ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – PROPOSED FINAL

Permit Number: AK0021245

Homer Wastewater Treatment Facility

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: May 31, 2016
Public Comment Period Expiration Date: June 30, 2016
Alaska Online Public Notice System

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

CITY OF HOMER

For wastewater discharges from the

Homer Wastewater Treatment Facility
3575 Heath Street
Homer, AK, 99603

The Alaska Department of Environmental Conservation (the Department or DEC) has reissued an APDES individual permit to the City of Homer 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 Homer Wastewater Treatment Facility and the development of the permit including:

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

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director of Water
Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

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

See http://www.dec.state.ak.us/commish/InformalReviews.htm 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
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800.

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm 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://www.dec.state.ak.us/water/wwdp/index.htm.

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-2685	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99709 (907) 451-2100

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1.0 APPLICANT

This fact sheet provides information on the Alaska Pollutant Discharge Elimination System (APDES) permit for the following entity:

Name of Facility:	Homer Wastewater Treatment Facility
APDES Permit Number:	AK0021245
Facility Location:	3575 Heath Street, Homer, AK 99603
Mailing Address:	same as facility location address
Facility Contact:	Mr. Todd Cook, Treatment Plant Superintendent (907) 235-3174

The map in Appendix A to the Fact Sheet shows the location of the treatment plant and the discharge location.

2.0 FACILITY INFORMATION

The Homer Wastewater Treatment Facility (WWTF), a Publicly Owned Treatment Works (POTW), is owned and operated by the City of Homer. The WWTF treats domestic wastewater from both the City of Homer and the nearby smaller community of Kachemak City. The facility also periodically accepts domestic wastewater at its recreational vehicle dumping station. The facility does not receive contributions from industrial users nor is the collection system combined with a storm sewer system. The facility has not undergone major modifications since the last permit issuance nor are there anticipated modifications planned for the upcoming permit cycle.

Wastewater is treated to secondary standards at the facility. The monthly design flow rate of the plant is 0.880 million gallons per day (mgd). Treatment at the facility consists of primary treatment, deep-shaft activated sludge, flotation clarifiers, an ultraviolet (UV) radiation disinfection chamber and a supplemental/back-up chlorination and dechlorination unit. The treated wastewater is then discharged to Kachemak Bay from Outfall 001 at approximately 2,178 feet (664 meters) offshore.

Primary treatment at the plant consists of a mechanical bar screen and a grit chamber. The raw wastewater is then treated in two 30-inch diameter steel-cased shafts completed to depths of approximately 500 feet below surface. The deep-shaft activated sludge process uses the pressures associated with depth to create elevated levels of dissolved oxygen that are used by the biological population to provide treatment of the wastewater. After the wastewater passes through the shafts, it is separated from the remaining solids at the surface and transported to the disinfection area. The effluent is then passed through a UV radiation disinfection chamber. In the event that the UV system is not operating optimally, or the facility is receiving heavy flow volumes, chlorination and dechlorination is occasionally utilized to supplement the UV treatment prior to discharging the effluent to Kachemak Bay. The terminus of the 20-inch outfall pipe has been fitted with a diffuser containing four ports to facilitate mixing of the effluent at the point of discharge. Sludge from the treatment process is treated by aerobic digestion, stabilized in an aerated lagoon, and then freeze dried in beds in the winter. Final disposal of sludge is by land application.

The facility serves a year-round population of approximately 5,415 Homer residents (United States (U.S.) Census Bureau 2015 estimate) and approximately 486 Kachemak City residents (U.S. Census Bureau 2014 estimate). However, visitors to the area during the fishing and tourism season can cause the population to increase significantly.

Table 1 summarizes monthly average plant performance from January 2011 through December 2015.

Table 1. Average Plant Performance

Parameter	Monthly Average 2011-2015
Flow	420,000 gallons per day (gpd)
5-day Biochemical Oxygen Demand (BOD_5)	16 milligrams per liter (mg/L)
BOD_5 percent removal	93 percent (%)
Total suspended solids (TSS)	17 mg/L
TSS percent removal	92 %
Fecal coliform (FC) bacteria	70 FC per 100 milliliters (mL)
Total Ammonia, as Nitrogen	30 mg/L
pH	7.0 - 7.6 standard units (s.u.)

3.0 BACKGROUND

The deep-shaft activated sludge WWTF in Homer was built in the late 1980s. The United States Environmental Protection Agency (EPA) issued the first National Pollutant Discharge Elimination System (NPDES) permit for the discharge in 1992. The NPDES permit was reissued by EPA on August 1, 2000 and subsequently expired on August 1, 2005. Authority for the permit transferred to the Alaska Department of Environmental Conservation (the Department or DEC) upon delegation to the State to administer the NPDES program on October 31, 2008. The DEC-reissued Homer WWTF APDES permit became effective November 9, 2010 and later expired on November 8, 2015.

Under the Administrative Procedures Act and state regulations 18 Alaska Administrative Code (AAC) 83.155(c), an APDES permit may be administratively extended (i.e., continues in force and effect) provided that the permittee submits a timely and complete application for a new permit prior to the expiration of the current permit. A timely application for a new permit was submitted by the City of Homer on May 8, 2015; therefore, the 2010 permit is administratively extended until such time a new permit is reissued.

4.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMRs) from November 2010 to December 2015 were reviewed to determine the facility's compliance with effluent limits.

No effluent violations were reported in 2010, 2014, and 2015. One total residual chlorine (TRC) exceedance was reported in April of 2011 and one FC Bacteria exceedance was reported in October 2012. In January 2013, the City of Homer reported that a mid-January rain event had damaged a manhole which allowed an excessive amount of storm water into the collection system, which in turn caused flooding and damage at the WWTF. In order to protect the remaining equipment, the operators bypassed a portion of the influent to a facultative pond for approximately 22 hours until the flows returned to normal. As a result, FC bacteria, BOD_5, and TSS concentrations exceeded permit effluent limits in January 2013. The high flows also flushed out much of the biomass from the shafts; however manual introduction of digester sludge into the shafts reestablished the biological component of the plant, and no effluent violations were reported on the February 2013 DMR.

In October 2014, DEC conducted an inspection of the Homer WWTF. DEC inspectors noted several effluent violations that the City of Homer reported in 2013 for which DEC did not have on file either an oral or written notification. As a result of this observation, DEC sent a Compliance Letter to the City of Homer on November 4, 2014. The Compliance Letter advised the City of Homer of the failure to report the noncompliance events noted during the October 2014 inspection. Additionally, DEC directed the City of Homer to the permit requirement that requires the permittee to verbally report effluent violations or other non-compliance events to DEC within 24 hours of becoming aware of the violation, as well as to provide written notification within five days of becoming aware of the violation. No other violations were noted during the October 2014 inspection.

DEC inspectors recommended that the facility consolidate their Operation and Maintenance Plan into a more comprehensive one as specified in the permit, and suggested a method for handling pH buffer bottles that may lessen the chances of using an expired buffer.

Appendix F of this fact sheet provides details on the nature of reported permit effluent limit exceedances from November 2010 through December 2015.

5.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

5.1 Basis for Permit Limits

The Clean Water Act requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the Water Quality Standards (WQS) of a waterbody are met and may be more stringent than TBELs. Both TBELs (Code of Federal Regulations (CFR) 40 CFR 133 adopted by reference in 18 AAC 83.010) and WQBELs are included in the permit. A detailed discussion of the basis for the effluent limits contained in AK0021245 is provided in Appendix B.

5.2 Basis for Influent, Effluent, and Receiving Water Monitoring

In accordance with Alaska Statutes (AS) 46.03.101(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in permits is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limits are required and/or to monitor effluent impact on receiving waterbody quality. The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for reissuance, as appropriate, to the Department. Sections 5.3 through 5.8 summarize monitoring requirements DEC has determined necessary to implement in the permit.

5.3 Monitoring Requirements

The permit requires monitoring of the effluent for flow, BOD_5, TSS, FC bacteria, enterococci bacteria, ammonia, pH, and TRC to determine compliance with the effluent limitations and/or for use in future reasonable potential analyses (RPA). The permit also requires monitoring of the influent for BOD_5 and TSS to calculate monthly removal rates for these parameters.

Monitoring frequencies are based on the nature and effect of a pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance.

The Permittee is responsible for electronically submitting DMRs and other reports in accordance with 40 CFR §127. The start dates for e-reporting are provided in 40 CFR §127.16. DEC has established a website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm that contains general information. As DEC implements the E-Reporting Rule, more information will be posted on this webpage. The permittee will be further notified by DEC in the future about how to implement the conditions in 40 CFR §127.

Table 2 contains influent and effluent monitoring requirements. Table 3 contains parameters for which effluent limits or monitoring requirements have changed since the previous permit.

5.4 Enterococci Bacteria

Enterococci bacteria are indicator organisms of harmful pathogens in marine water and are a better indicator of acute gastrointestinal illness than FC bacteria. In 1986, EPA published Ambient Water Quality Criteria for Bacteria that contained their recommended bacteria water quality (WQ) criteria for

primary contact recreational users from gastrointestinal illness. The Beaches Environmental Assessment and Coastal Health Act of 2000 requires states and territories with coastal recreation waters to adopt bacteria criteria into their WQS that are as protective as EPA's 1986 published bacteria criteria by April 10, 2004. Alaska did not adopt the enterococci bacteria into the WQS by the April 10, 2004 deadline; therefore, EPA promulgated the 1986 bacteria criteria for Alaskan coastal recreational waters in 2004. Accordingly, monitoring for enterococci bacteria is required in the permit at the point of discharge.

