ and BOD_5, reported during the previous permitting period. The City made a request to use $CBOD_5$ instead of BOD_5 as the parameter to measure oxygen demand in a 2021 permit renewal application for the Spring Creek WWTF, another lagoon WWTF operated by the City. DEC requested that the City collect additional samples of influent and effluent ammonia and NO_2/NO_3 to be used as paired results of nitrogen-containing compounds in the Spring Creek WWTF wastewater in order to demonstrate in another way that nitrifying bacteria were present in sufficient quantities to cause interference in the 5-day BOD tests. The City complied with DEC's request, and sampled ammonia and NO_2/NO_3 on July 16, August 3, August 13, and August 20, 2021 at the Spring Creek WWTF. The overall results from the additional testing were inconclusive in showing that nitrification is exerting an undue influence on overall oxygen demand but based on a review of all the data and the justification offered by the City, DEC approved using $CBOD_5$ in the Spring Creek WWTF renewal permit as a measure of oxygen demand. The City presented less data in their Lowell Point WWTF permit renewal application request for use of $CBOD_5$ instead of BOD_5, and DEC did not request the City collect additional samples of ammonia or NO_2/NO_3 at the Lowell Point WWTF but based on the earlier review of Spring Creek WWTF data and a review of the available Lowell Point WWTF data, DEC determined that $CBOD_5$ is an acceptable parameter for oxygen demand in the current permit. More information about DEC's decision to require $CBOD_5$ to be used as a biochemical oxygen demand parameter can be found in Fact Sheet Appendix A.

4.5.3 Existing Use

In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of the Resurrection Bay. Water quality criteria are developed to specifically protect the uses of the water body as a whole. Given that water quality criteria will be met at, and beyond, the boundary of the chronic mixing zone, the designated and existing uses beyond the boundary of the chronic mixing zone will be maintained and fully protected under the terms of the permit as required in 18 AAC 70.240(c)(2). WQS at 18 AAC 70.020(a) classifies Resurrection Bay as protected for the following marine water uses: aquaculture, seafood processing, and industrial water supply; contact and secondary water recreation; growth and propagation of fish, shellfish, aquatic life, and wildlife; and harvesting for the consumption of raw mollusks or other raw aquatic life. The water body's existing uses were maintained and protected under the terms of the previous permit. The mixing zone authorization does not propose any modifications that would result in changes to existing uses.

The permit reissuance application does not propose any changes that would result in a lower quality effluent. Effluent monitoring and receiving water monitoring have indicated that the discharge neither partially nor completely eliminates an existing use of the water body outside of the mixing zone. The size of the interim chronic mixing zone will remain the same as the chronic mixing zone authorized in the previous permit until the conditions of the disinfection compliance schedule have been fulfilled and the facility can meet effluent limits for FC bacteria. The interim chronic mixing zone size is driven by FC bacteria and is defined as a rectangle having a length of 800 m and a width of 100 m, centered on the diffuser, extending from marine bottom to surface. Ammonia and enterococci are parameters contained within the interim chronic mixing zone sized for FC bacteria. In DEC's analysis, FC bacteria will still require the most dilution of the parameters that demonstrated reasonable potential to exceed water

quality criteria, and therefore will determine the final chronic mixing zone size. FC bacteria, ammonia, and enterococci will fit within the final chronic mixing zone sized for FC bacteria when the facility has completed the requirements of the compliance schedule to install disinfection treatment. More information about the compliance schedule requiring the facility to install disinfection treatment can be found in Fact Sheet Part 7.4. The chronic final mixing zone sized for FC bacteria has a dilution factor of 57.2 and is defined as the area of a rectangle having a length of 75 m and a width of 5.5 m centered on the diffuser and extending from the marine bottom to the surface. The acute mixing zone, also with ammonia as the driving factor, has dilution factor of 7.6. The acute mixing zone is defined as having a length of 62 m and a width of 1.0 m centered on the diffuser and extending from the marine bottom to the surface. Water quality criteria may be exceeded within the authorized chronic mixing zones. All water quality criteria will be met and apply at the boundary of the chronic mixing zone.

DEC has determined that the existing uses and biological integrity of the water body will be maintained and fully protected under the terms of the permit as required at 18 AAC 70.240(c)(2) and 18 AAC 70.240(c)(3).

4.5.4 Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d) and 18 AAC 70.240(c)(4)(C), the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

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

The CORMIX modeling suggests that the maximum expected effluent concentrations of pollutants will be diluted relatively rapidly and that the mixing zone will not preclude or limit established fishery activities per 18 AAC 70.240(c)(4)(C). DEC has determined that application data and available mixing zone modeling suggests that pollutants discharged will neither produce objectionable color, taste, or odor in harvested aquatic resources for human consumption, nor preclude or limit fish and shellfish harvesting per 18 AAC 70.240(d)(6) and 18 AAC 70.240(c)(4)(C).

4.5.5 Spawning Areas

In accordance with 18 AAC 70.240(f), in lakes, streams, rivers, or other flowing fresh waters, a mixing zone will not be authorized in a spawning area for Arctic grayling northern pike, lake trout, brook trout, sheefish, burbot, landlocked coho salmon, chinook salmon, sockeye salmon, or anadromous or resident rainbow trout, Arctic char, Dolly Varden, whitefish, or cutthroat trout.

The interim and final mixing zones are authorized in the marine waters of Resurrection Bay. 18 AAC 70.240(f), which prohibits authorizing mixing zones in streams, rivers or other flowing fresh waters used for anadromous or resident fish spawning, does not apply. Discharges to fresh waters are not authorized under the permit.

The Alaska Department of Fish and Game (ADF&G) anadromous waters interactive catalog indicates that the outfall to Resurrection Bay is not located in relative proximity to an area where salmon are

present and known to spawn, and other fish species listed in 18 AAC 70.240(f) are not present. DEC contacted Mr. Tony Munter of ADF&G on December 30, 2021, to inquire about Essential Fish Habitat in Cook Inlet, in the vicinity of the outfall, 60º 4' 54" North latitude and 149° 26' 20" West longitude. Mr. Munter is the Habitat Division contact in the Seward area. Mr. Munter responded on January 11, 2022, with the comment that "ADF&G has reviewed proposed APDES permit renewal AK0021890 for the City of Seward Lowell Point Wastewater Treatment Facility discharge into the west side Resurrection Bay and any potential spawning fish habitat near the outfall. ADF&G has verified coho and pink salmon spawning populations in Scheffler Creek (AWC 231-30-10070) near the outfall with sockeye salmon also present in this stream. Tonsina Creek (AWC 231-30-10040), near Caines Head State Recreation Area, is south of Lowell Point and has known spawning populations of chum and pink salmon."

4.5.6 Human Health

In accordance with 18 AAC 70.240(d), the mixing zone must be protective of human health and will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota, or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. An analysis of the effluent data that was included with the City's application for permit reissuance and the results of the RPA conducted on pollutants of concern indicated that the level of treatment will be protective of human health when the requirements of the compliance schedule have been fulfilled and the facility can meet final FC bacteria effluent limits. The effluent data was then used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the final chronic mixing zone to ensure all water quality criteria are met in the water body at the boundary of the mixing zone. The quality of the effluent is expected to meet water quality criteria in the receiving water. More information about pollutants of concern to human health in the Lowell Point WWTF effluent can be found in Appendix A.

DEC has determined that the permit satisfied 18 AAC 70.240(d)(1), 18 AAC 70.240(k)(4), and 18 AAC 70.240(c)(4)(A), and that the level of treatment at the Lowell Point WWTF is protective of human health at the time when the compliance schedule requirements have been fulfilled and the facility can meet final FC bacteria effluent limits.

4.5.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, pollutants for which the interim and final mixing zones will be authorized will not result in concentrations that result in undesirable or nuisance to aquatic life, cause permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Nor will the discharge form a barrier to migration or prevent zone of passage in the receiving water.

Based on a review of effluent data, outfall structure and location, mixing zone modeling, and tidal velocities at the point of discharge, the Department concludes that the discharge will meet all water quality criteria at the boundary of and outside the final chronic mixing zone. DEC determined that the mixing zones will not create a significant adverse effect to fish spawning or rearing, form a barrier to migratory species, fail to provide a zone of passage, result in undesirable or nuisance aquatic life, result in permanent or irreparable displacement of indigenous organism, or result in reduction in fish population levels and that 18 AAC 70.240 are met.

The ADF&G anadromous waters interactive catalog indicates that the outfall to Resurrection Bay is located in relative proximity to, but not directly within, an area where fish are not known to spawn. ADF&G responded on January 11, 2022, with a response to an email request for any additional information or concerns related to the discharge from the Spring Creek WWTF. In ADF&G's response, Mr. Tony Munter stated that ADF&G verified coho and pink salmon spawning populations in Scheffler Creek (AWC 231-30-10070) near the outfall with sockeye salmon also present in this stream. Tonsina Creek (AWC 231-30-10040), near Caines Head State Recreation Area. Mr. Munter did not indicate that ADF&G had any additional concerns regarding aquatic life and wildlife as a result of discharges from the Lowell Point WWTF.

DEC performed CORMIX modeling for ammonia. The mixing zone models produced by CORMIX indicate that the travel time of an organism drifting through the acute mixing zone to be approximately 2 minutes; therefore, there will be no lethality to organisms passing through the acute mixing zone. Furthermore, the final chronic and acute mixing zones sizes predicted by CORMIX modeling demonstrate that water quality criteria will be met at the boundaries of the mixing zones and the mixing zone sizes are as small as practicable. CORMIX models incorporated expected tidal velocities, effluent temperatures, effluent flow rates and ambient density profiles and including the most recent five years of effluent data to determine which parameters had RP to exceed water quality criteria at the end of pipe, and then which of the parameters required the most dilution to meet water quality criteria for the chronic and acute mixing zones. FC bacteria was the pollutant that required the most dilution to meet water quality criteria at the boundary of the mixing zone in the previous permit and the chronic interim mixing zone sized for FC bacteria and containing ammonia and enterococci as additional parameters will remain in place until the facility has fulfilled the requirements of the compliance schedule in the permit to install disinfection treatment and meet final FC bacteria effluent limits. More information about the compliance schedule requiring the facility to install disinfection treatment can be found in Fact Sheet Part 7.4. Ammonia and enterococci will fit within the chronic final mixing zone sized for FC bacteria to meet their respective water quality criteria when the facility has met the provisions of the compliance schedule.