The previous permit contained enterococci bacteria monitoring requirements. Samples were collected monthly May through September for the duration of the permit. The Homer WWTF's effluent did not exceed the single sample maximum light use coastal recreation waters criterion of 276 counts/100 mL.

Light use coastal recreation waters as defined in 40 CFR 131.41 are those waters that are not designated bathing waters but are typically used by less than half of the number of people at a typical designated bathing beach waters within the State, but are more than infrequently used. Alaska does not have any marine designated bathing beaches for comparison. Therefore, DEC reviewed the uses of the receiving water as reported by the City of Homer on their mixing zone application, Form 2M to assess the type and level of use in the vicinity of the outfall.

The outfall is located approximately 2,178 feet from the shoreline. The nearest identified location where activities occur that may result in full body immersion or ingestion is approximately three quarters of a mile from the outfall. The nearest identified location in which incidental water use may occur such as wading and boating, is approximately one half mile from the outfall.

Based on the information above, DEC conducted a RPA for enterococci bacteria for light use coastal recreation, the results of which indicated that there is not reasonable potential (RP) for enterococci bacteria to exceed WQ criteria. See Appendix D for a summary of the RPA.

However, enterococci bacteria effluent monitoring will continue to be required so that DEC can re-evaluate the monitoring data at the end of the five-year permit cycle and assess the need for applying enterococci effluent limits in the next reissuance of the permit.

Table 2. Outfall 001: Effluent Limits and Monitoring Requirements

Effluent Limits						Monitoring Requirements		
Parameter	**Units**	**Average Monthly Limit**	**Average Weekly Limit**	**Maximum Daily Limit**	**Minimum Daily Limit**	**Sample Location**	**Sample Frequency**	**Sample Type**
Flow	mgd	0.880	not applicable (N/A)	report	N/A	effluent	continuous	recording
BOD_5	mg/L	30	45	60	N/A	influent and effluent [b]	2/month	24-hour composite [c]
	lbs/day [a]	220	330	440				
TSS	mg/L	30	45	60	N/A	influent and effluent [b]	2/month	24-hour composite [c]
	lbs/day [a]	220	330	440				
BOD_5 minimum percent removal: 85%			TSS minimum percent removal: 85%			influent and effluent	1/month	calculated [d]
FC Bacteria [e]	FC/100 mL	200	400	800	N/A	effluent	1/week	grab
Enterococci Bacteria	count/100 mL	N/A	N/A	report	N/A	effluent	1/month [f]	grab
Total Ammonia, as Nitrogen	mg/L	49	N/A	79	N/A	effluent	1/month	24-hour composite [c]
pH	s.u.	N/A	N/A	8.5	6.5	effluent	5/week	grab
TRC	mg/L	0.0075 [g,h]	N/A	0.013 [g,h]	N/A	effluent	daily	grab

Footnotes:

a. lbs/day = concentration (mg/L) x flow (mgd) x 8.34 (conversion factor). Influent and effluent samples must be taken over approximately the same time period.
b. Limits apply to effluent. Report average monthly influent concentration.
c. See Appendix C of the permit for a definition.
d. 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.
e. Average FC and enterococci bacteria average results must be reported as the geometric mean. When calculating the geometric mean, replace all results of zero, 0, with a one, 1. The geometric mean of "n" quantities is the "nth" root of the quantities. For example the geometric mean of 100, 200, and 300 is (100 x 200 x 300)1/3= 181.7.
f. Sampling required once per month only during the time period May-Sept. Sampling should be conducted at same time as FC bacteria sampling.
g. Compliance with the effluent limits for TRC cannot be determined using EPA-approved analytical methods. DEC will use the minimum detection limit of 0.1 mg/L as the compliance limit for this parameter.
h. No test shall be required if chlorine is not used for disinfection.

Table 3. Effluent and Monitoring Requirement Changes from Prior Permit

Parameter	Units	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit		Sample Frequency	
		2010 Permit	2016 Permit	2010 Permit	2016 Permit	2010 Permit	2016 Permit	2010 Permit	2016 Permit
Total Ammonia, as Nitrogen	mg/L	report	49 mg/L	N/A	N/A	report	79 mg/L	1/month	no change
Temperature	degrees Celsius (°C)	report	N/A	N/A	no change	N/A	no change	1/week	N/A

5.5 Receiving Waterbody Monitoring Requirements

The permit establishes an ambient monitoring station (Station AMB) in Kachemak Bay. Station AMB, representing ambient conditions in Kachemak Bay, must be established in a location outside the influence of the facility's discharge, greater than 140 meters from the end of the outfall. DEC must provide written approval for the location of Station AMB.

Ambient monitoring for ammonia is required for use in the next RPA. Because criteria for ammonia in marine water are dependent on the pH, temperature, and salinity of the receiving water, pH, temperature, and salinity receiving water measurements shall also be required whenever ammonia is sampled. The previous permit also required ambient monitoring for ammonia, pH, temperature, and salinity for data gathering purposes.

Ammonia, pH, temperature, and temperature monitoring were only required for the first two years of the permit. The permit stated that pH, temperature, and salinity should be collected twice per year. One sample in the summer months, defined as June 1 through September 30, and one sample in the winter, defined as October 1 through May 31. Ammonia was required to be collected monthly May through September and twice during the remainder of the year. A review of the facility's DMRs indicate that the monitoring frequency was not fully adhered to during the previous permit cycle. For instance, while the facility monitored for pH and temperature, for the time period of April 2011, the first month that the facility reported ambient monitoring, through April 2013, temperature and pH were monitored seven times; five of the samples were from the winter, two of the samples were from the summer. In addition, the facility only reported three salinity monitoring results between April 2011 and September 2012. Because this data is essential for determining the appropriate ammonia WQ criteria, and because this data also provides information that is useful for mixing zone modeling, ambient monitoring for ammonia, pH, temperature, and salinity will again be required for the first two years of the reissued permit. The monitoring frequency has been increased so that an adequate data set can be collected for statistical purposes as well as to better assess ambient conditions and their effect on the toxicity of ammonia. If sufficient ambient data is not collected in the first two years of the permit, ambient monitoring for ammonia, pH, temperature, and salinity shall be required for the duration of the permit.

Table 4 contains ambient receiving waterbody monitoring requirements.

Table 4. Station AMB: Ambient Monitoring Requirements

Parameter	Units	Sampling Frequency	Sample Type
Total Ammonia as Nitrogen [a]	mg/L	monthly May 1- Oct 31 twice Nov 1 - April 30	grab
pH [a]	s.u.	monthly May 1- Oct 31 twice Nov 1 - April 30	grab
Temperature [a]	°C	monthly May 1- Oct 31 twice Nov 1 - April 30	grab
Salinity [a]	grams/kilogram	monthly May 1- Oct 31 twice Nov 1 - April 30	grab

Footnote:

a. Ammonia, pH, temperature, and salinity samples should occur at approximately the same time.

6.0 RECEIVING WATERBODY

6.1 Description of Receiving Waterbody

Kachemak Bay is a 39 mile (63 kilometer) long arm of the southern portion of Cook Inlet, with an average depth of 25 fathoms (150 feet). Circulation in Kachemak Bay is influenced by the east to west flow of the Alaska Coastal Current in the Gulf of Alaska; water general flows into Kachemak Bay on the southern shore, and out on the northern shore. Tidal flows in Kachemak Bay are extreme, with average vertical differences of 15 feet (4.6 meters). Tidal currents in the area of the discharge are estimated to be around two knots.

6.2 Outfall Location

The treated effluent from the Homer WWTF is discharged at 59° 37’ 58” North latitude and 151° 32’ 52” West longitude, to Kachemak Bay. The City of Homer discharges effluent into Kachemak Bay at a depth of -10.18 feet mean lower low water (MLLW) at latitude 59° 37' 58" and longitude 151° 32' 52".

6.3 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the Alaska WQS. The State’s WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The antidegradation policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Kachemak Bay has not been reclassified pursuant to 18 AAC 70.230, nor does it have site-specific water quality criteria pursuant to 18 AAC 70.235. Therefore, existing uses and designated uses are the same and Kachemak Bay must be protected for all marine designated use classes listed in 18 AAC 70.020(a)(2). These marine designated uses consist of the following: 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.

6.4 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. Kachemak Bay is not included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.

6.5 Mixing Zone Analysis

Under 18 AAC 70.240, as amended through June 26, 2003, the Department may authorize a mixing zone in a permit. A chronic mixing zone is sized to protect the ecology of the waterbody as a whole, while an acute mixing zone is sized to prevent lethality to passing organisms. DEC modeled the acute and chronic mixing zones and calculated dilution factors using CORMIX 9.0 modeling program. CORMIX 9.0 is the latest version of the widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. Inputs to CORMIX included the maximum expected effluent concentrations and the acute and chronic WQ criteria of parameters that demonstrated RP (see Appendix B for details on the RPA), as well as any site-specific discharge and ambient data such as varying tidal velocities that simulate the alternating currents associated with the flow and ebb of tides in Kachemak Bay.

Based on the maximum expected effluent concentrations and chronic WQ criteria, ammonia required more dilution than FC bacteria to meet WQ criteria; therefore, ammonia determined the chronic mixing zone size. FC bacteria fits within the chronic mixing zone sized for ammonia. The WQ criteria for ammonia and FC bacteria may be exceeded within the authorized chronic mixing zone. The chronic mixing zone for this discharge has a dilution of 69:1 and is defined as a rectangle, with a length, perpendicular to the shore, of 97 meters and a width of 136 meters. The mixing zone extends from the seafloor to the surface. All chronic aquatic life criteria will be met and apply at and beyond the boundary of the chronic mixing zone.