Based on a review of effluent data, outfall structure and location, mixing zone modeling, and tidal velocities at the point of discharge, the Department concludes that the discharge will meet all water quality criteria at the boundary of and outside the final chronic mixing zone.

DEC determined that the mixing zones will not create a significant adverse effect to fish spawning or rearing, form a barrier to migratory species, fail to provide a zone of passage, result in undesirable or nuisance aquatic life, result in permanent or irreparable displacement of indigenous organism, or result in reduction in fish population levels.

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.

DEC contacted Ms. Sabrina Farmer of the United States Fish & Wildlife Service (USFWS) on January 3, 2022, with inquiries about whether USFWS had any concerns about a permitted discharge from the Lowell Point WWTF at 60° 04' 54" North latitude and 149° 26' 20" West longitude impacting threatened or endangered species. No one from USFWS responded to DEC's request for information.

DEC consulted the USFW IPaC tool at https://ecos.fws.gov/ipac/location/index. After consulting the IPaC tool, DEC determined that the location of the outfall and a circular chronic mixing zone with a

radius of 100 m was outside of a USFWS proposed or final critical habitat area for threatened or endangered species.

DEC contacted Ms. Jenna Malek of the National Oceanic and Atmospheric Administration (NOAA) on January 5, 2022, to inquire about whether a discharge from the outfall of the Lowell Point WWTF would impact any threatened or endangered species under NOAA's jurisdiction. Ms. Malek responded on the same day, stating that "The following threatened and endangered species could be found in the area affected by effluent discharge:

Humpback whale, Western North Pacific DPS: Endangered

Humpback whale, Mexico DPS: Threatened

Fin whale: Endangered

Steller sea lion, Western DPS: Endangered

Steller sea lion, Western DPS Critical Habitat (mouth of Resurrection Bay)

No detrimental effects to fauna in the area have been documented with previously authorized mixing zones for the facility, nor does the mixing zone appear to pose an undesirable nuisance to aquatic life. The RPA and CORMIX modeling resulted in an overall decrease in the area of the final chronic mixing zone compared to the interim chronic mixing zone. The reduction in area of the final chronic mixing zone reduces the possibility for any threatened or endangered species potentially in the area to come into contact with the treated wastewater.

Due to the reduced size and short residence time of pollutants in the mixing zones, DEC has concluded that the mixing zones are sized to not cause an adverse effect on threatened or endangered species in the vicinity of the discharge. DEC will provide a copy of the permit and fact sheet to NOAA and USFWS when it is publicly 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.

Permit monitoring requirements that have changed since the previous permit are the requirements for new monitoring requirements for phosphorus and a new effluent monitoring frequency for ammonia. New WQBELs for ammonia are an AML of 23 mg/L, an AWL of 35 mg/L and DML of 47 mg/L. All parameters previously monitored will continue to be monitored in the permit. The frequency of ammonia monitoring has increased from bimonthly monitoring to monthly monitoring.

The 2017 permit had seasonal requirements for BOD5, imposing secondary standard average monthly, average weekly and daily maximum effluent limits and removal rates for the months between November and June and equivalent to secondary standards for monthly and weekly average effluent limits and removal rates in the summer months between July and October. The permit also included monitoring requirements for $CBOD_5$ average monthly and daily maximum concentrations starting in June 2020. The current permit will require BOD_5 monitoring only for the DML. The permit will require $CBOD_5$ effluent limits to be reported for AML, AWL, and DML. A review of data collected from the previous permitting period provided corroborating evidence for the permittee's request to use $CBOD_5$ to determine oxygen demand in the effluent. More information about BOD_5 and $CBOD_5$ in the Lowell Point WWTF can be found in Fact Sheet Part 3.0, Part 4.5.2, and Appendix A.

The permit requires a compliance schedule for the permittee to install disinfection treatment to the Lowell Point WWTF effluent. An analysis of bacteria monitoring results reported in the previous permitting period in addition to a review of similar facilities in Alaska influenced the decision for DEC to require disinfection of the effluent. More information about the compliance schedule for disinfection can be found in Fact Sheet Part 7.4 and a more information about effluent bacteria monitoring results can be found in Fact Sheet Part 3.0 and Appendix A. FC bacteria, the parameter driving the interim chronic mixing zone, the dilution factor, 2,048, and interim chronic mixing zone size will remain unchanged from the chronic mixing zone authorized in the previous permit, where it was described as the area within a rectangle having a length of 800 m and a width of 100 m, extending from the marine bottom to the surface. Ammonia and enterococci will remain as a parameter contained within the interim chronic mixing zone sized for FC bacteria. Additionally, shoreline and edge of mixing zone monitoring for FC bacteria and enterococci during May 1 – September 30 will be a requirement of the permit until the facility has installed disinfection treatment and can meet final FC bacteria effluent limits. More information about the compliance schedule requiring the facility to install disinfection treatment can be found in Fact Sheet Part 7.4. A final chronic mixing zone sized for FC bacteria will be in the permit and is defined as the area of a rectangle having a length of 75 m and a width of 5.5 m centered on the diffuser and extending from the marine bottom to the surface. The final chronic mixing zone dilution factor is 57.2. Ammonia and enterococci will be parameters contained in the final chronic mixing zone when the facility has met the provisions of the compliance schedule to install disinfection treatment. The acute mixing zone authorized in the previous permit was described as the area within a square having equal sides of 1.0 m, extending from the marine bottom to the surface, with ammonia as the driving parameter and a dilution factor of 4.0. The shape and size of the acute mixing zone authorized in the previous permit was a square, with sides measuring 1.0 m. An acute mixing zone is authorized in the current permit, with ammonia as the driving parameter, with a dilution factor of 7.6. The acute mixing zone is defined as having a length of 62 m and a width of 1.0 m centered on the diffuser and extending from the marine bottom to the surface. The dilution and size of the acute mixing zone authorized in the current permit is larger than those authorized in the previous permit due to new calculations from mixing zone modeling based on receiving water data and data from effluent sampling of ammonia collected since the previous permit reissuance.

The effluent limitations in this permit reissuance are consistent with 18 AAC 83.480. Therefore, the permit effluent limitations, standards, and conditions in AK0022543 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 water body'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 Water Quality Standards (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).

Resurrection Bay is listed in Category 3 on DEC's most recent Integrated Report (Alaska's 2020 Integrated Report). Waters listed in Category 3 lack sufficient information for DEC to make an impairment or attainment determination. Accordingly, 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)(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).*

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. Per 18 AAC 70.020 and

18 AAC 70.050, all fresh waters are protected for all uses; therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the DEC Toxics manual apply and were evaluated. This will ensure existing uses and the water quality necessary for protection of existing uses of the receiving water body 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 WQ 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.

Conventional pollutants of concern in domestic wastewater are BOD_5, TSS, pH, and $CBOD_5$. Additional domestic wastewater pollutants are temperature, DO, ammonia, phosphorus, FC, and enterococci. The permit includes numeric effluent limits or continued monitoring, addressing each of these pollutants of concern. The permit requires facilities to implement an Operation and Maintenance (O&M) Plan to minimize the production of waste and the discharge of pollutants to waters of the U.S., to ensure that domestic wastewater facilities provide for the protection or attainment of existing and designated uses. The permit also contains a compliance schedule that requires the permittee to install disinfection treatment to control FC and enterococci bacteria in the effluent.

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;*

As previously stated, Section 1.2.2 of the permit requires that the discharge shall not cause or contribute to a violation of the WQS at 18 AAC 70. WQBELs are set equal to the most stringent water quality criteria available under 18 AAC 70.020(b) for any of the protected water use classes. Because of the nature of the permitted discharges, other pollutants are not expected to be present in the discharges at levels that would cause, have the reasonable potential to cause, or contribute to an exceedance of any Alaska WQS.

Section 1.2.2 of the permit requires that the discharge shall not cause a violation of the WQS except if excursions are authorized in accordance with provisions in 18 AAC 70.200 – 70.240 (i.e., mixing zone, variance, etc.).

As a result of the Lowell Point WWTF reasonable potential to exceed water quality criteria for ammonia, FC and enterococci, and available assimilative capacity in the receiving water, mixing zones are authorized in the wastewater discharge permit in accordance with 18 AAC 70.240. More information about the Lowell Point WWTF mixing zones can be found in Fact Sheet Part 4.5. The resulting effluent end-of-pipe limits and monitoring requirements in the permit that are listed in Table 3 protect water quality criteria, and therefore, will not violate the water quality criteria found at 18 AAC 70.020 beyond the boundary of the authorized final chronic mixing zone. A smaller acute mixing zone has been authorized in the permit, consistent with 18 AAC 70.240(d)(7), to ensure no lethality to passing organisms occurs. The interim chronic mixing zone authorized in the previous permit and sized for FC bacteria, containing ammonia and enterococci as parameters, will remain unchanged from the chronic mixing zone authorized in the previous permit until the facility has met the requirements of the compliance schedule to install disinfection treatment and the treatment allow the facility to meet final

FC bacteria effluent limits, at which time ammonia and enterococci will fit within a final chronic mixing zone sized for FC bacteria. The permit authorizes a final chronic mixing zone sized for FC bacteria, with a dilution factor of 57.2 and a rectangular shape, having a length of 75 m and a width of 5.5 m centered on the diffuser and extending from the marine bottom to the surface. More information about the compliance schedule to require disinfection treatment can be found in Fact Sheet Part 7.4. More information about the sizes of the chronic and acute mixing zones for the Lowell Point WWTF can be found in Fact Sheet Part 4.5. DEC is assured that WQS will be met at the boundaries of the chronic final mixing zone.

The permit reissuance application does not propose any changes that would likely result in wastewater of lower quality to be discharged than has been discharged under the previously issued NPDES permits or the previous APDES permit for the Lowell Point WWTF. The Alaska WQS upon which the permit effluent limits are based, serve the specific purposes of protecting the existing and designated uses.

There are no WET requirements imposed by the permit because the facility's design flow is less than 1.0 mgd and the discharge consists of domestic wastewater with no significant industrial user components.

Site-specific criteria as allowed by 18 AAC 70.235 have not been established for the Lowell Point WWTF, as listed in 18 AAC 70.236(b), and are therefore not applicable. The permit does not authorize short term variance or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210; therefore this does not apply.

The Department has determined 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), 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. Wastewater operations at the Lowell Point WWTF often exceed minimal percent removal and concentration based secondary and equivalent to secondary treatment requirements for POTWs at 40 CFR § 133.102 and 18 AAC 72.050. The facility includes preliminary treatment, and organic decomposition through aerobic and facultative cell synthesis in the lagoon. The facility does not disinfect effluent at present, but the permit includes a compliance schedule to require disinfection treatment within the five-year permit period, which will bring the facility to the highest statutory and regulatory requirements. 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 WQS of a water body 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 standard established under CWA §303, including state narrative criteria for water quality." The permit requires compliance with the 18 AAC 70 WQS, includes effluent limits for ammonia, FC, DO, temperature, and pH, and monitoring for other applicable WQS pollutants.

The Department reviewed available information on known point source discharges to receiving waters covered under the permit and found that the Spring Creek WWTF, APDES permit AK0053724, exceeded BOD_5 effluent limits 19 times and BOD_5 removal rates two times between October 2016 and April 2021. During the same time period the Spring Creek WWTF exceeded $CBOD_5$ removal rate limits six times, TSS effluent limits 31 times and TSS removal rates one time. Also, the Spring Creek WWTF exceeded FC monthly average effluent limits six times. Enforcement actions for the Spring Creek WWTF effluent limit exceedances are ongoing. The Fox Island WWTF; APDES permit AKG572103 reported Non-Monthly Average violations for FC and enterococci bacteria in October 2017 and June 2018. The Fox Island WWTF also had exceedances of FC bacteria in September 2018 and June 2019. All violations incurred at the Fox Island WWTF were isolated occurrences and the facility has controls in place to address these exceedances.

After review of the methods of treatment and control and the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the

discharge authorized under this general permit meets the highest applicable statutory and regulatory requirements; therefore, 18 AAC 70.016(c)(7)(C) 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.

The City submitted a revised antidegradation analysis in the required Antidegradation Form 2G on December 3, 2021, which included an alternatives analysis to address (4)(C-F) of this subsection.

(i) According to the City's alternatives analysis, the revised application is for a new or expanded discharge, meaning a discharge that is regulated for the first time. The City found that the discharge requires a Tier 2 analysis as defined under 18 AAC 70.016(c)(2)(A) – (E). As part of the alternatives analysis, the City considered ammonia effluent limits required for the first time when ammonia will be a newly regulated parameter in the new permit. When the terms of the compliance schedule to install disinfection treatment at Lowell Point WWTF have been met, all parameters will fit within a chronic mixing zone sized for FC bacteria. The City's analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the proposed ammonia discharge, per 18 AAC 70.015(c)(4)(C) is provided below:

(ii) Commonly used ammonia removal processes include biological nitrification-denitrification, fixed media, breakpoint chlorination, air stripping, and ion exchange.

i. Nitrification-denitrification has been most commonly used, including as an add-on unit process for older, aerated lagoons, which have typically not been designed to be effective at removing ammonia. Considerations for an application at the Lowell Point WWTF are that pH adjustment might be necessary; a supplemental carbon source, usually methanol, may be needed for denitrification; these processes don't work as well with cold wastewater, the condition this lagoon experiences during at least seven months of the year; and substantial additional operator attention will be required. Heating, or at least retention of as much latent sewage heat as possible through insulation of the lagoon surface, may be necessary, at a substantial cost.

ii. A second option of ammonia reduction in the effluent is installation of fixed media. One type of media the City is already familiar with is Bio-Domes by Wastewater Compliance Systems (WCS). WCS has experienced some success with ammonia reduction when Bio-Domes are used for wastewater polishing after most of the BOD_5 reduction has already taken place in the lagoon. Other fixed media used for lagoon renovations elsewhere include NitrOx and Pacques Anammox.

iii. A third option is breakpoint chlorination. A possible benefit is that this option has the potential to provide concurrent effluent disinfection, as would be required under the compliance schedule to install disinfection treatment to the effluent.

iv. Other potential options to reduce ammonia concentrations in the effluent are air stripping and ion exchange facilities.

(iii) The City identified the receiving water quality and accompanying environmental impacts on the receiving water for each of the practicable alternatives identified in their analyses of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the proposed ammonia discharge, per 18 AAC 70.015(c)(4)(D). The discussion of effects to the receiving water quality and accompanying environmental impacts is provided below:

i. For the nitrification-denitrification alternatives option identified, the anticipated effects would potentially be increased energy consumption and associated air and water discharges; impacts from production of chemicals to make this process work; short-term and long-term dislocations, and noise and land use from construction of facilities. In exchange for this, ammonia discharge into Resurrection Bay may be reduced by up to 100 pounds per day as nitrogen.

ii. For the installation of fixed media alternatives option, the environmental impacts would be similar to nitrification-denitrification, except chemical use would likely be reduced, so the environmental impact would be reduced. The slight benefit would be a reduction in discharge of ammonia to Resurrection Bay of up to 100 pounds per day.

iii. For the breakpoint chlorination option identified, the environmental impacts from this option would be the greatest for chemical production and use. Additionally, the trucks, train, marine vessels, and aircraft that bring these supplies to Seward have an impact on the environment, even if slight. And a significant exchange that appears to have a net environmental detriment is increased chemical usage. The use of 150 pounds per day of chlorine generated from salt, water and power for chlorination and sulfur dioxide shipped in for dechlorination is expected to reduce the discharge of ammonia to Resurrection Bay by up to 100 pounds per day. A possible benefit is that this option has the potential to provide concurrent effluent disinfection that would supplement the compliance schedule to install disinfection treatment at Lowell Point WWTF. The 14-in diameter, 3,350 ft outfall pipe has a detention time of nearly 80 minutes at normal flow, which could enable reducing the size of a chlorine contact chamber.

iv. For air stripping and ion exchange facilities options, the environmental impacts would be similar to other options considered.

(iii) The City identified the evaluation of the cost for each of the practicable alternatives, relative to the degree of water quality degradation, per 18 AAC 70.015(c)(4)(E). The discussion of costs is provided below:

i. For the nitrification-denitrification alternatives option identified, capital costs will be substantial at $4 million, or more, and likewise Operation and Maintenance (O&M) costs would increase dramatically, perhaps by more than $500,000 annually. For a cost comparison, the City of Palmer recently revised its aerated lagoons by installing sequencing batch reactor technology for improved ammonia removal at a cost that exceeded $12 million dollars. The cost to reduce the Lowell Point WWTF wasteload would be comparable.

ii. For the option of installation of fixed media, the City provided an example of 40 Bio-Domes installed at the Lowell Point WWTF lagoon in 2015 at a cost of

$400,000. The cost today for a similar stand-alone project at the Lowell Point WWTF lagoon may exceed $1 million and these facilities would increase operational costs for power and labor by $100,000 to $200,000 per year. For other fixed media, the NitrOx and Pacques Anammox; because of other renovations necessary to install them, their initial costs may be about twice as much as the Bio-Domes. Ongoing operating costs might be similar.

iii. For the breakpoint chlorination option, although this may have a fairly low initial cost, probably $600,000 for a hypochlorite chlorine generator, pumps, tanks and controls; its ongoing operating costs would be substantial. At up to $600 per day for hypochlorite generation and $600 per day for sulfur dioxide for dechlorination, plus increased power and operator attention, its total additional annual cost might exceed $600,000.

iv. For the air stripping and ion exchange facilities, options, the capital costs would likely exceed $5 million and their associated operating costs could exceed $600,000 per year in operating costs. They would be less desirable than the other options.

(iv) The City addressed identification of a proposed practicable alternative that would prevent or lessen water quality degradation while also considering accompanying cross-media environmental impacts alternatives, per 18 AAC 70.015(c)(4)(F) and reported, "At this stage we do not believe any of the ammonia reduction options really are practicable but have attempted to be fair with our analysis. We have presented options with brief support and explanation. Much more detail, including results from pilot studies and design will be necessary to advance a chosen alternative if ammonia reduction is required. Costs in this analysis should be considered to be order-of-magnitude and will need to be refined if an approach to reduce ammonia from the effluent discharged to Resurrection Bay is advanced." The City concluded that they believe there is no practicable alternative for ammonia reduction.

The Department has determined that discharge under the limitations and requirements of the permit is identified as the only practicable alternative; therefore 18 AAC 70.016(c)(7)(D)(i) finding is met.

(ii) The methods of prevention, control, and treatment the Department finds to be most effective and reasonable are currently in use at the facility or will be in use at the facility when the facility has met the requirements of the compliance schedule to install disinfection treatment in the permit and include meeting federal (40 CFR 133) and state (18 AAC 72.050) requirements. The Lowell Point WWTF utilizes 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, as described in Fact Sheet Part 2.2. The facility O&M Plan establishes standard operational procedures and regular maintenance schedules for the prevention, control, and treatment of all wastes and other substances discharged from the facility. The O&M Plan that prevents or minimizes the release of pollutants into Resurrection Bay include minimum components such as preventative maintenance, spill prevention, water conservation, and public information and education. Section 2.6 of the permit 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.

The Department has 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; therefore 18 AAC 70.016(c)(7)(D)(ii) finding 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);*

The Lowell Point lagoon treats all of the domestic wastewater generated in the sewer service area on the west side of Resurrection Bay. It serves a resident population of 2,700 plus a transient and visitor population of many times that during the peak of its summer visitor season. The wastewater system enables local infrastructure to be built and operated to provide vital services for Seward and, by extension, to other areas of Alaska. This impacts schools, the hospital, clinics, long term care facilities, the Alaska Vocational Technical Center, the Alaska Railroad, the hospitality industry, shops, eco-tourism, fishing, military support and other services, enabling them to operate more robustly and provide local jobs. The City of Seward benefits from an enlarged tax base, sales tax revenues, and utility customers to share the expenses of operating utilities, a library, Alaska SeaLife Center, parks, recreational facilities, cultural amenities, and other functions that enrich a community and draw visitors to it. The State of Alaska benefits when local communities can be more self-sufficient and support the State's mission for being "open for business".

The harbor industrial area is a vital component of the City's marine-related economic base. Seafood processing facilities, restaurants, shops, hotels, services, tour and recreational boats, and educational training employ hundreds of workers and meet the needs of recreationalists and commercial fishermen. Other enterprises, including communications and warehousing are also located in this area.