There is a smaller, initial, acute mixing zone for ammonia surrounding the outfall and contained within the larger chronic mixing zone. The acute mixing zone for this discharge has a dilution of 10:1 and is defined as a rectangle, with a length of 1.2 meters and a width of 9.3 meters. Acute aquatic life criteria will be met and apply at and beyond the boundary of this smaller initial mixing zone surrounding the outfall.

According to EPA (1991) and 18 AAC 70.255, 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. The Department determined that the travel time of an organism drifting through the acute mixing zone to be approximately one and a half minutes; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Appendix E 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 waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species.

The following summarizes the Department's mixing zone analysis:

<u>Size</u>

In accordance with 18 AAC 70.255, the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, DEC used CORMIX to model the chronic and acute mixing zones for low and high tidal conditions.

Because 18 AAC 70.245(b)(5) requires the Department to consider the characteristics of the effluent after treatment of the wastewater, DEC reviewed five years of DMRs from January 2011 through December 2015 and Homer's wastewater discharge application, Form 2A, to determine which parameters had RP to exceed WQ criteria, and then which of the parameters required the most dilution to meet WQ criteria for the chronic and acute mixing zones. Ammonia required more dilution than FC bacteria for both the chronic and acute mixing zones (see above discussion). Therefore, ammonia was modeled in CORMIX to determine the smallest practicable mixing zone sizes.

The maximum expected concentration for ammonia, corresponding acute and chronic WQ criterion, and ambient concentrations were entered into CORMIX. Other data required for the mixing zone modeling included: the input of receiving water characteristics at the outfall such as the depth the receiving water at the outfall, the ambient velocity, wind velocity, and outfall and diffuser specifications, such as the size, direction, and number of ports. Based on the inputs, CORMIX predicted the distance at which ammonia would meet WQ criteria as well as the corresponding dilution at that point.

Updated and more accurate information (as compared to the previous basic CORMIX inputs), such as the height of the port above the seabed, were applied for the current mixing zone modeling. The more accurate modeling results showed an increase in the available dilution and reduced the overall mixing zone sizes (i.e., surface area) from those authorized by the previous permit. The previous chronic mixing zone was 235 meters by 122 meters (dilution 48:1) and the acute mixing zone was 8 meters by 3 meters (dilution 7:1). The 2016 permit authorizes a chronic mixing zone of 97 meters by 136 meters (dilution 69:1) and an acute mixing zone of 1.2 meters by 9.3 meters (dilution 10:1). The prior CORMIX model for the previously permit reissuance was run with a port height above the seabed of 2.04 meters, however, the as-builts of the Homer outfall places the port height above the seabed at 0.38 meters (1.25 feet). The as-builts also show that the outfall line is buried approximately seven feet below the seabed. It is apparent that this measurement, rather than the port height above the seabed was used in the prior model. Therefore, DEC used the more accurate port height for this permit's CORMIX model. The height of the port above the seabed at 0.38 meters as opposed to 2.04 meters allows for more mixing, greater dilution, and results in smaller surface area mixing zones.

Table 5 summarizes basic CORMIX inputs that were used to model the chronic and acute mixing zones for ammonia. Figure 1 illustrates the approximate location of the mixing zone.

Table 5. Summary of CORMIX Inputs

Parameter Modeled	Maximum Expected Concentration	Ambient Concentration	Chronic Water Quality Criterion	Acute Water Quality Criterion
Ammonia	79.5 mg/L	0.049 mg/L	1.2 mg/L	7.9 mg/L
Outfall and Receiving Waterbody Characteristics				
Outfall Type and Length	2,178 feet (664 meters) submerged multiport diffuser modeled as single port as the diffuser configuration creates a discharge that more closely resembles that of a single port discharge			
Riser Length	3.05 meters			
Depth at Discharge	3.1 meters			
Number and Size of Ports	four 4-inch ports, pointing in opposite directions, opposite ports are 3 feet apart			
Port Height above Seabed	0.38 meters (1.25 feet)			
Density	surface density 1025 kilograms per cubic meter (kg/m^3) bottom density 1030 kg/m^3 pycnocline height: 5 feet			
Ambient Velocity	0.1 knots low tidal current 0.9 knots high tidal current			
Wind Velocity	2 knots			
Effluent Characteristics				
Flow Rate	0.88 mgd average monthly			
Temperature	13.5 º C			

Technology

In accordance with 18 AAC 70.240(a)(3), the most effective technological and economical methods should be used to disperse, treat, remove, and reduce pollutants. Secondary treatment is provided by a deep-shaft activated sludge biological process. The treatment process includes primary treatment with mechanical bar screens and a grit chamber, two 30-inch diameter steel-cased shafts 500 feet below the surface, flotation clarifiers, and a UV radiation disinfection chamber. A backup/supplementary chlorination and dechlorination system is also occasionally used when the UV system may not be operating optimally or when the facility receives heavy flow volumes.

Existing Use

In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of Kachemak Bay. See Section 6.3 for Kachemak Bay's existing uses. The waterbody's existing uses have been maintained and protected under the terms of the previous permit. The mixing zone authorization, which is smaller than the mixing zone authorized in the previous permit, does not propose any modifications that would result in changes to existing uses.

Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.250(b)(2) and (b)(3), 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.

Spawning Areas

In accordance with 18 AAC 70.255(h), the mixing zone may not be authorized in a known spawning area for anadromous fish or resident fish spawning redds for Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon. The Alaska Department of Fish and Game (ADF&G) interactive regulatory and interactive essential fish habitat (EFH) maps at http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=maps.maps indicates that coho salmon are reared in the general vicinity of the Homer WWTF, but that there are no known spawning areas for any of the species listed above. See Section 10.3 for more information on EFH.

Human Health

In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone must be protective of human health. An analysis of the effluent data that was included with the Homer WWTF discharge application and the results of the RPA conducted on pollutants of concern indicate that the level of treatment at the Homer WWTF is protective of human health. The effluent data was then used in conjunction with applicable WQ criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all WQ criteria are met in the waterbody at the boundary of the mixing zone.

Aquatic Life and Wildlife

In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife. CORMIX modeling conducted for this discharge to the Kachemak Bay incorporated the most stringent WQ criterion in the model for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife, and all WQ criteria will be met at the boundary of the authorized mixing zone.

Endangered Species

In accordance with 18 AAC 70.250(a)(2)(D), the authorized mixing zone will not cause an adverse effect on threatened or endangered species. On February 8, 2016, DEC contacted the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) and requested them to identify any threatened or endangered species under their jurisdiction in the vicinity of the Homer WWTF outfall. See Section 10.2 of the fact sheet for more information regarding endangered species.

A mixing zone has been authorized for the Homer WWTF since the facility's first NPDES-issued permit in 1992. Since then, no detrimental effects to fauna in the area have been documented, nor does it appear to pose an undesirable nuisance to aquatic life. The RPA and CORMIX modeling resulted in an overall decrease in the size of the mixing zone, further reducing the possibility for any threatened or endangered species potentially in the area to come into contact with the treated wastewater.

Figure 1. Homer WWTF Approximate Mixing Zone Location

7.0 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." 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." The effluent limitations in this permit reissuance are consistent with 18 AAC 83.480.

The prior permit required effluent temperature monitoring. APDES Application Form 2A also requires effluent monitoring for temperature. DEC has determined that the Form 2A temperature monitoring requirements are sufficient to identify whether temperature should be considered as a pollutant of concern. Therefore, DEC has

not included effluent temperature monitoring in the Homer WWTF permit. According to EPA's *Interim Guidance for Performance-Based Reduction of NPDES Monitoring Frequencies (EPA, 1996), monitoring requirements are not considered effluent limitations under the CWA and therefore Antibacksliding prohibitions would not be triggered by reductions in monitoring frequencies.*

Therefore, the permit effluent limitations, standards, and conditions in AK0021245 are as stringent as in the previously issued permit, are consistent with 18 AAC 83.480, and no backsliding analysis is required for this permit reissuance.

8.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy. The Antidegradation Policy of the WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation Policy.

The Department's approach to implementing the Antidegradation Policy, found in 18 AAC 70.015, is based on the requirements in 18 AAC 70 and the Department's *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*, dated July 14, 2010. Using these procedures and policy, the Department determines whether a waterbody, or portion of a waterbody, is classified as Tier 1, Tier 2, or Tier 3, where a higher numbered tier indicates a greater level of water quality protection. At this time, no Tier 3 waters have been designated in Alaska. Kachemak Bay is not listed as impaired on DEC's most recent *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report;* therefore, a Tier 1 designation is not warranted. In addition, little other baseline receiving water data exists. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 waterbody.

The State's Antidegradation Policy in 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 (i.e. Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-(E) are met. The Department's findings follow:

- ***18 AAC 70.015 (a)(2)(A). Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.***

Based on the evaluation required per 18 AAC 70.015(a)(2)(D) below, the Department has determined that the most reasonable and effective pollution prevention, control, and treatment methods are being used and that the localized lowering water of quality is necessary.

The Homer WWTF collects, treats, and disposes wastewater from the City of Homer and the nearby smaller community of Kachemak City. Year-round residents number approximately 5,901 In addition to seasonal industries such as commercial fishing, the City of Homer hosts a number of events that draws large numbers of both Alaskan and non-Alaskan residents to Homer via road, boat, and plane, resulting in an increase in demand for wastewater treatment services. These events include a winter king salmon derby in March, a summer-long halibut derby, the Kachemak Bay Shorebird Festival in May, and the Kachemak Bay Wooden Boat Festival in September. In addition, Homer is centrally located to a number of State and National Parks. These include Kachemak Bay State Park & Wilderness, Kenai Fjords National Park, Katmai National Park, and Lake Clark National Park and Preserve. Local Homer businesses provide vital support services to visitors of these parks. Homer is also home to the Alaska Maritime National Wildlife Refuge Islands & Oceans Visitor Center, which is open year round and offers services such as educational exhibits, interpretive programming, and meeting space for conservation-oriented organizations.

Ultimately, by providing wastewater treatment services, the Homer WWTF contributes not only to the local economic and social development of Homer, but to the overall economic and social development of the State of Alaska as well.

DEC determined that the permitted activities are necessary to accommodate important economic and social development and the anticipated minor lowering of water quality is necessary for these purposes and that the finding is met.

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

Section 1.2.1 of the permit requires that the discharge shall not cause a violation of the WQS at 18 AAC 70 except if excursions are authorized in accordance with provisions in 18 AAC 70.200 – 70.270 (e.g., variance, mixing zone, etc.). As a result of the facility's RP to exceed WQ criteria for ammonia and FC bacteria, a mixing zone is authorized in the Homer WWTF permit in accordance with 18 AAC 70.240. The resulting effluent end-of-pipe limitations and monitoring requirements in the permit (See Table 2) protect WQS, and therefore, will not violate the WQ criteria found at 18 AAC 70.020.

There are no site-specific criteria associated with 18 AAC 70.235.

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

Historical WET testing conducted in the mid-1990s demonstrated that no toxic effects result from the discharge of the treated wastewater from the Homer WWTF. DEC conducted an industrial user survey in 2015 to identify any industries that may discharge non-domestic wastewater into the Homer WWTF collection and treatment system and that would have the potential to adversely impact the treatment capabilities of the WWTF and the quality of the treated wastewater. DEC did not identify any significant industrial users through this survey, and there have been no significant changes to the treatment process. The nature of the discharge continues to be, as it was in the 1990s, solely domestic in nature. Therefore, no evidence indicates that the Homer WWTF will violate the WET limit in 18 AAC 70.030.

DEC determined that the reduction in water quality will not violate the criteria of 18 AAC 70.020. 18 AAC 70.235, or 18 AAC 70.030 and that the finding is met.

- ***18 AAC 70.015(a)(2)(C). The resulting water quality will be adequate to fully protect existing uses of the water.***

The WQS serve the specific purpose of protecting the existing uses of the receiving waterbody. Kachemak Bay is protected for all designated uses (See Section 6.3 of this fact sheet); therefore, the most stringent WQ criteria found in 18 AAC 70.020 and in the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (2008) were selected for use in the RPA for the Homer WWTF effluent. Use of these protective criteria will ensure that the resulting water quality at and beyond the boundary of the authorized mixing zone will fully protect all designated uses of the receiving waterbody.

DEC determined that the discharge from the Homer WWTF will be adequate to fully protect existing uses of the waterbody and that the finding is met.

- ***18 AAC 70.015(a)(2)(D). The methods of pollution prevention, control, and treatment found by the Department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.***

18 AAC 72.050 allows for the discharge of domestic wastewater from a community domestic wastewater treatment works only if the discharge has received a minimum of secondary treatment. The Homer WWTF

produces secondary treated domestic wastewater via a deep-shaft activated sludge process. Federal secondary treatment standards at 40 CFR 133.102, adopted by reference at 18 AAC 83.010(e), describe minimum levels of effluent quality in terms of BOD_5, TSS, and pH that are achievable by secondary treatment facilities. Accordingly, DEC has applied the BOD_5 and TSS minimum achievable effluent quality levels as TBELs in this permit. The previous permit contained WQ criteria for pH that are more stringent than the pH TBELs. The Homer WWTF has consistently demonstrated compliance with the more stringent WQ pH criteria; therefore, the previous permit limits are retained and the pH TBELs are not applied in this permit.

The Homer 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. The Homer WWTF Operation and Maintenance Plan (OMP) establishes standard operational procedures and regular maintenance schedules for the prevention, control, and treatment of all wastes and other substances discharged from the facility. Best management practices requirements in the OMP that prevent or minimize the release of pollutants into Kachemak Bay include minimum components such as preventative maintenance, spill prevention, water conservation, and public information and education. Section 3.0 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.

DEC determined that the methods of pollution prevention, control, and treatment to be most effective and reasonable for applying to all wastes and substances discharged from Homer WWTF, are the practices and requirements set out in the permit and that the finding is met.

- ***18 AAC 70.015(a)(2)(E). 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 applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.990(30) (as amended June 26, 2003) and in the Implementation Methods. Accordingly, there are three parts to the definition, which are:

- (A) any federal technology-based effluent limitation guidelines (ELG) identified in 40 CFR § 125.3 and 40 CFR § 122.29, as amended through August 15, 1997, adopted by reference at 18 AAC 83.010(c)(9);
- (B) minimum treatment standards in 18 AAC 72.040; and
- (C) any treatment requirement imposed under another state law that is more stringent than a requirement of this chapter.

The first part of the definition includes all federal technology-based 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), which are incorporated in this permit.

The second part of the definition 18 AAC 70.990(B) (2003) appears to be in error, as 18 AAC 72.040 describes discharges to sewers and not minimum treatment. The correct reference appears to be the minimum treatment standards found at 18 AAC 72.050, which refers to domestic wastewater discharges only. The permit includes stipulations that meet and exceed the intent of 18 AAC 70.990.

The third part includes any more stringent treatment required by state law, including 18 AAC 70 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.

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

9.0 OTHER PERMIT CONDITIONS

9.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the QAPP within 120 days of the effective date of the final permit. The permittee must also provide DEC written notice upon completion and implementation of the QAPP. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The plan shall be retained on site and made available to the Department upon request.

9.2 Industrial User Survey

The permittee is required to submit with their permit reissuance application, Form 2A, an Industrial User Survey report. The goal of the Industrial User Survey is to identify industries that discharge non-domestic wastewater into the Homer WWTF collection (and ultimately the treatment system) that have the potential to adversely impact the treatment capabilities of the Homer WWTF and the quality of the treated wastewater. The results will be used to determine if the Homer WWTF may need to develop a pretreatment program or include pretreatment requirements in their wastewater discharge permit. The pretreatment program is authorized under CFR 40 Part 403, adopted by reference in 18 AAC 83.010(g)(2).

9.3 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 the OMP that was required under the previous permit within 120 days of the effective date of the reissued permit. The permittee must also provide DEC written notice upon completion and implementation of the OMP. The plan shall be reviewed annually, be updated as necessary, be retained on site, and made available to the Department upon request.

9.4 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.

10.0 OTHER LEGAL REQUIREMENTS

10.1 Ocean Discharge Criteria

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

Interactive nautical charts depicting Alaska's baseline plus additional boundary lines are available at http://www.charts.noaa.gov/OnLineViewer/AlaskaViewerTable.shtml. The charts are provided for

informational purposes only. The U.S. Baseline committee makes the official determinations on baseline.

A review of National Oceanic and Atmospheric Administration (NOAA) Nautical Chart 16640 indicates that the Homer WWTF outfall terminus is positioned landward of the baseline of the territorial sea; therefore, ODCE regulations do not require further analysis herein.

10.2 Endangered Species Act

NMFS is responsible for administration of the Endangered Species Act (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.

Section 7 of the ESA requires a federal agency to consult with the USFWS and NMFS to determine whether their authorized actions may harm threatened and endangered species or their habitats. As a state agency, DEC is not required to consult with USFWS or NMFS regarding permitting actions; however, DEC interacts voluntarily with these federal agencies to obtain listings of threatened and endangered species and critical habitat. DEC contacted USFWS and NMFS on February 8, 2016 and requested them to identify any threatened or endangered species or critical habitat under their jurisdiction in the vicinity of the Homer WWTF outfall. Currently, USFWS has not responded.

NMFS directed DEC to an interactive endangered species map at http://alaskafisheries.noaa.gov/mapping/esa/. DEC's review of the map indicates that the humpback whale (*Megaptera novaengliae),* Cook Inlet beluga whale (*Delphinapterus leucas*), and the eastern and western Distinct Population Segment (EDPS and WDPS) Stellar Sea Lion (*Eumetopias jubatus)* occur in Kachemak Bay. The EDPS Stellar Sea Lion, according to the NMFS website, was previously listed as a threatened species, but has recovered to the point that it is no longer considered threatened; however, the WDPS Stellar Seal Lion, has been listed as endangered since 1997. The NMFS interactive map also identifies Kachemak Bay as critical habitat for the Cook Inlet beluga whale.

10.3 Essential Fish Habitat

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

As a state agency, DEC is not required to consult with NMFS regarding permitting actions; however, DEC interacts voluntarily with NMFS. On February 8, 2016, DEC contacted and requested NMFS to identify any EFH under their jurisdiction in the vicinity of the Homer WWTF.

NMFS directed DEC to the following website: http://alaskafisheries.noaa.gov/habitat/efh for information on EFH. The EFH interactive map on the website indicates that the approximate discharge area is designated EFH for flathead sole, sculpin, pacific cod, skate, and chum, pink, coho, sockeye, and Chinook salmon.