Seward also supports the Spring Creek Correctional Center, a State of Alaska Department of Corrections institution located on the east side of Resurrection Bay. Alaska's only maximum-security prison, the facility has a capacity of 550 long-term sentenced male inmates and a staff of 100+ with rotating schedules. Most of the prison staff live in Seward and many have families, including children, who attend local schools. They perform a vitally important service in protecting the public by segregating violent criminals from society and providing opportunity to reprogram and rehabilitate the inmates. Seward, indeed, all of Alaska, benefits from having the prison located in and served by this community. Seward's Public Works staff operate and maintain both the Lowell Point and Spring Creek WWTFs on a shared basis. In summary, Seward Public Works' considerable commitment to build and operate the collection system, lagoon, and outfall under DEC permit authorization for the past 41 years supports important economic and social activities in Seward, meets environmental rules, and protects Alaskans in many ways.

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 (QAPP)

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update, implement and/or maintain the 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 on site and made available to the Department upon request.

7.2 Operation and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limitations, monitoring requirements, and all other permit requirements at all times. The permittee is required to review and update if necessary and implement the O&M Plan that was required under the previous permit within 120 days of the effective date of the final permit to ensure that it includes appropriate best management practices and pollution prevention measures. The plan shall be retained on site and made available to the Department upon request.

7.3 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 Lowell Point 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 Lowell Point WWTF''s collection system. DEC may request further information on specific industries or business to assist in this evaluation.

7.4 Compliance Schedule

In accordance with 18 AAC 70.910 and 18 AAC 83.560, when appropriate, APDES permits may include a series of required steps and deadlines (i.e., a compliance schedule), which upon completion, enables the permittee to meet the permit's WQBEL. A compliance schedule establishes remedial measures in a permit, including an enforceable sequence of interim requirements such as actions, operations, or milestone events leading to compliance. Compliance schedules authorized under 18 AAC 83.560 require that if a permit establishes a schedule of compliance that exceeds one year, the schedule must set out interim requirements and dates for their achievement. If the time necessary to complete any interim requirement is more than one year, the schedule shall require reports on progress towards completion of the interim requirements.

The Department reviewed monitoring data submitted by the City for the Lowell Point WWTF during the previous permitting period, June 2017 – December 2021, the Disinfection Analysis Report submitted by the City with their application for permit reissuance, and applicable regulations, including new regulations that have been enacted since the previous permit was issued and provided a summary of this information below.

7.4.1 Lowell Point WWTF Disinfection Background

Prior to the issuance of the previous individual APDES permit, AK0021890, the Lowell Point WWTF discharge was authorized under a NPDES permit. The City applied for an individual APDES permit and on April 21, 2017, AK0021890 was issued to the Lowell Point WWTF. FC bacteria effluent limits in the permit were set at 25,000 FC/100 mL for the AML, 37,500 FC/100 mL for the AWL, and 50,000 FC/100 mL for the DML. The FC bacteria effluent limits in the 2017 permit were based on the facility's performance, the dilution available in the mixing zone, and applicable water quality criteria. In the 2017 permit, FC bacteria was the driver of the chronic mixing zone, defined as the area within a rectangle with a length of 800 m and a width of 100 m, centered on the diffuser and extending from the marine bottom to the surface. The dilution of the chronic mixing zone was 2,048, determined by CORMIX modeling. Ammonia and enterococci were parameters included in the mixing zone. The effluent was monitored for enterococci monthly during the summer season (May 1 – September 30) and enterococci DMLs were reported. The City was required to conduct summer shoreline monitoring for FC bacteria and enterococci and monitoring of FC bacteria and enterococci at the western edge of the mixing zone. Periodic FC bacteria monitoring at the shoreline and western edge of the mixing zone was required by the permit in the months between October and April. The City was required to prepare a disinfection analysis report evaluating the addition of different disinfection alternatives into the treatment process, due with the application for reissuance of AK0021890.

Results obtained from FC bacteria and enterococci effluent monitoring from June 2017 – December 2021 indicate that the DML and AWL were both exceeded four times and the AML was exceeded nine times. The permit did not require effluent enterococci limits, but results indicate that the enterococci monitoring results exceeded the daily maximum enterococci WQC of 130 cfu/100 mL in 21 of 21 samples, and in fourteen samples, the enterococci concentrations were at or greater than the laboratory upper threshold analysis maximum limits. The marine water quality criteria found in 18 AAC 70 apply at the boundary of the mixing zone, including the shoreline. The results of the 2017 - 2021 shoreline monitoring events indicated that FC bacteria was present above minimum detection levels in 12 of 26 samples and did not exceed the daily maximum WQC of 43 FC/100 mL in any sample. Enterococci, a bacteria known to be more specific to humans than FC bacteria, was found above the minimum detection level in 11 of 21 samples and was not found above the daily maximum WQC of 130 cfu/100 mL. Results from additional monitoring at the boundary of the mixing zone reported eight of 18 FC bacteria and seven of 18 enterococci samples were present above the minimum detection level at the southern boundary of the mixing zone and one FC bacteria sample exceeded the daily maximum detection level of 43 FC/100 mL. No enterococci samples exceeded the daily maximum detection level of 130 cfu/100 mL at the southern boundary of the mixing zone. Five of eight FC bacteria samples were present above the minimum detection level at the northern boundary of the mixing zone and none exceeded the FC bacteria daily maximum detection level. Three of seven FC bacteria samples were present above the minimum detection level at the eastern boundary of the mixing zone and none exceeded the FC bacteria daily maximum detection level. Eleven of 19 FC bacteria samples were present above the minimum detection level in the ambient water outside of the mixing zone and none exceeded the FC bacteria daily maximum detection level.

7.4.2 Lowering of Water Quality

The Lowell Point WWTF has contributed to a violation of water quality standards in the receiving environment demonstrated by the number of exceedances of FC bacteria effluent limit results reported from June 2017 to December 2021. 18 AAC 70.10(a) requires that a person may not conduct an operation that causes or contributes to a violation of the water quality standards set by antidegradation policy in 18 AAC 70.015 and the water quality criteria in 18 AAC 70.020(b). Revised antidegradation regulations at 18 AAC 70.015(a)(2)(D)(i) require that for existing point sources, such as the Lowell Point WWTF, all wastes and other substances discharged will be controlled and treated to achieve the highest statutory and regulatory requirements. The receiving water, Resurrection Bay, is a Tier 2 water body. FC bacteria and enterococci concentrations could be reduced if an effective and practicable disinfection measure is identified and applied to the Lowell Point WWTF effluent, preventing, or lessening the degradation of water quality. The City submitted a disinfection analysis report with the application for reissuance of AK0021890 that identified four alternatives for disinfection.

7.4.3 Mixing Zone

The mixing zone authorization regulations at 18 AAC 70.240 allow for a reduction in water quality of Resurrection Bay below levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water in a mixing zone. In the previous permit, the Department authorized the mixing zone with FC bacteria as the driving parameter to accommodate important economic and/or social development in the community of Seward, in accordance with 18 AAC 70.015(a)(2)(A). However, 18 AAC 70.240(c)(1)(B) states that the Department will approve a mixing zone as proposed only if the Department finds that available evidence reasonably demonstrates the effluent will be treated to remove, reduce, and disperse pollutants, using methods that the Department finds to be the most effective, technologically, and economically feasible. Additionally, 18 AAC 70.240 requires a mixing zone to be as small as practicable. Installation of disinfection treatment at the Lowell Point WWTF is an effective technologically and economically feasible method that will treat the effluent to remove, reduce and disperse pollutants, specifically bacteria. Disinfection is a common, widely utilized treatment at similar facilities throughout the state and nationally. After the facility has installed disinfection treatment and meets final effluent limitations for FC bacteria, based on available data, the parameter driving the size of the chronic mixing zone will continue to be FC bacteria, but the area of the final chronic mixing zone size shall be greatly reduced. All pollutants in the effluent, including ammonia and enterococci will fit within the final chronic mixing zone and the final chronic mixing zone will be consistent with the mixing zone regulations at 18 AAC 70.240, requiring a mixing zone to be as small as practicable.

7.4.4 Disinfection at Other WWTFs

The Department included compliance schedules in authorizations to discharge under AKG572000, Small POTWs and other Small Treatment Works Providing Secondary Treatment of Domestic Wastewater and Discharging to Surface Water. The AKG572000 fact sheet documents the Department's decision whereby DEC determined that facilities that had historically received authorizations containing high FC bacteria effluent limits (e.g., an AML of 100,000 FC/100 mL and a DML of 500,000 FC/100 mL) would receive five-year compliance schedules in their authorizations to come into compliance with the more stringent FC bacteria limits (AML 200 FC/100 mL, AWL 400 FC/100 mL, DML 800 FC/100 mL) and that the vast majority of permittees covered by the general permit had demonstrated the capability of achieving on a regular basis. Twelve facilities with discharge flow rates ranging from 1,000 to 400,000 gpd were issued authorizations to discharge with five-year compliance schedules to come into compliance with the above stated FC bacteria effluent limits. Consistent with the Department's

2012 decision regarding FC bacteria effluent limits in General Permit AKG572000 (effective November 1, 2012 – May 4, 2017), DEC made the same decision in 2013 for facilities authorized to discharge under General Permit AKG573000, Domestic Wastewater Treatment Lagoons Discharging to Surface Water (effective September 1, 2013 – August 31, 2018**)**. This resulted in two facilities receiving authorizations to discharge with five-year compliance schedules to come into compliance with the above stated FC bacteria effluent limits. Finally, the Department performed a review of APDES wastewater discharge individual permits and general permit authorizations for domestic wastewater treatment facilities performing secondary treatment. Eighty-eight facilities were identified ranging in design flow from 750 gallons per day to 58 MGD. All of the identified facilities performed some type of effluent disinfection. Lagoon POTWs with disinfection treatment of effluent include the Valdez WWTF. The Valdez WWTF serves a population of about 3,800 and has a flow of 2.5 mgd, discharging to marine water in Port Valdez. The facility has two aerated lagoons and a percolation pond serving as a chlorine contact pond. The Cold Bay Lagoon is a one-cell aerated lagoon with a flow of 0.072 mgd, discharging to marine water in Cold Bay and the effluent is treated with chlorine. The Eareckson Air Station Lagoon in Shemya is a two-cell aerated lagoon with a flow of 0.30 mgd, discharging to the marine waters of the Pacific Ocean and the effluent is treated with chlorine. The City of Galena's #2 Lagoon is a 4-cell aerated lagoon with a flow of 0.060 mgd, discharging to wetlands and the effluent is treated with chlorine. Finally, Ft. Greely's Lagoon consists of an Imhoff tank followed by a 2-cell aerated lagoon with a flow of 0.46 mgd, discharging to Jarvis Creek and the effluent is treated with chlorine.