10.4 Kachemak Bay Critical Habitat Area

The Alaska Legislature classified the tide and submerged lands of Kachemak Bay as a critical habitat area in 1974 "to protect and preserve habitat areas especially crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose" (AS 16.20.500). The Alaska Department of Fish and Game (ADF&G) adopted The Kachemak Bay and Fox River Flats Critical Habitat Areas Management Plan in 1993. Any activities occurring in the Kachemak Bay Critical Habitat Area must meet the goals and policies of the management plan and requires that the City of Homer obtain a Special Areas Permit from ADF&G for the discharge. ADF&G reissued a Special Areas Permit to the City of Homer on May 28, 2015. The Special Areas Permit states that the proposed project

is not expected to adversely impact habitat values or fish and wildlife populations provided that the conditions of the APDES permit are adhered to and that outfall structures do not restrict public access to and use of fish and wildlife resources. The City of Homer Special Areas Permit expires on December 31, 2020.

10.5 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.

10.5.1 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.

10.5.2 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'.

10.6 Permit Expiration

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

11.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2014. Alaska Pollutant Discharge Elimination System permits reasonable potential analysis and effluent limits development guide.

ADEC. 2012. 18 AAC 70 Water quality standards, as amended through April 8, 2012.

ADEC. 2010. Alaska's final 2010 integrated water quality monitoring and assessment report, July 15, 2010.

ADEC. 2010. Interim antidegradation methods, Effective July 14, 2010.

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

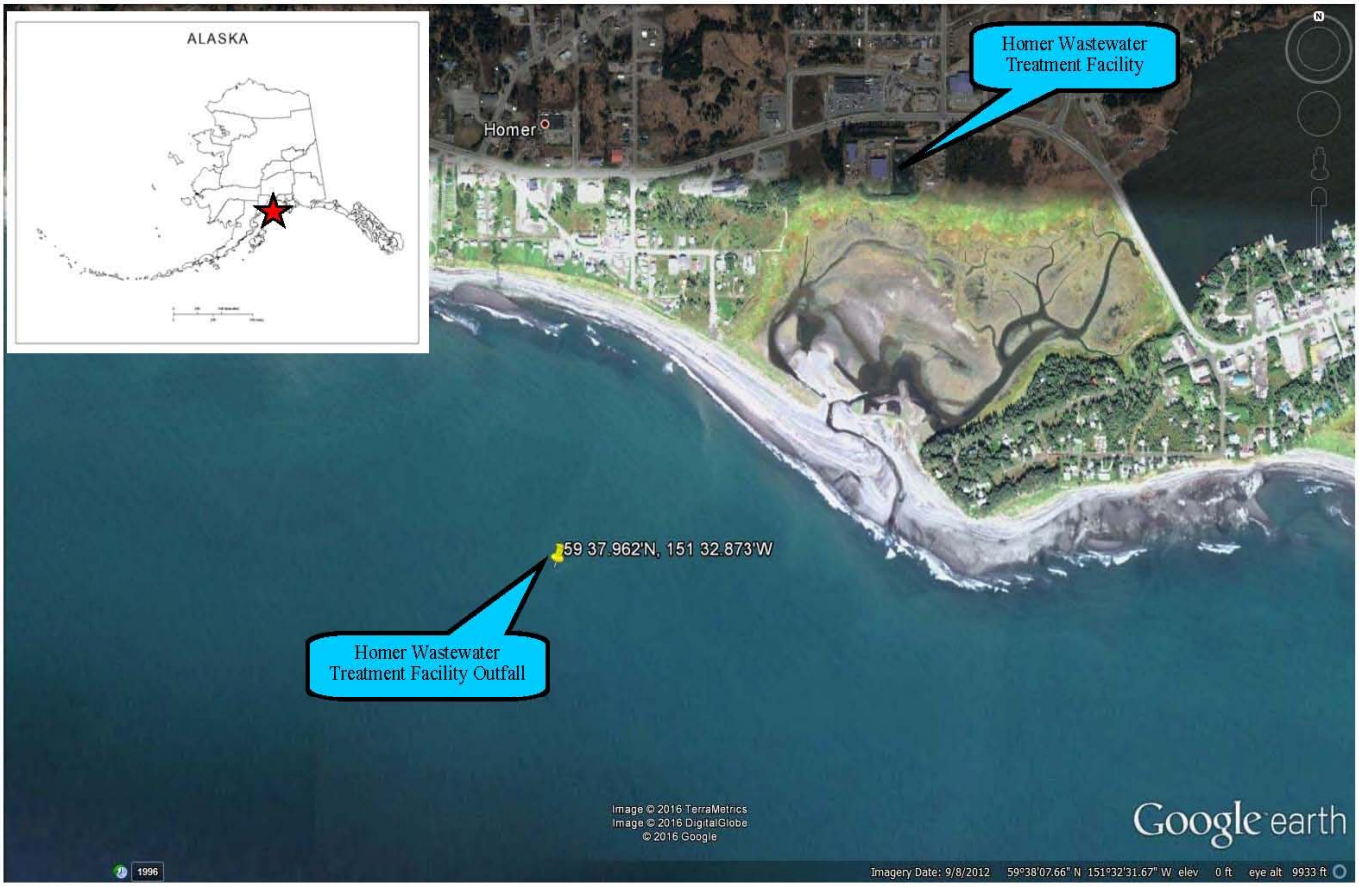
ADEC 2003. 18 AAC 70 Water quality standards, as amended through June 26, 2003.

EPA (Environmental Protection Agency).1996. Interim guidance for performance-based reduction of NPDES permit monitoring frequencies. EPA/833/B-96-001.

EPA.1991. Technical support document for water quality-based toxics control. EPA/505/2-90-001.

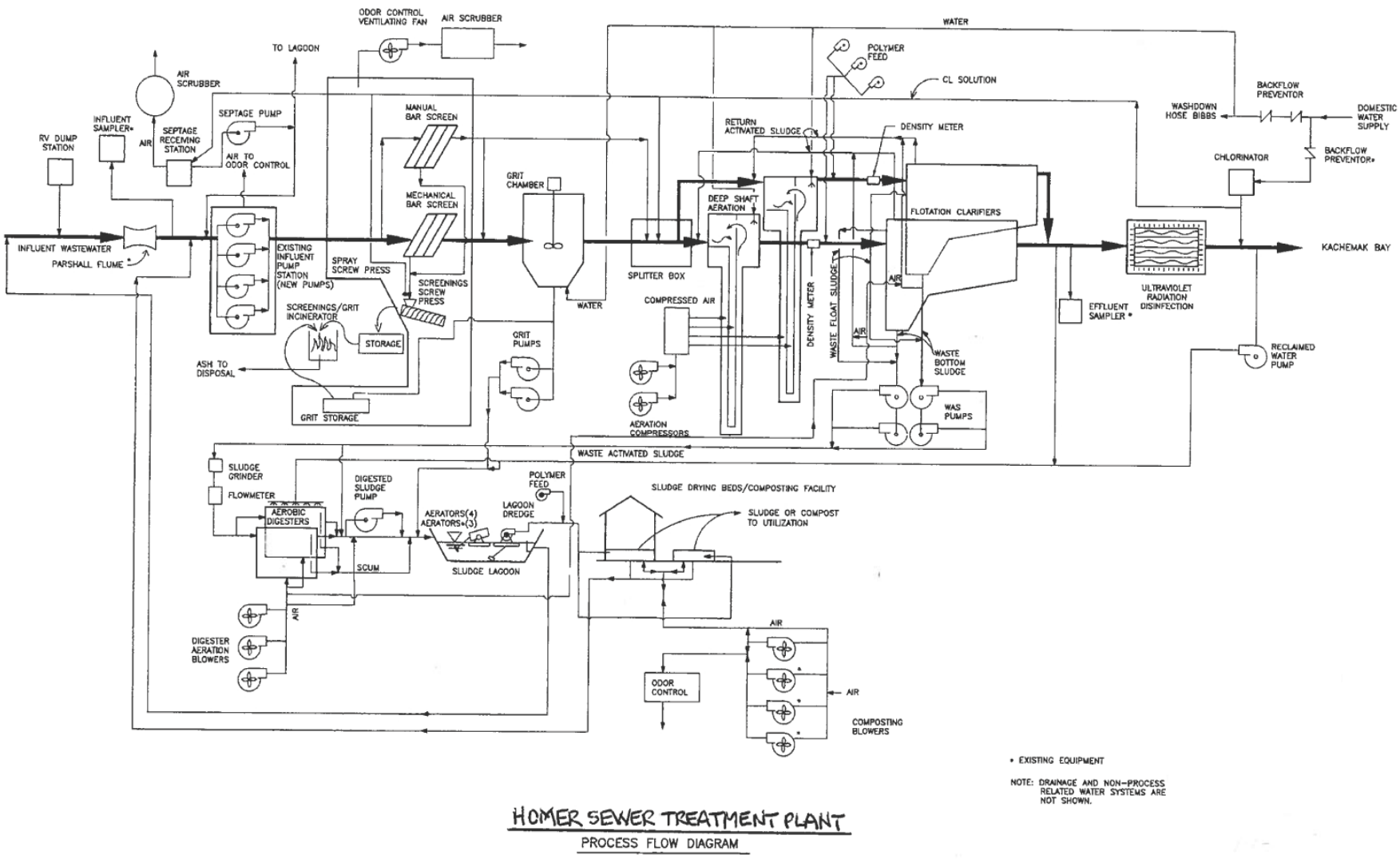
APPENDIX A. FACILITY INFORMATION

Figure 1. Homer Wastewater Treatment Facility Location



AREAS DEPICTED ARE REPRESENTATIVE, AND MAY NOT BE EXACT.	2/5/16 EDITED	DIVISION OF WATER 410 WILLOUGHBY AVE, SUITE 303 JUNEAU, AK 99803 PHONE (907) 465-5272 WWW.STATE.AK.US/DEC	G. SHIREY BY	ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM CITY OF HOMER WASTEWATER TREATMENT FACILITY HOMER, ALASKA	FIGURE NUMBER 1

Figure 2. Homer Wastewater Treatment Facility Process Flow Diagram



APPENDIX B. BASIS FOR EFFLUENT LIMITATIONS

B.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 water body. The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

The Clean Water Act (CWA) requires a Publicly Owned Treatment Works (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. Secondary requirements only limits 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 discharge 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 (WQ) criterion for the waterbody. If a pollutant causes or contributes to an exceedance of a WQ criterion, a WQBEL for the pollutant must be established in the permit. Table B-1 summarizes the basis for effluent limits contained in the permit. Further details for each effluent limit follows in this section.

Table B-1. Basis for Effluent Limits

EFFLUENT PARAMETER	UNITS	EFFLUENT LIMITS					
		Average Monthly Limit (AML)	Average Weekly Limit (AWL)	Maximum Daily Limit (MDL)	Average Monthly Percent Removal	Minimum Daily Limit	Basis for Limit
Flow	million gallons per day (mgd)	0.880	N/A	N/A	N/A	N/A	18 AAC 72.255
BOD_5	mg/L	30	45	60	85 % [b] (minimum)	N/A	18 AAC 83.010(e)
	pounds per day (lbs/day) [a]	220	330	440			
TSS	mg/L	30	45	60	85% [b] (minimum)	N/A	18 AAC 83.010(e)
	lbs/day [a]	220	330	440			
Fecal Coliform (FC) Bacteria	FC/100 mL	200 [c]	400 [c]	800	N/A	N/A	18 AAC 83.480
Total Ammonia, as Nitrogen	mg/L	49	N/A	79	N/A	N/A	18 AAC 83.435(6)(d) 18 AAC 83.530(2)
pH	standard units (s.u.)	N/A	N/A	8.5	N/A	6.5	18 AAC 70.020(b)(18)(A)(i) 18 AAC 70.020(b)(18)(C)
Total Residual Chlorine (TRC) [d]	mg/L	0.0075 [e]	N/A	0.013 [e]	N/A	N/A	18 AAC 70(b)(23)

Footnotes:

a. lbs/day = concentration (mg/L) x average monthly flow (mgd) x 8.34 (conversion factor). Influent and effluent samples must be taken over approximately the same time period.

b. 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.

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

d. No test shall be required if chlorine is not used for disinfection.

e. Compliance with the effluent limits for TRC cannot be determined using Environmental Protection Agency (EPA)-approved analytical methods. DEC will use the minimum detection limit of 0.1 mg/L as the compliance limit for this parameter.

B.2 Secondary Treatment Effluent Limitations

The CWA requires a POTW to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," that all POTWs were required to meet by July 1, 1977. The Department has adopted the "secondary treatment" effluent limits, 18 AAC 83.010(e), which are found in 40 Code of Federal Regulations (CFR) §133.102. TBELs apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133.102, the State of Alaska requires maximum daily limitations of 60 mg/L for BOD_5 and TSS in its definition of secondary treatment found in its waste disposal regulations (18 AAC 72.990); however, the waste disposal regulations do not specify the percent removal requirements that are required by 40 CFR 133, so the more stringent 40 CFR 133 requirements are applied. The secondary treatment effluent limits are listed in Table B-2.

Table B-2. Secondary Treatment Effluent Limits

Parameter	Units	AML	AWL	MDL	Average Monthly Minimum Removal
BOD_5	mg/L	30	45	60	85%
TSS	mg/L	30	45	60	85%
pH	s.u.	Between 6.0 – 9.0 s.u. at all times			

B.3 Water Quality – Based Effluent Limits

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 §303, including state narrative criteria for water quality. The WQS are composed of use classifications, numeric and/or narrative water quality criteria and an antidegradation policy (See Section 8.0, Antidegradation). The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. Existing uses are those uses actually attained in a waterbody on or after November 28, 1975, whether or not they are included in the WQS [40 CFR § 131.3(e)]. Designated uses are those uses specified in water quality standards for each waterbody or segment whether or not they are being attained [40 CFR § 131.3(f)].

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

Permit AK0021245 authorizes discharges of secondary treated domestic wastewater to marine water. The designated uses for marine water that have not been reclassified are:

water supply for aquaculture, seafood processing, and industrial; contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

B.4 Reasonable Potential Analysis

The Department used the process described in the Technical Support Document (TSD) for Water Quality-Based Toxics Control (EPA, 1991) and DEC's guidance, APDES *Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to evaluate the Homer Wastewater Treatment Facility (WWTF) effluent.

Discharge monitoring reports (DMRs) from January 2011 through December 2015 and the Homer WWTF discharge application were reviewed to identify pollutants of concern (POC). POC are those pollutants that already have a TBEL or WQBEL for a particular pollutant, pollutants with a total maximum load WLA 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 Department identified ammonia, FC bacteria, and enterococci bacteria as POC in the Homer WWTF discharge because they were detected in the effluent in levels above WQ criteria. The Department did not identify any other POC in the Homer wastewater discharge for reasonable potential analysis (RPA).

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration downstream of where the effluent enters the receiving waterbody for each pollutant of concern. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the receiving waterbody concentration. If the projected concentration of the receiving waterbody exceeds the numeric criterion for a limited parameter, then there is reasonable potential (RP) that the discharge may cause or contribute to an excursion above the applicable WQ criterion. DEC assesses RP to exceed both acute and chronic criterion. Appendix C 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 waterbody. A mixing zone can be used only when there is adequate receiving waterbody flow volume, and the concentration of the pollutant of concern in the receiving waterbody is below the numeric WQ criterion necessary to protect the designated uses of the waterbody.

B.5 Procedure for Deriving Water Quality-Based Effluent Limits

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

In cases where a mixing zone is not authorized, either because the receiving waterbody already exceeds the criterion, the receiving waterbody flow is too low to provide dilution, or for some other reason one is not authorized, the criterion becomes the WLA.

Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion.

The WQS at 18 AAC 70.020(a) designates classes of water for beneficial uses of water supply, water recreation, and of growth and propagation of fish, shellfish, other aquatic life, and wildlife. Homer WWTF must adhere to the most stringent of the standards for these designated uses because Kachemak Bay is protected for all uses.

B.5.2 *Fecal Coliform Bacteria*

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

During the development of this permit reissuance, the Department reviewed the FC bacteria monitoring results submitted on discharge monitoring reports from January 2011 to December 2015.

The previous permit limits of an AML of 200 FC/100 mL, an AWL of 400 FC/100 mL and the MDL of 800 FC/100 mL were each exceeded. The AML three times, the AWL four times, and the MDL, seven times. The average reported maximum daily concentration for all samples collected between January 2011 and December 2015 was 1,363 FC/100 mL.

FC bacteria can be reasonably expected to exceed WQ criteria (See Appendix C.3). A mixing zone is required to meet the WQ criteria of 14 FC/100 mL AML and 43 FC/100 mL MDL. At a maximum expected FC bacteria concentration of 800 FC/100 mL, FC bacteria requires a dilution factor of 18.6. Because ammonia requires more dilution (69.1) to meet WQ criteria than FC bacteria, ammonia drives the chronic mixing zone, and FC bacteria is included in the chronic mixing zone sized for ammonia.

DEC multiplied the chronic mixing zone dilution factor by the FC bacteria WQ criteria and obtained an AML of 967 FC/100 mL and a MDL of 2,971 FC/100 mL. DEC then compared these limits with the previously discussed AML of 200 FC/100 mL and the MDL of 800 FC/100 mL and selected the more stringent limits for the permit per 18 AAC 83.480(a) and based on the performance data indicating that the facility can routinely achieve the limits. An AWL of 400 FC/100 mL is selected as there is not a comparable FC WQ criterion. The selected limits are protective of WQ criteria at the boundary of the mixing zone. Furthermore, FC bacteria WQ criteria are met prior to the boundary of the mixing zone; therefore, monitoring for FC bacteria shall not be required at the boundary of the mixing zone sized for ammonia.

B.5.3 *Total Ammonia, as Nitrogen*

Total ammonia is the sum of ionized (NH_4^+) and un-ionized ammonia (NH_3). Temperature, pH, and salinity affect which form, NH_4^+ or NH_3 is present. NH_3 is more toxic to aquatic organisms than NH_4^+ and predominates with higher temperature and pH. NH_3 is less toxic with increased salinity.

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 prior permit required the City of Homer to monitor ammonia once per month. The review of data from January 2011- December 2015 indicated a range of results from a minimum of 2.5 mg/L to a maximum observed concentration of 69 mg/L. The average ammonia concentration of 60 reported results was 31 mg/L.

DEC derived ammonia criteria from the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances* (DEC, 2008). The 85th percentile of the pH, temperature, and salinity data (8.3 s.u., 8.1 degrees Celsius, and 33 grams per kilogram respectively) that was collected by the Permittee in Kachemak Bay were used in the ammonia criteria tables contained in the above manual to extrapolate and establish an acute criterion of 7.9 mg/L and a chronic of criterion 1.2 mg/L. Homer's ammonia monitoring results indicated exceedances for both acute and chronic WQ criteria; ammonia was therefore selected for RPA. The resulting RPA indicated that there is RP for ammonia to exceed WQ criteria at the end of pipe.