7.4.5 Interim FC Effluent Limits

While the compliance schedule is in effect, the permittee must comply with interim FC bacteria effluent limits and monitoring requirements as specified in Table 8. Interim ammonia effluent limits are based on facility performance. In the previous permit, the Department determined that since August 2015, following the completion of the sludge removal project and with the addition of the Bio-Dome units, FC bacteria limits imposed in the 2011 permit had been achieved and would be retained. FC bacteria effluent limits in the 2011 permit were based on a dilution of 2,048:1 available within a mixing zone defined as a rectangular area with a length of 800 m and a width of 100 m. CORMIX models, with the updated data inputs provided by the City for permit reissuance, verified that the 2,048:1 dilution continued to be a conservative dilution available within the mixing zone.

18 AAC 83.530, limits for POTWs must include weekly average limits unless impracticable. The AWL WQBEL for FC bacteria in the previous permit followed the precedent set by the secondary treatment standard at 18 AAC 83.605 for BOD_5 and TSS, where the weekly limit equals 1.5 times the calculated monthly average limit. The AWL in the previous permit was therefore calculated as 25,000 FC/100 ml multiplied by 1.5 = 37,500 FC/100 mL.

Table 8: Interim FC Effluent Limits

Parameter	Units [b]	Effluent Limits [a]			Monitoring Frequency		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Fecal coliform bacteria (FC bacteria)	FC/100 m/L	25,000 [c]	37,500 [c]	50,000 [d]	Effluent	1/Month	Grab

Footnotes:

a. Final FC bacteria effluent limits are found in Section 1.2, Table 2.
b. Unit: FC/100 mL = fecal coliform bacteria colonies per 100 milliliters.

c. If more than one FC bacteria sample is collected within the reporting period, the average result 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 $(100 \times 200 \times 300)^{1/3} = 181.7$.

d. If fewer than ten samples are collected within a 30-day period, the effluent limit cannot be exceeded. If ten or more samples are collected within a 30-day period, not more than 10% of the samples may exceed the effluent limit

Each year that the compliance schedule is in effect, the permittee must submit a progress report assessing the progress during the previous year towards meeting the incremental milestones and discuss actions targeted for the upcoming year.

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/hc/en-us .

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 (ODCE)

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 ODCE.

Interactive nautical charts depicting Alaska's baseline plus additional boundary lines are available at https://www.charts.noaa.gov/InteractiveCatalog/nrnc.shtml 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 Lowell Point WWTF Outfall 001A 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 (ESA)

The ESA requires federal agencies to consult with USFWS and the National Marine Fisheries Service (NMFS) if their actions could beneficially or adversely affect any threatened or endangered species. NMFS, which is an agency within the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), 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 NOAA on January 3rd and 5th 2022 and requested information about threatened or endangered species under their respective jurisdictions in the vicinity of the Lowell Point WWTF outfall.

Ms. Jenna Malek of NOAA responded on January 5, 2022, stating that "The following threatened and endangered species could be found in the area affected by effluent discharge:

Humpback whale, Western North Pacific DPS: Endangered

Humpback whale, Mexico DPS: Threatened

Fin whale: Endangered

Steller sea lion, Western DPS: Endangered

Steller sea lion, Western DPS Critical Habitat (mouth of Resurrection Bay)

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.

8.3 Essential Fish Habitat (EFH)

EFH includes the waters and substrate (sediments, etc.) necessary for fish from commercially fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH.

DEC contacted Tony Munter of ADF&G on December 30, 2021 , and requested they identify any concerns regarding Essential Fish Habitat or in the vicinity of the Lowell Point WWTF outfall. As a state agency, DEC is not required to consult with NOAA on EFH; however, DEC voluntarily contacts agencies to notify them of the proposed permit issuance and to obtain listings of EFH in the area. The Department accessed EFH information via use of NOAA's Habitat Conservation Interactive EFH Mapper located at: EFH Mapper (noaa.gov) .The Data Query Tool was used for Resurrection Bay, near the Lowell Point WWTF outfall location. This tool indicated that the Lowell Point WWTF outfall location and mixing zone area does not intersect with spatial data representing EFH for any species/management units.

No habitat areas of particular concern nor EFH areas protected from fishing were identified at the location. Mr. Munter responded on January 11, 2022, with the comment that "ADF&G has reviewed proposed APDES permit renewal AK0021890 for the City of Seward Lowell Point WWWTF discharge into the west side Resurrection Bay and any potential spawning fish habitat near the outfall. ADF&G has verified coho and pink salmon spawning populations in Scheffler Creek (AWC 231-30-10070) near the outfall with sockeye salmon also present in this stream. Tonsina Creek (AWC 231-30-10040), near Caines Head State Recreation Area, is south of Lowell Point and has known spawning populations of chum and pink salmon.

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 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 the 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 EPA. In addition, the permittee is required to submit a biosolids permit application to 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 is NPDES Form 2S and can be found

on EPA's website, www.epa.gov, under NPDES forms. A 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

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Alaska Department of Environmental Conservation, "Interim Antidegradation Implementation Methods," Policy and Procedure 05.03.103, July 14, 2010.

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Sabrina Farmer (Sabrina.Farmer@fws.gov), "Re: Critical habitat and/or marine mammal concerns inquiry: APDES Permit AK0021890 - City of Seward's Lowell Point Wastewater Treatment Facility," January 5, 2022.

Tony Munter (Tony.Munter@alaska.gov), "RE: Essential Fish Habitat or fish spawning concerns inquiry: APDES Permit AK0021890 - City of Seward's Lowell Point Wastewater Treatment Facility," January 11, 2022.

USEPA, "Alaska DEC NPDES Permit Writer's Course" Reference Manual. May, 2019.

State of Maine. Department of Environmental Protection. *Lagoon Systems in Maine*. http://www.lagoonsonline.com/.

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 POTW to meet effluent limits based on available wastewater treatment technology, specifically, secondary treatment effluent limits. The Alaska Department of Environmental Conservation (the 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 water quality 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 parameter 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, chlorine, ammonia, or metals, depending on the type of treatment system used and the quality of the influent to the POTW (e.g., industrial facilities, as well as residential areas discharging into the POTW). When technology-based effluent limits (TBELs) do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a 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 are provided in this section.

Table A- 1: Basis for Effluent Limits

EFFLUENT PARAMETER	UNITS	EFFLUENT LIMITS					
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Average Monthly Percent Removal	Minimum Daily Limit	Basis for Limit
Flow	million gallons per day (mgd)	---	---	4.9	---	---	18 AAC 72.245
BOD_5	milligrams per liter (mg/L)	30	45	60	85 % (minimum)	---	18 AAC 83.010(e) 18 AAC 83.540
	pounds per day (lbs/day)	1,266	1,839	2,452			
TSS	mg/L	30	45	60	85% (minimum)	---	18 AAC 83.010(e) 18 AAC 83.540
	lbs/day	1,266	1,839	2,452			
Fecal Coliform (FC) Bacteria [c] (November 1- April 30)	FC/100 mL	162	243	320	---	---	18 AAC 83.435(6)(d)
FC Bacteria (May 1- October 31)	FC/100 mL	200	400	800	---	---	18 AAC 83.480
Copper, total recoverable (November 1- April 30)	micrograms per liter (µg/L)	52	N/A	97	---	---	18 AAC 83.435(6)(d) 18 AAC 83.540
	lbs/day	2.1	N/A	4.0			
Copper, total recoverable (May 1- October 31)	µg/L	34	N/A	54	---	---	18 AAC 83.435(6)(d) 18 AAC 83.540
	lbs/day	1.4	N/A	2.2			
pH	standard units	---	---	9.0	---	6.0	18 AAC 83.010(e)
Dissolved Oxygen	mg/L	---	---	---	---	2.0	18 AAC 83.435(6)(d)

A.2 Secondary Treatment Effluent Limitations

A.2.1 Secondary Treatment and Equivalent to Secondary Treatment Effluent Limits

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. In 1984, the definition of secondary treatment was revised to include special consideration for facilities that use trickling filters or waste stabilization ponds

(i.e., lagoons) as the principal process. CWA Section 304(d)(4) deems biological treatment facilities such as lagoons a treating wastewater to a level equivalent of secondary treatment. The Department adopted the secondary treatment and equivalent to secondary treatment TBELs, which are found in 40 CFR §133.102 and 40 CFR§133.105, respectively, adopted by reference in 18 AAC 83.010(e). The TBELs identify the minimum level of effluent quality attainable by application of secondary treatment or equivalent to secondary treatment in terms of BOD_5, $CBOD_5$, TSS, and pH.

40 CFR §133.105 describes the minimum level of effluent quality attainable by facilities to be eligible for treatment equivalent to secondary treatment.

1) The BOD_5, $CBOD_5$, and TSS effluent concentrations consistently achievable through proper operation and maintenance of the treatment works exceeds the minimum level of the effluent quality set forth as attainable by secondary treatment; and
2) A trickling filter or waste stabilization pond is used as the principal process; and
3) The treatment works provides significant biological treatment of municipal wastewater.

Following evaluations according to 40 CFR §133.101(g), 40 CFR §133.101(f) and §133.105(f)(1), the Lowell Point Wastewater Treatment Facility (Lowell Point WWTF) meets the requirement of providing biological treatment of wastewater by way of a lagoon system. Prior to the issuance of the previous permit and based on performance of the lagoon during 2011 - 2016, DEC imposed effluent limits corresponding to those required of similar aerated lagoon facilities in other communities in Alaska in the previous permit. The limits imposed in the previous permit were secondary standards during the entire year for pH, and TSS and BOD_5 during the season November - June, including BOD_5 percent removal. The previous permit imposed equivalent to secondary standards for BOD_5 during the season July – October, including BOD_5 percent removal. A review of five years of effluent monitoring data, June 2017 through December 2021, shows that the facility cannot consistently meet secondary treatment requirements for the Daily Maximum Limit (DML), Average Monthly Limit (AML) or Average Weekly Limit (AWL) for BOD_5. Also, the facility still cannot consistently meet secondary treatment requirements for percent removal of BOD_5. The Lowell Point WWTF permittee, the City of Seward (City), requested that the effluent limits for BOD_5 be replaced with $CBOD_5$ effluent limits. DEC reviewed the City's request and data submitted by the City in support of the request and the findings of the review are discussed in this section. DEC first reviewed the secondary treatment and equivalent to secondary treatment standards imposed in the previous permit and identified exceedances of the effluent limits. Table A-2 lists the secondary and equivalent to secondary treatment standards and the exceedances of the treatment standards from BOD_5, $CBOD_5$ and TSS effluent monitoring between June 2017 and December 2021.