Because there is RP for ammonia to exceed WQ criteria at the end of the pipe, and because ammonia is the driving parameter in the authorized mixing zone, WQBELs were developed for ammonia (MDL 79 mg/L, AML 49 mg/L) that are protective of the waterbody at the boundary of the mixing zone.

18 AAC 83.530(2) requires effluent limits from a continuously discharging POTW to be stated as AWL and AMLs unless impracticable.

Secondary treatment standards at 18 AAC 83.605 establishes AWLs as being 1.5 times the AML. Following this precedent, the AWL for ammonia is derived by multiplying ammonia's AML of 49 mg/L 1.5 times to obtain an AWL of 73.5 mg/L. However, the Homer WWTF produces an effluent with ammonia concentrations well below 73.5 mg/L. The maximum reported ammonia concentration between January 2011 and December 2015 was 69 mg/L and the average monthly for this same time period was 30 mg/L. In addition, the monitoring frequency for ammonia in this permit is monthly. Applying a weekly limit that is considerably above the WWTF's performance to a parameter that is monitored monthly is impracticable.

Additionally, Section 5.2.3 of the TSD recommends establishing a MDL for toxic pollutants and pollutant parameters in lieu of an AWL. EPA rationalizes that the basis for a 7-day average for POTWs derives from secondary treatment standards and that this basis is not related to the need for assuring achievement of WQ standards. Furthermore, a 7-day average, which could comprise up to seven or more daily samples, could average out peak toxic concentrations and the discharge's potential for causing acute toxic effects would be missed. A MDL, measured as a grab sample, would be toxicologically protective of potential acute toxicity impacts.

Therefore, based on the reasons above, an AWL for ammonia is impracticable and will not be applied in the permit.

See Appendix C for details on RP determination and Appendix D for details on permit limit derivation.

B.5.4 *pH*

Alaska 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 may not be less than 6.5 or greater than 8.5 s.u..

DEC reviewed the monthly pH effluent monitoring results from Homer WWTF between January 2011 and December 2015. During this time period, the average reported minimum pH level was 7.0 s.u., while the average maximum reported pH level was 7.6 s.u. Because the facility has consistently demonstrated compliance with the marine pH WQ criteria, the Department has determined that a mixing zone for pH is not required, and compliance with the pH marine WQ criteria will continue to be required at the point of discharge from the facility.

B.5.5 *Total Residual Chlorine*

Alaska WQS at 18 AAC 70.020(b) (Water Quality Criteria for Toxics and Other Deleterious Substances) states that total residual chlorine (TRC) in marine water may not exceed an acute criterion of 0.013 mg/L or a chronic criterion of 0.0075 mg/L.

Homer WWTF primarily uses ultraviolet (UV) radiation for disinfection; however, if the UV system is not operating optimally, or if the facility is receiving heavy flow volumes, the City of Homer may use chlorine for disinfection, which is followed by dechlorination.

When chlorine is used for disinfection, the City of Homer is required to monitor for chlorine. Based on results that the City of Homer reported on their discharge monitoring reports, chlorine was used eight times between January 2011 and December 2015. Compliance with the above TRC WQ criteria cannot be determined using Environmental Protection Agency-approved analytical methods. Therefore, DEC uses the minimum detection limit of 0.1 mg/L as the compliance limit for TRC. Based on the minimum detection limit of 0.1 mg/L, the City of Homer exceeded TRC one out of the eight times during the five year time span mentioned above.

The Department has determined that based on the above results, and the infrequency in which chlorine is used for disinfection, the TRC limits of the prior permit will remain unchanged in the reissued permit.

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Alaska Department of Environmental Conservation (the Department or DEC) used to determine if the discharge authorized in the draft permit has the reasonable potential (RP) to cause or contribute to a violation of Alaska Water Quality Standards. 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 (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to determine the RP for any pollutant to exceed a water quality (WQ) criterion.

To determine if there is RP for the discharge to cause or contribute to an exceedance of WQ criteria for a given pollutant, the Department compares the maximum projected receiving waterbody concentration to the criteria for that pollutant. RP to exceed exists if the projected receiving waterbody concentration exceeds WQ criteria, and a water quality-based effluent limit must be included in the permit

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 (such as ammonia), 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 estimate.

This section discusses how the maximum projected receiving waterbody concentration is determined.

C.1 Mass Balance

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

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

Where,

C_d = Receiving waterbody concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = 85th percentile measured receiving waterbody ambient concentration

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

Q_u = Receiving waterbody flow

Q_d = Receiving waterbody flow rate = Qe + Qu

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

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

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

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

Where,

MZ = the fraction of the receiving waterbody flow available for dilution.

Where mixing is rapid and complete, MZ is equal to 1 and equation C-2 is equal to equation C-3 (i.e., all of the critical low flow volume is available for mixing).

If a mixing zone is not authorized, dilution is not considered when projecting the receiving waterbody concentration, and

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

In other words, if a mixing zone is not authorized (either because the stream already exceeds water quality (WQ) criteria or the Department does not allow one), 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 WQ criteria, the discharge cannot cause or contribute to a WQ violation for that pollutant. In this case, the mixing or dilution factor (% MZ) is equal to zero and the mass balance equation is simplified to $C_d = C_e$.

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

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

After the D simplification, this becomes:

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

C.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*." In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving waterbody concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum observed effluent concentration (MOC) by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the MOC and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean. When fewer than 10 data points are available, the *TSD* recommends making the assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

DEC used ProUCL, a statistical software program, to determine that the monitoring data submitted for ammonia follows a normal distribution. Therefore, the RPM equation in Section 2.4.2.1 of the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* is used to determine the RPM for ammonia.

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

Where,

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

μ_n = mean calculated by ProUCL = 30.49

σ = the standard deviation calculated by ProUCL = 11.17

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

n = number of valid data samples = 60

RPM = 1.2 (rounded)

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

$$\text{MEC} = (\text{RPM})(\text{MOC})$$

MOC = 69 milligrams per liter (mg/L)

In the case of ammonia,

MEC = (1.2)(69) = 82.8 mg/L*

* The above MEC calculation is simplified for illustrative purposes. The MEC is calculated in the RPA tool with an RPM prior to rounding. The actual MEC as calculated in the Department's RPA tool is 79.5 mg/L.

Comparison with WQ criteria for ammonia

In order to determine if RP exists for this discharge to violate WQ criteria, the highest projected concentrations at the boundary of the mixing zone is compared with acute and chronic WQ criteria. For example:

Acute: 7.9 mg/L = 7.9 mg/L (acute criterion)

YES, there is RP to violate acute criterion

Chronic: 1.2 mg/L = 1.2 mg/L (chronic criterion)

YES, there is RP to violate chronic criterion

Table C-1 summarizes the data, multipliers, and criteria used to determine RP to exceed WQ criteria at the end of the pipe and at the boundary of the chronic mixing zone. Since there is a

reasonable potential for the effluent to cause an exceedance of chronic WQS for protection of aquatic life, WQBELs for ammonia are required. See Appendix D for the calculations.

Table C-1: Ammonia Reasonable Potential Calculation and Determination

Parameter	MOC	Number of Samples	Upstream Concentration	CV	RPM	MEC	Water Quality Criteria	End of Pipe RP?	Maximum Projected Receiving Waterbody Concentration [a]	Boundary of Mixing Zone RP?
Total Ammonia as Nitrogen (mg/L)	69	60	0.05	0.4	1.2	79.5	1.2 (chronic)	Yes	1.2 (chronic)	Yes
							7.9 (acute)	Yes	7.9 (acute)	Yes

Footnote:
a. Calculated using CORMIX acute dilution 10.1 and chronic dilution 69.1.

C.3 Fecal Coliform Bacteria Reasonable Potential Determination

DEC reviewed discharge monitoring reports (DMRs) from January 2011 – December 2015 (See Appendix B.6.2). The monitoring results demonstrate that Homer WWTF does at times produce effluent with FC concentrations that meet Alaska Water Quality Standards (14 FC/100 mL AML or 43 FC/100 mL MDL). In general, however, FC effluent concentrations exceed WQ criteria, therefore, it can be reasonably expected that Homer WWTF will have RP to exceed WQ criteria for FC bacteria at the end-of-pipe, but not at the mixing zone boundary after dilution has been applied.

C.3 Enterococci Bacteria Reasonable Potential Determination

The previous permit required enterococci bacteria monitoring May – September for the duration of the permit. DEC reviewed DMRs from January 2011 – December 2015 and found that the acute light use coastal recreation waters criteria of 276 counts/100 mL was not exceeded. However, when the results were evaluated as a monthly event, the 30-day geometric mean exceeded the chronic light use coastal recreation waters criteria of 35 counts/100 mL. Therefore, DEC conducted a RPA for enterococci bacteria using DEC's RPA guidance referred to above. The results of the RPA indicated that there is not RP for the Homer WWTF to exceed enterococci bacteria criteria for light use coastal recreation waters. See Fact Sheet Section 5.4 for more information regarding light use coastal recreation waters and enterococci bacteria.

While enterococci bacteria does not demonstrate RP, enterococci bacteria effluent monitoring will continue to be required in the reissued permit so that DEC can re-evaluate the monitoring data at the end of the five-year permit cycle.

Table C-2 summarizes the enterococci bacteria RPA.