Table A- 2: Secondary and Equivalent to Secondary Treatment Standards and Exceedances 6/2017 – 12/2021 (Year-Round Results)

Parameter	Average Monthly Limit	Average Weekly Limit	Daily Maximum Limit	Minimum Monthly Percent Removal

Treatment Standard	Secondary Treatment	Equivalent to Secondary Treatment	Secondary Treatment	Equivalent to Secondary Treatment	Secondary Treatment	Equivalent to Secondary Treatment	Secondary Treatment	Equivalent to Secondary Treatment
BOD_5	30 (mg/L)	45 (mg/L)	45 (mg/L)	65 (mg/L)	60 (mg/L)	-------	85 (%)	65 (%)
Number of Exceedances of BOD_5 6/2017 – 12/2021	9	8	9	7	8		17	2
TSS	30 (mg/L)	45 (mg/L)	45 (mg/L)	65 (mg/L)	60 (mg/L)	-------		65 (%)
Number of Exceedances of TSS 6/2017 – 12/2021	0	0	0	0	0		0	0
pH	Both secondary and equivalent to secondary treatment requires pH to be between 6.0 to 9.0 standard pH units (S. U.).							
Number of Exceedances of pH 10/2016 – 4/2021	0							

All BOD_5 effluent limits were exceeded on at least one occasion, even including the less conservative limits set for equivalent to secondary standard limits.

A.2.2 The Case to Support Using $CBOD_5$ as a Biological Oxygen Demand Parameter at the Lowell Point WWTF

References in the academic field (Rich, Fellow, 1996 and Tremblay, 2014) and facilities outside Alaska have determined that $CBOD_5$ is a better indicator of lagoon performance than BOD_5, due to apparent poor BOD removal as the result of nitrogenous oxygen demand exerted in the BOD bottle in the 5-day test. DEC has reviewed the data provided by the City in support of this request and has determined that there is some evidence to support the City's request, but it is not conclusive and some questions remain about the extent of nitrogenous oxygen demand in the lagoon. DEC required the City to collect and report $CBOD_5$ data during the last two years of the permitting period to evaluate the performance of the lagoon by comparing $CBOD_5$ and BOD_5 results to determine the feasibility of using $CBOD_5$ as an indicator of oxygen demand, per 18 AAC 83.010(e). This did not provide many data points upon which to compare the two parameters measuring oxygen demand, so the comparison between the two parameters provides an incomplete picture. The City has stated that BOD_5 exceedances have been a direct consequence of high lagoon temperatures. The City's assertion is supported by the data; when effluent temperatures are high, as they are in the late summer months, so are the BOD_5 concentrations. Figure A-1 is a graph showing AML concentrations for BOD_5, $CBOD_5$ (when available), and monthly average effluent temperatures at the Lowell Point WWTF. Both $CBOD_5$ and BOD_5 concentrations increase with a corresponding increase in effluent temperature, rising in the late summer months and decreasing in the winter months. Using only Lowell Point WWTF data, the case presented by the City provides insufficient support for DEC to make the determination to use $CBOD_5$ instead of BOD_5 as a measure of oxygen demand at the Lowell Point

WWTF. However, $CBOD_5$ was monitored for five years (2016 – 2021) at the nearby Spring Creek Wastewater Treatment Facility (Spring Creek WWTF), along with BOD_5. The Spring Creek WWTF is a POTW, operated by the City, and uses the same lagoon-based wastewater treatment methods as are in effect at the Lowell Point WWTF, although it is a smaller facility. The Spring Creek WWTF is located in a relatively close geographical proximity to the Lowell Point WWTF, so DEC determined that it is feasible to compare temperature, BOD_5 and $CBOD_5$ results from Spring Creek WWTF to Lowell Point WWTF and base the decision on whether to use $CBOD_5$ instead of BOD_5 at the Lowell Point WWTF, using the Spring Creek WWTF data as support for the decision. Figure A-2 is a graph showing AML concentrations for BOD_5, $CBOD_5$ and monthly average effluent temperatures at the Spring Creek WWTF. The City also measured influent and effluent ammonia and nitrate/nitrite (NO_3/NO_2) on a weekly basis for one month in July – August 2021 at the Spring Creek WWTF, at DEC's request, to demonstrate that nitrogenous oxygen demand is higher in the summer and may be interfering with the five-day BOD tests taken in the summer months. While the results from the ammonia and NO_3/NO_2 testing at Spring Creek WWTF were inconclusive, the City established an adequate circumstantial case that nitrogenous oxygen demand was causing undue influence in the 5-day BOD_5 tests for the Spring Creek WWTF and, by extension, can be used to demonstrate that the same effects are being seen at Lowell Point WWTF.

Figure A- 1: Comparison of Lowell Point WWTF Temperatures, BOD_5 and $CBOD_5$ – 06/2017 – 12/2021

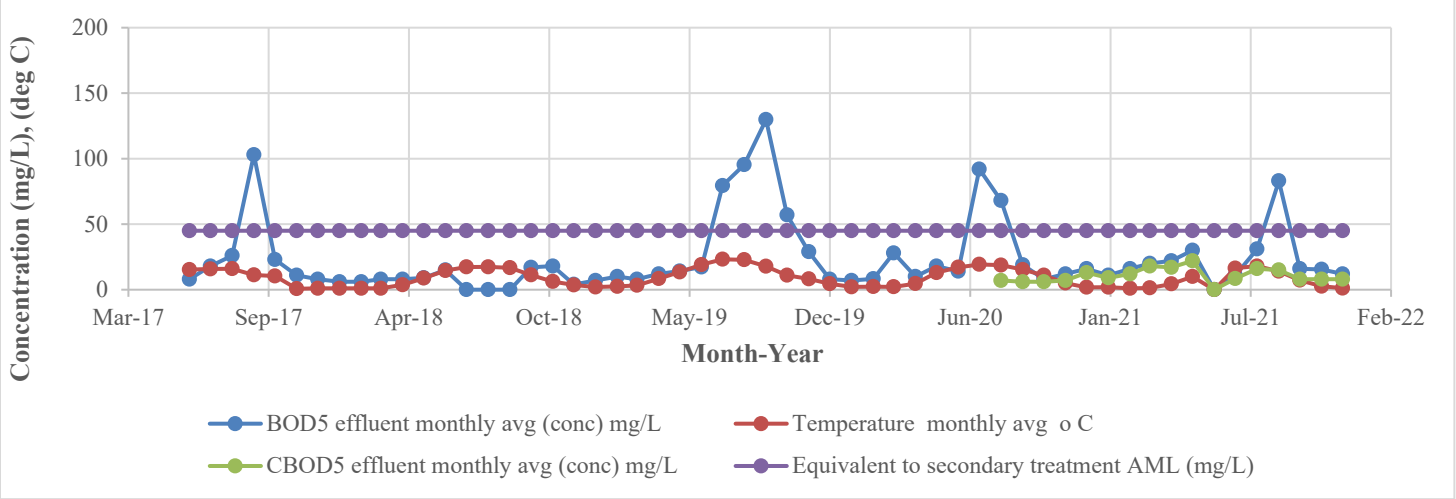
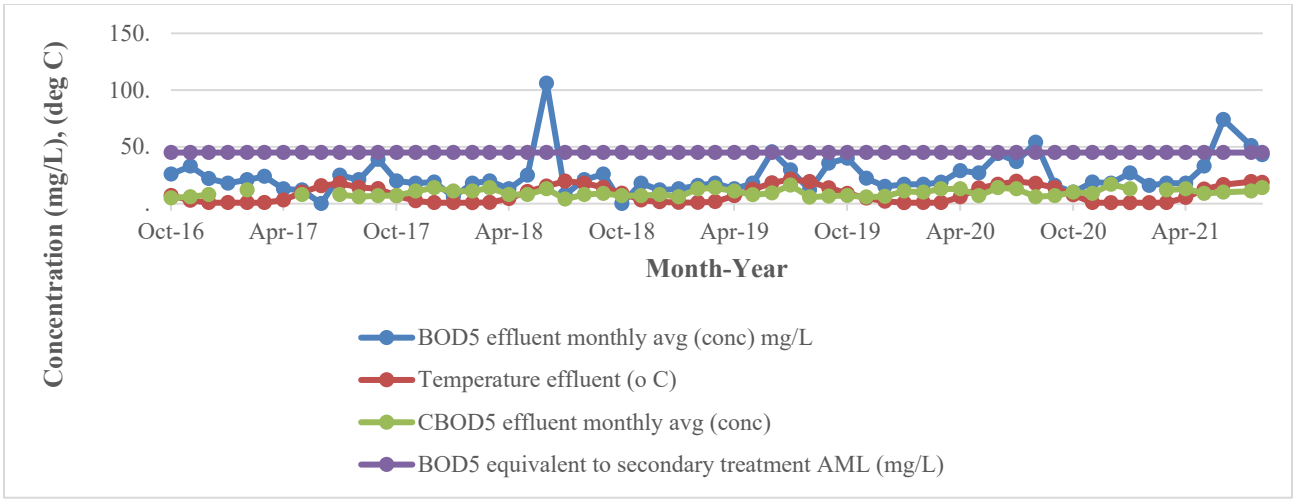


Figure A- 2: Comparison of Spring Creek WWTF Effluent Temperatures, BOD_5, and $CBOD_5$ - 10/2016 - 8/2021



After reviewing the data presented by the City in support of using $CBOD_5$ as a parameter to measure oxygen demand at Spring Creek WWTF and Lowell Point WWTF, DEC has determined that $CBOD_5$ is an appropriate parameter in the permit to be used to determine oxygen demand in both facilities. The permit requires the City to report the DML for BOD_5 on a monthly basis, without secondary or equivalent to secondary BOD_5 effluent limits imposed. The limits imposed in the previous permit for BOD_5 will be replaced with associated $CBOD_5$ secondary treatment standard effluent limits. Secondary treatment standard effluent limits for TSS and TSS percent removal will be carried forward in the permit, as well as secondary treatment standards for pH daily maximum and minimum effluent limits, and $CBOD_5$ percent removal.

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 water body 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 water body. Designated uses are those uses specified in WQS for each water body or segment whether or not they are being attained [40 CFR Section 131.3(f)]. Existing uses are those uses actually attained in a water body on or after November 28, 1975, whether or not they are included in the WQS [40 CFR Section 131.3].

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies 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).

Permit AK0021890 authorizes discharges of secondary treated domestic wastewater to marine water. The designated uses for marine water, that have not been reclassified are: (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.

A.4 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, (RPA Guide) to

evaluate the Lowell Point WWTF effluent. Discharge monitoring reports (DMRs) from June 2017 to December 2021, Form 2A Application to Discharge Effluent and additional 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 Lowell Point WWTF's effluent as reported in the above documents, revealed the presence of ammonia, fecal coliform bacteria (FC bacteria), and enterococci bacteria (enterococci) 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 water body concentration outside of the influence of the outfall for each pollutant of concern. The chemical-specific concentration of the effluent and receiving water body and, if appropriate, the dilution available from the receiving water body, are factors used to project the receiving water body concentration. If the projected concentration of the receiving water body exceeds the numeric criterion for a limited parameter, then there is reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality criterion. DEC assesses reasonable potential (RP) to exceed both acute and chronic criterion. Appendix B contains more details on the RPA conducted for this permit.

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 water body. A mixing zone can be used only when there is adequate receiving water body flow volume, and the concentration of the pollutant of concern in the receiving water body is below the numeric water quality criteria necessary to protect the designated uses of the water body.

A.4.1 Specific Effluent Limits in the Lowell Point WWTF Permit

A.4.1.1 *Floating, Suspended, or Submerged Matter, Including Oil and Grease*

The WQS for floating, suspended, or submerged matter, including oil and grease, are narrative. The most stringent standard, found at 18 AAC 70.020(b)(8)(A)(i), requires that fresh waters, "may not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use; cause a film, sheen, or discoloration on the receiving of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the receiving of the water, within the water column, on the bottom, or upon adjoining shorelines."

A.4.1.2 *pH*

The WQS at 18 AAC 70.020(b)(18)(A)(i) Aquaculture and 18 AAC 70.020(b)(18)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife states that the pH water quality criteria for marine waters may not be less than 6.5 or greater than 8.5 Standard Units (S.U.).

DEC reviewed pH monitoring data for Outfall 001A from June 2017 to December 2021. During this period, the lowest minimum pH value recorded was 6.6 S.U. and the highest minimum pH value recorded was 7.4 S. U. The lowest pH maximum pH value recorded was 6.9 S.U. and the highest maximum pH value recorded was 8.0 S. U. The previous permit implemented WQBELs for pH that required a minimum of 6.5 S.U. and a maximum of 8.5 S.U., monitored at a frequency of three times per week. During the previous permitting period, neither the pH minimum nor the pH maximum WQBEL was exceeded. The pH minimum and maximum WQBELs are carried forward in the permit. The pH has remained stable and within the WQBEL effluent limits during the previous permitting period and the monitoring frequency requirement of three times per week is carried forward in the permit.

A.4.1.3 *Dissolved Oxygen*

Aerobic microorganisms require dissolved oxygen (DO) to metabolize organic wastes into inorganic byproducts and reproduce. Municipal wastewater exerts a demand on the oxygen resource of waterbodies via BOD_5 or $CBOD_5$. The WQS at 18 AAC 70.020(b)(15)(A)(i) states that 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, surface DO concentration in coastal water may not be less than 6.0 milligrams per liter (mg/L) except where natural conditions cause this value to be depressed. In no case may DO levels exceed 17mg/L.

DEC reviewed DO monitoring data for Outfall 001A from June 2017 to December 2021. During this period, the lowest minimum DO value recorded was 2.3 mg/L and the highest minimum DO value recorded was 12.8 mg/L. The lowest DO maximum value recorded was 5.7 mg/L and the highest maximum pH value recorded was 14.8 mg/L. The facility has demonstrated that it can consistently meet DO WQS for coastal waters. The previous permit required a DO daily minimum concentration of 6.0 mg/L and daily maximum concentration of 17 mg/L, monitored at a frequency of one time per week. The daily maximum and minimum effluent limitations and monitoring frequency requirement are carried forward in the permit.

Since the Lowell Point WWTF can be reasonably expected to meet the WQS at 18 AAC 70.020(b)(15)(A)(i), a mixing zone is not required for DO.

A.4.1.4 *Fecal Coliform Bacteria*

FC bacteria are a non-pathogenic indicator species whose presence suggests the likelihood that pathogenic bacteria are present.

The WQS at 18 AAC 70.020(b)(14)(D) Harvesting of raw mollusk or other aquatic life criterion states that the FC concentration shall not exceed 14 FC colonies per 100 milliliters (FC/100 mL) and not more than 10% of samples shall exceed a FC concentration of 43 FC/100 mL.

DEC reviewed FC bacteria monitoring data for Outfall 001A from June 2017 to December 2021. No disinfection measures were used to reduce bacteria levels during this time. The results of the daily maximum FC bacteria samples ranged from 368 FC/100 mL to 120,000 FC/100 mL. The results of the average monthly FC bacteria samples ranged from 268 FC/100 mL to 106,262 FC/100 mL. As the effluent is routinely only sampled one time per month, the results of the average weekly FC bacteria samples consistently had the same numerical value as the average monthly FC bacteria samples. The effluent DML for FC bacteria was 50,000 FC/100 mL and this limit was exceeded four times. The effluent AWL of 37,500 FC/100 mL was exceeded four times. The effluent AML was 25,000 FC/100 mL and this limit was exceeded nine times.

With no disinfection measures in place at the Lowell Point WWTF, FC bacteria can be reasonably expected to exceed WQ criteria at the end of the pipe. The permit has imposed a compliance schedule requiring the City to install a system of disinfection to the effluent of the WWTF in order for the facility to meet final effluent limits of 200 FC/100 mL AML, 400 FC/100 mL AWL, and 800 FC/100 mL DML. Until completion of a system of effluent disinfection has been installed and the final effluent limits for FC bacteria can be met, the FC bacteria interim effluent limits and minimum monitoring frequency requirements of sampling once per month imposed in the previous permit are carried forward in the permit.

In the previous APDES permit, FC bacteria was the parameter that required the greatest dilution to meet WQ criteria at the boundary of the chronic mixing zone and the permit conditions required the City to monitor FC bacteria in the effluent, at the western boundary of the mixing zone, and the

shoreline adjacent to the southern boundary of the mixing zone. The chronic mixing zone size, shape, dilution factor of 2048 authorized in the previous permit, and receiving water body monitoring requirements will be maintained in the permit until the facility has met the requirements of the compliance schedule to install disinfection treatment and the facility can meet the final FC bacteria effluent limits. When the facility has met the requirements imposed by the compliance schedule in the permit, FC bacteria will remain the driving parameter of a smaller mixing zone with a dilution factor of 57.2, a length of 75meters (m) and a width of 5.5 m. Ammonia and enterococci will fit inside the final chronic mixing zone sized for FC bacteria. The FC bacteria monitoring frequency of two samples per month will be carried forward from the previous permit, before and after the facility has installed disinfection treatment and can meet final FC bacteria limits.

A.4.1.5 *Total Ammonia (as Nitrogen)*

Ammonia is the sum of ionized (NH_4^+) and un-ionized ammonia (NH_3). Temperature, pH, and salinity affect which form, NH_4^+ or NH_3 is present. NH_3 is more toxic to aquatic organisms than NH_4^+ and predominates with higher temperatures 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 nitrogen. Excess ammonia as nitrogen in the environment can lead to dissolved oxygen depletion, eutrophication, and toxicity to aquatic organisms. The water quality criteria are based on the worst-case conditions. In the previous permit, there were no ammonia effluent limits imposed because there was insufficient data to perform an RPA for ammonia. For the Lowell Point WWTF, the critical concentrations for pH, temperature and salinity are based on data submitted by the applicant from two receiving water sampling locations; one location (the Public Works mid-Bay station) located near the Spring Creek WWTF and the other (the Alutiiq Pride Hatchery Bay station) located close to the entrance of Resurrection Bay. The City collected receiving water data between 2016 and 2021 and DEC derived ammonia criteria from the salinity, and 85th percentile of the pH and temperature receiving water data from Appendices F and G in the *2008 Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances* (Toxics Manual), consistent with the Department's RPA Guide. DEC calculated an acute ammonia WQS numeric criterion of 6.2 mg/L and a chronic criterion of 0.93 mg/L for the RPA. The City sampled the receiving water for ambient ammonia concentration and found no ammonia present in the receiving water above detectable levels, so the ambient ammonia concentration (C_s) was zero. More information about ammonia criteria derived from ambient water monitoring results can be found in Fact Sheet Parts 3.3 and 4.5.

The City sampled ammonia in the effluent on a bi-monthly basis in the previous permitting period to build a robust data set to determine whether ammonia had RP to exceed WQS at the end of the pipe in the current permit. The City reported effluent ammonia data for Outfall 001A from June 2017 to December 2021. The results ranged from 0.1 mg/L to 34.00 mg/L. DEC conducted an RPA on the available ammonia effluent data and determined that there is RP for ammonia to exceed water quality criteria. The ammonia effluent data was incorporated into the CORMIX models, used to determine the dilution required for ammonia to meet WQS at the boundary of the final chronic mixing zone sized for FC bacteria. In the current permit, the acute mixing zone with ammonia as the driving parameter is defined as the area within a rectangle having a length of 62 m and a width of 1.0 m, centered on the diffuser, and extending from the marine bottom to the surface. More information about mixing zone sizes can be found in Fact Sheet Part 4.5.

Ammonia will meet WQS at the boundary of the final chronic mixing zone sized for FC bacteria, but the dilution required (50) is close to the dilution required for FC bacteria to meet WQS at the edge of the chronic mixing zone, therefore the permit implements new WQBELs for ammonia in the permit at Outfall 001A with a DML of 47 mg/L, an AWL of 35 mg/L, and an AML of 23 mg/L. More

information about calculations for ammonia effluent limits in the permit can be found in Fact Sheet Appendices B and C. The selected limits are protective of WQ criteria at the boundary of the final chronic mixing zone sized for FC bacteria. The monitoring frequency of monthly reporting is changed from the previous permit from bimonthly to monthly in the permit, because when the final FC bacteria limits are met, ammonia is the toxic parameter that will have the greatest RP to exceed WQS at the end of the pipe.