Table C-2: Enterococci Bacteria Reasonable Potential Calculation and Determination

Parameter	Number of Samples	MEC	Water Quality Criteria (light use coastal recreational)	End of Pipe RP?
Enterococci Bacteria (counts/100 milliliters)	25	17 (geometric mean of data)	35 (chronic)	No
		250 (MOC)	276 (acute)	No

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 (WQ) 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 WQ criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and WQ 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 aquatic life 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 WQ criteria at the end of pipe.

In the absence of WQ criteria for a particular pollutant, such as for 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS), TBELs are applied as end-of pipe effluent limits.

In the case of the Homer Wastewater Treatment Facility (WWTF), ammonia demonstrated RP to exceed at the end of pipe and at the boundary of the authorized mixing zone; therefore, the Department developed WQBELs for ammonia.

D.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 (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to calculate WQBELs for ammonia. The first step in calculating WQBELs is the development of a waste load allocation (WLA) for the pollutant.

D.1.1 Mixing Zone-based WLA

When the state authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations and WQ criteria of the pollutant.

Since acute aquatic life and chronic aquatic life standards apply over different time frames and may have different mixing zones, it is not possible to compare the WLAs directly to determine which standard is the most stringent. The acute criteria are applied as a one-hour average and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

D.1.2 "End-of-Pipe" WLAs

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the state 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. As with the mixing-zone based WLA, the acute and chronic criteria must be converted to LTAs and compared to determine which one is more stringent. The more stringent LTA is then used to develop permit limits.

D.1.3 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the TSD to calculate the maximum daily limit (MDL) and average monthly limit (AML). This approach takes into account effluent variability (using the coefficient of variation (CV)), sampling frequency, and the difference in time frames between the AML and MDL.

The MDL is based on the CV of the data and the probability basis, while the AML is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95% for the AML calculation and 99% for the MDL calculation.

The following is a summary of the steps to derive WQBELs from WQ criteria for pollutants that have reasonable potential to exceed WQ criteria. These steps are found in the Department's Reasonable Potential Analysis and Effluent Limitation Guidance and the guidance's accompanying Excel Reasonable Potential Analysis Tool. The guidance and tool were used to calculate the MDL and AML for ammonia in the Homer WWTF permit.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic waste load allocations using the following equations:

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

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

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

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

$Q_s = Critical\ Upstream\ Flow$

$Q_d = Critical\ Discharge\ Flow$

$C_s = Critical\ Upstream\ Concentration$

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

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

For ammonia,

$D_a = 10$

$D_c = 69$

$C_s = 0.0487$

$WLA_a = 79.35\ mg/L$

$WLA_c = 79.37\ mg/L$

$WQC_a = 7.9\ mg/L$

$WQC_c = 1.2\ mg/L$

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

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

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

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

Where:

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

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

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

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

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

$CV = coefficient\ of variation$

For ammonia:

$LTA_a = 37\ mg/L$

$LTA_c = 53\ mg/L$

Step 3 – Choosing the More Limiting LTA

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

Step 4 - Calculate the Permit Limits

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

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

Where:

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

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

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

$$CV = coefficient\ of variation$$

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

Where:

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

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

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

$$CV = coefficient\ of variation$$

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

For ammonia:

$$MDL = 79\ mg/L$$

$$AML = 49\ mg/L$$

D.2 Mass-Based Limits

Alaska Pollutant Discharge Elimination System (APDES) regulations at 18 AAC 83.540 require that effluent limits be expressed in terms of mass unless they cannot appropriately be expressed by mass, if it is infeasible, or if the limits can be expressed in terms of other units of measurement. In addition, 18 AAC 83.520 requires that effluent limits for a publicly owned treatment works be calculated based on the design flow of the facility. Expressing limitations in terms of concentration as well as mass encourages the proper operation of a facility at all times. The mass based limits are expressed in pounds per day and are calculated as follows:

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

D.3 Flow

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

D.4 Effluent Limit Summary

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

Table D-1. Summary of Effluent Limitations

Parameter	Fact Sheet Reference
BOD_5	Appendix B-Section B.2
TSS	Appendix B- Section B.2
Fecal Coliform Bacteria	Appendix B-Section B.5.2
Total Ammonia, as Nitrogen	Appendix B- Section B.5.3
pH	Appendix B- Section B.5.4
Total Residual Chlorine	Appendix B- Section B.5.5

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 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an APDES permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet; however, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met. See Section 6.5 of the Fact Sheet for the Homer Wastewater Treatment Facility mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable? **Yes**	•Technical Support Document for Water Quality Based Toxics Control • DEC's RPA Guidance • EPA Permit Writers' Manual	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **Yes**		18 AAC 70.240 (a)(3)
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters.		18 AAC 70.255(f)

Criteria	Description	Resources	Regulation
Existing use	Does the mixing zone…		
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **No** **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(1)
	(2) impair overall biological integrity of the waterbody? **No** **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(2)
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **Yes** **If no, then mixing zone prohibited.**		18 AAC 70.250(a)(3)
	(4) cause an environmental effect or damage to the ecosystem that the department considers to be so adverse that a mixing zone is not appropriate? **No** **If yes, then mixing zone prohibited.**		18 AAC 70.250(a)(4)
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 be reduced in size or prohibited.**		18 AAC 70.250(b)(2)
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **No** **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(3)

Criteria	Description	Resources	Regulation
Spawning Areas	Does the mixing zone…		
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255 (h)
Human Health	Does the mixing zone…		
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **No** **If yes, mixing zone prohibited.**		18 AAC 70.250 (a)(1)
	(2) contain chemicals expected to cause carcinogenic, mutagenic, teratogenic, or otherwise harmful effects to human health? **No** **If yes, mixing zone prohibited.**		
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **No** **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(1)(C)
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **Yes** **If no, mixing zone prohibited.**		18 AAC 70.255 (b),(c)
	(5) occur in a location where the department determines that a public health hazard reasonably could be expected? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255(e)(3)(B)

Criteria	Description	Resources	Regulation
Aquatic Life	Does the mixing zone…		
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **No** **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(2)(A-C)
	(2) form a barrier to migratory species? **No** **If yes, mixing zone prohibited.**		
	(3) fail to provide a zone of passage? **No** **If yes, mixing zone prohibited.**		
	(4) result in undesirable or nuisance aquatic life? **No** **If yes, mixing zone prohibited.**		18 AAC 70.250(b)(1)
	(5) result in permanent or irreparable displacement of indigenous organisms? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(1)
	(6) result in a reduction in fish or shellfish population levels? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(2)
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(1)
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **No** **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(2)

Criteria	Description	Resources	Regulation
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone?**No** If yes, are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. **Not applicable** If yes, will conservation measures be included in the permit to avoid adverse effects? **Not applicable** **If no, mixing zone prohibited.**		Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)

*Based on the 2003 Alaska Water Quality Standards 18 AAC 70.240 through 18 AAC 70.270.

APPENDIX F. HOMER WWTF EFFLUENT LIMIT VIOLATIONS November 2010- December 2015

Monitoring Period	Parameter	Value Type	Reported Value	Permit Limit
2010 No reported effluent violations				
2011 No reported effluent violations				
January - March	No reported effluent violations			
April	Total Residual Chlorine	maximum daily limit (MDL)	0.37 milligrams per liter (mg/L)	0.013 mg/L (compliance level 0.1 mg/L)
May - December	No reported effluent violations			
2012				
January –September	No reported effluent violations			
October	Fecal Coliform (FC) Bacteria	MDL	892 FC/100 milliliters (mL)	800 FC/100 mL
November – December	No reported effluent violations			
2013				
January	FC Bacteria	average monthly limit (AML)	605 FC/100 mL	200 FC/100 mL
		average weekly limit (AWL)	980 FC/100 mL	400 FC/100 mL
		MDL	52,800 FC/100 mL	800 FC/100 mL
	5-Day Biochemical Oxygen Demand (BOD_5)	AML	32 mg/L	30 mg/L
		AWL	50 mg/L	45 mg/L
		minimum percent (%) removal	67%	85%
	Total Suspended Solids (TSS)	AML	36 mg/L	30 mg/L
		AWL	49 mg/L	45 mg/L

Monitoring Period	Parameter	Value Type	Reported Value	Permit Limit
		MDL	85 mg/L	60 mg/L
		minimum % removal	69%	85%
February	No reported effluent violations			
March	FC Bacteria	AML	236 FC/100 mL	200 FC/100 mL
		AWL	905 FC/100 mL	400 FC/100 mL
		MDL	2,790 FC/100 mL	800 FC/100 mL
April	FC Bacteria	AML	49 FC/100 mL	200 FC/100 mL
		AWL	486 FC/100 mL	400 FC/100 mL
		MDL	1,864 FC/100 mL	800 FC/100 mL
	BOD_5	AML	32 mg/L	30 mg/L
		minimum % removal	76%	85%
	TSS	AML	98 mg/L	30 mg/L
		AWL	163 mg/L	45 mg/L
		MDL	547 mg/L	60 mg/L
		minimum % removal	40%	85%
May	No reported effluent violations			
June	FC Bacteria	AML	365 FC/100 mL	200 FC/100 mL
		AWL	645 FC/100 mL	400 FC/100 mL
		MDL	1,793 FC/100 mL	800 FC/100 mL
July	FC Bacteria	MDL	1,114 FC/100 mL	800 FC/100 mL
August	No reported effluent violations			
September	FC Bacteria	MDL	1,440 FC/100 mL	800 FC/100 mL
October –December	No reported effluent violations			
2014 No reported violations				

Monitoring Period	Parameter	Value Type	Reported Value	Permit Limit
2015 No reported violations				