A.4.1.6 *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 monthly geomean concentration shall not exceed 35 enterococci colony forming units per 100 milliliters (cfu/100 mL) and not more than 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 would only take place during the summer season, May to September.

DEC reviewed enterococci bacteria monitoring data for Outfall 001A from June 2017 to December 2021. The daily maximum enterococci results ranged from 350 cfu/100 mL to 19,900 cfu/100 mL. As with FC bacteria, the lack of disinfection measures in the Lowell Point WWTF effluent caused elevated enterococci concentrations to be present in the effluent. Until the facility has fulfilled the requirements of the compliance schedule to install a disinfection system to control FC bacteria, enterococci will be a parameter in the interim chronic mixing zone authorized in the previous permit. DEC anticipates that enterococci levels would be reduced levels through operational controls, but it is doubtful that the enterococci concentrations would meet WQ criteria in 18 AAC 70.020(b)(14)(B) for contact recreation at the end of the pipe and therefore, enterococci will be a parameter included in the final chronic mixing zone sized for FC bacteria. Enterococci will not have effluent limits in the permit, as the variability of the data is too great and the sampling results too few to calculate limits that would be appropriate after disinfection is in place. When the facility has fulfilled the requirements of the compliance schedule to install disinfection treatment to the effluent, enterococci will be included as a parameter contained within the final chronic mixing zone sized for ammonia.

The minimum required monitoring frequency of monthly sampling is carried forward from the previous permit, during the summer season only. The summer season for enterococci bacteria sampling is May 1 – September 30, when the receiving water would most likely be used for contact recreation. Enterococci bacteria monitoring is required to be performed at the same time as FC bacteria monitoring and shall be collected on the same day.

A.5 Selection of Most Stringent Limitations

Table A-4 provides a summary and reference to those parameters that contain effluent limits at the point of discharge at the Lowell Point WWTF.

Table A- 3: Summary of Effluent Limitations

Parameter	Fact Sheet Reference	Type of Effluent Limit
BOD_5	Fact Sheet Part 3.3 APPENDIX A- A.2	TBEL, implemented at end of pipe
$CBOD_5$		

Parameter	Fact Sheet Reference	Type of Effluent Limit
TSS		
pH	Fact Sheet Part 3.3 APPENDIX A- Part A.4.1.2	WQBEL, implemented at end of pipe
FC Bacteria	Fact Sheet Part 3.3 APPENDIX A- Part A.4.1.4	Dilution from mixing zone applied to meet WQS at boundary of mixing zone
Enterococci Bacteria	Fact Sheet Part 3.3 APPENDIX A– Part A.4.1.6	Dilution from mixing zone applied to meet WQS at boundary of mixing zone
Total Ammonia, as Nitrogen	Fact Sheet Part 3.3 APPENDIX A- Part A.4.1.5	Dilution from mixing zone applied to meet WQS at boundary of mixing zone
Dissolved Oxygen	Fact Sheet Part 3.3 APPENDIX A- Part A.4.1.3	WQBEL, implemented at end of pipe

APPENDIX B - REASONABLE POTENTIAL DETERMINATION C

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 water body concentration to the criteria for that pollutant. Reasonable potential to exceed exists if the projected receiving water body 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 water body, the maximum projected receiving water body 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 water body concentration downstream of the effluent discharge
C_e = Maximum projected effluent concentration
C_u = Assumed receiving water body ambient concentration
Q_d = Receiving water body flow rate = $Q_e + Q_u$
Q_e = Effluent flow rate (set equal to the design flow of the wastewater treatment facility (WWTF)
Q_u = Receiving water body 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 assumes that the discharge is rapidly and completely mixed with the receiving water body. If a mixing zone based on a percentage of the critical flow in the receiving water body is authorized based on the assumption of incomplete mixing with the receiving water body, 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 water body flow available for dilution.

Where mixing is rapid and complete, MZ is equal to 1 and equation B-2 is equal to equation B-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 water body concentration, and

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

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

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

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

After the D simplification, this becomes:

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

B.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in section 3.3 of the TSD, "*Determining the Need for Permit Limits with Effluent Monitoring Data*" and the process described in section 2.4 of DEC's RPA Guide. In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving water body 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 at the Lowell Point Wastewater Treatment Facility (Lowell Point WWTF, or the facility), the Department used ProUCL, a statistical software program, to determine a CV of 0.8414 for ammonia. ProUCL indicated that the data set follows a normal statistical distribution. Therefore, the RPM equation in section 2.4.2.1 of the RPA Guide is used to determine the RPM for ammonia:

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

Where,

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

μ_n = mean calculated by ProUCL = 12.16
σ = the standard deviation calculated by ProUCL = 8.06
p_n = the z − statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.905$
n = number of valid data samples = 26
RPM = 1.4

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

(Equation B-8)

$$MEC = (RPM)(MOC)$$

MOC = 34.00 milligrams per liter (mg/L)

In the case of ammonia,

MEC = (1.4)(34.00) = 47.29 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 = 47.29 mg/L > 0.93 mg/L (most stringent ammonia criterion)

YES, there is RP for ammonia to violate water quality criteria

Table B- 1: Reasonable Potential Analysis Results and Determination for the Lowell Point WWTF

Parameter	Maximum Observed Effluent Concentration (MOC)	Number of Samples	CV	RPM	Maximum Expected Concentration (MEC)	Most Stringent Water Quality Criterion	Reasonable Potential? (Yes/No)
Ammonia (mg/L)	34.00	26	0.6393	1.4	47.29	0.93 (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), total suspended solids (TSS), and 5-day carbonaceous biochemical oxygen demand ($CBOD_5$); TBELs are applied as end-of pipe effluent limits.

In the case of the Lowell Point Wastewater Treatment Facility, ammonia demonstrated reasonable potential to exceed at the end of pipe and requires nearly the same amount of dilution to meet water quality criteria as FC bacteria, the driving parameter of the 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 the aquatic life chronic monthly limit, the WLA is applied directly as an average monthly limit (AML). The daily maximum limit (DML) 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 water body 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 chronic aquatic life 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 daily maximum limit (DML) and average monthly limit (AML). This approach takes into account effluent variability (using the coefficient of variation (CV)) and sampling frequency.

The DML 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 DML 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 DMLs and AMLs for ammonia in the Lowell Point 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 water body.

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

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

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

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

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

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

$\mathrm{Q_d} = \text{Critical Discharge Flow}$

$\mathrm{C_s} = \text{Critical Upstream Concentration}$

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

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

For ammonia,

$\mathrm{D_a} = 7.6$

$\mathrm{D_c} = 50.2$

$\mathrm{C_s} = 0$ milligrams per liter (mg/L)

$\mathrm{WLA_a} = 47.2$ mg/L

$\mathrm{WQA_a} = 5.7$ mg/L

$\mathrm{WLA_c} = 46.5$ mg/L

$\mathrm{WQC_c} = 0.93$ 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:

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

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

Where:

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

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

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

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

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

$\mathrm{CV} = \text{coefficient of variation}$

For ammonia:

$\mathrm{LTA_a} = 14.4\ \mathrm{mg/L}$

$\mathrm{LTA_c} = 23.6\ \mathrm{mg/L}$

Step 3 – Choosing the More Limiting LTA

To protect a water body 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 $\mathrm{LTA_a}$ is more limiting.

Step 4 - Calculate the Permit Limits

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

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

Where:

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

$\sigma_\mathrm{n} = \ln[\mathrm{CV}^2 + 1]^{1/2}$

$\sigma_\mathrm{n}^2 = \ln[\mathrm{CV}^2 + 1]$

$\mathrm{CV} = \text{coefficient of variation}$

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

Where:

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

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

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

$\mathrm{CV} = \text{coefficient of variation}$

$\mathrm{n} = \text{number of samples per month}$

For ammonia:

$\mathrm{DML} = 47\ \mathrm{mg/L}$

$\mathrm{AML} = 23\ \mathrm{mg/L}$

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 Lowell Point Wastewater Treatment Facility mixing zone analysis.

	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable? **Yes** **If yes, mixing zone may be approved as proposed or authorized with conditions.**	Technical Support Document for Water Quality-Based Toxics Control DEC's Reasonable Potential Analysis Guidance Environmental Protection Agency's Permit Writers' Manual CORMIX 12.0	**18 AAC 70.240(k)**
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **Yes** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**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.	N/A	**18 AAC 70.240(l))**
Existing Uses	Does the mixing zone… (1) maintain and protect designated and existing uses of the waterbody as a whole? **Yes** **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?		**18 AAC 70.240(c)(3)**

	Description	Resources	Regulation
	No **If yes, mixing zone may be approved as proposed or authorized with conditions.**		
	(3) create a public health hazard that would preclude or limit existing uses of the waterbody for water supply or contact recreation? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(B)**
	(4) preclude or limit established processing activities or established commercial, sport, personal use, or subsistence fish and shellfish harvesting? **No** **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? **No** **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(6)**
Spawning Areas	Does the mixing zone… (1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, chinook, and sockeye salmon? **No** **If yes, mixing zone may not be approved.**		**18 AAC 70.240(f)**
Human Health	Does the mixing zone… (1) contain bioaccumulating, bioconcentrating, or persistent chemicals above natural levels to significantly adverse levels? **No** **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(1)**

	Description	Resources	Regulation
	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? **No** **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(2)**
	(3) occur in a location where the department determines that a public health hazard reasonably could be expected? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(k)(4)**
Aquatic Life	Does the mixing zone… (1) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(A)**
	(2) result in a reduction in fish or shellfish population levels? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(D)**
	(3) result in permanent or irreparable displacement of indigenous organisms? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions**		**18 AC 70.240(c)(4)(E)**
	(4) form a barrier to migratory species or fish passage? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(G)**
	(5) result in undesirable or nuisance aquatic life? **No** **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(5)**

	Description	Resources	Regulation
	(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? **Yes** **If no, mixing zone may not be approved.**		**18 AAC 70.240(d)(7)** **18 AAC 70.240(d)(8)**
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone? If yes, are there likely to be adverse effects to T/E spp based on comments received from the United States Fish and Wildlife Service or National Oceanic and Atmospheric Association? If yes, will conservation measures be included in the permit to avoid adverse effects? **No** **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(F)**