ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – FINAL

Permit Number: AK0022951

City and Borough of Juneau – Mendenhall Wastewater Treatment Plant

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: April 11, 2014
Public Comment Period Expiration Date: May 12, 2014
Alaska Online Public Notice System

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

CITY AND BOROUGH OF JUNEAU

For wastewater discharges from

Mendenhall Wastewater Treatment Plant
2009 Radcliffe Road
Juneau, AK, 99801

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to issue an APDES individual permit (AK0022951) to the City and Borough of Juneau. 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 Mendenhall Wastewater Treatment Plant and the development of the permit including:

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

Appeals Process

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

Director, Division of Water
Alaska Department of Environmental Conservation
410 Willoughby Avenue, Suite 310
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
P.O. Box 111800
Juneau AK, 99811-1800.

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://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) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 410 Willoughby Avenue, Suite 310 P.O. Box 111800 Juneau, AK 99811-1800 (907) 465-5180

TABLE OF CONTENTS

TABLES

FIGURES

LIST OF APPENDICES

1.0 APPLICANT

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

Name of Facility:	Mendenhall Wastewater Treatment Plant (MWWTP)
APDES Permit Number:	AK0022951
Facility Location:	2009 Radcliffe Road, Juneau, AK 99801
Mailing Address:	2009 Radcliffe Road, Juneau, AK 99801
Facility Contact:	Ms. Samantha Stoughtenger

2.0 FACILITY INFORMATION

The City and Borough of Juneau (CBJ or permittee) owns, operates, and maintains the MWWTP located in Juneau, Alaska. The sequential batch reactor (SBR) secondary treatment plant discharges treated municipal wastewater to the Mendenhall River though a submerged multi-port diffuser located approximately 5,800 feet downriver of the Brotherhood Bridge, and 1.4 miles upstream from the Gastineau Channel. The map in Appendix A to the Fact Sheet depicts the location of the treatment plant and the discharge location.

The design flow of the MWWTP is 4.9 million gallons per day (mgd) and is the largest of three wastewater treatment facilities in the Juneau area. The plant services a resident population of approximately 20,000 and supporting commercial businesses. Because Juneau is a summer season destination area, the actual population is higher during the summer months. The MWWTP only receives wastewater from the domestic wastewater collection system and storm water is conveyed through a separate sewer collection system.

The Alaskan Brewing Company has been identified as a Significant Industrial User that discharges to the domestic wastewater collection system and ultimately to the MWWTP. The brewing company discharges 31,500 gallons per day (gpd) intermittently into the MWWTP collection system. The permittee indicated in their permit reissuance application that the brewing company has not caused or contributed to any problems at the plant in the three years prior to application submittal.

The MWWTP provides preliminary treatment of the influent sewage by fine screening and grit removal. The influent flows into the plant, solids are ground, and a sieve removes large debris. The wastewater settles in the influent well and is lifted into tea cup strainers that remove grit. The grit falls into a grit clarifier where it is removed. From the influent pump station, the wastewater is distributed to one of eight SBRs where it receives secondary biological treatment facilitated by the use of aeration blowers and jet circulation pumps. When an SBR completes a reaction cycle, the treated effluent is decanted and disinfected by ultra-violet (UV) light treatment prior to discharge to Mendenhall River. Treated effluent is discharged on an intermittent basis from the MWWTP coinciding with the decanting of each SBR. Each SBR is decanted at a rate of approximately 5,000 to 6,000 gallons per minute (gpm) for approximately 20 minutes at the end of each respective SBR reaction cycle. The treated effluent is conveyed through a 48-inch diameter high density polyethylene (HDPE) outfall pipeline that is anchored to the river bottom and oriented perpendicularly to the direction of flow in Mendenhall River. The diffuser fitted at the end of the outfall is approximately 70 feet in length and contains 13-rectangular ports each having a cross sectional area of 0.5 square feet (ft^2).

Sludge removed from the SBRs is stored in the sludge storage tank. The sludge is then dewatered in a belt filter press and is sent to either a local or out-of-state landfill for disposal.

Table 1: Design Criteria for Mendenhall Wastewater Treatment Plant

Design Flow	4.9 mgd
Average Monthly Flow	2.08 mgd [a]
Influent Biological Oxygen Demand, 5-day (BOD_5) Loading	7,356 lbs/day [b]
Influent Total Suspended Solids (TSS) Loading	8,990 lbs/day

Notes:
a. Monthly average flow measured from May 2006 to July 2013.
b. lbs/day = pounds per day

2.1 Background

In the mid-1960s, the first wastewater treatment facility was constructed at the MWWTP site. In the 1970s and again in the 1980s, the MWWTP underwent major upgrades and expansions. Construction of the current SBR facility began in 1986, and MWWTP began treating wastewater using SBR secondary treatment in 1989. Between 1989 and 1991, further modifications were made to various control equipment and process control strategies that resulted in improved BOD_5 and TSS removal rates as well as increased daily average flow capacity. In 2000, MWWTP installed a UV light disinfection system and discontinued the use of chlorination in June, 2003.

The MWWTP has historically been permitted by the Environmental Protection Agency (EPA) under National Pollutant Discharge Elimination System (NPDES) Permit Number AK0022951; which was last issued on May 1, 2006 and expired on April 30, 2011. On October 31, 2008 the Department received authority from EPA to administer the NPDES Program in the State of Alaska for domestic wastewater discharges. CBJ submitted a timely permit reissuance application to the Department. As a result, the Department accordingly issued a letter to CBJ noting that appropriate APDES permit reapplication materials had been received, and in accordance with 18 AAC 83.155(c), until a new APDES permit was issued by the Department, the 2006 EPA-issued NPDES permit (2006 permit) was administratively extended.

3.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMR) from May 2006 to July 2013 were reviewed to determine the facility's compliance with effluent limits during the previous permit cycle. Table 2 below details specific incidences of permit limit exceedances that occurred since the permit was issued in May 2006. Not included in Table 2 are reportable noncompliance violations due to missed submittal dates for DMRs or missed sampling events. DMRs have been submitted consistently on time since May 2006 with the exception of one month, January 2011, when the DMR was submitted late. Throughout the permit cycle the permittee has submitted noncompliance notifications to DEC as required, reporting missed sampling events and other issues of noncompliance.

In the past five years, the MWWTP has been inspected three times, once by EPA in April 2008, and twice by DEC staff in May 2008 and December 2010. Deficiencies noted during EPA's 2008 inspection

were the Quality Assurance Project Plan (QAPP) did not accurately reflect the current sampling and analyses at the plant, and samples were being received at the contract laboratory outside the acceptable temperature range. No follow-up compliance or enforcement action was taken following the EPA inspection.

In May 2008, DEC staff conducted an inspection of the MWWTP and noted minor errors on the DMRs and that the QAPP had limited access in a locked office and was unsigned. No follow-up compliance or enforcement action was taken following the DEC 2008 inspection.

The latest inspection was conducted December 1, 2010 by DEC which included a site visit and records review. Following the inspection, an Inspection Report and Compliance letter was sent to the permittee on May 18, 2011 noting that overall the facility was clean and appeared to be in good operational order; however the following deficiencies were noted therein: the QAPP was unsigned, undated, and contained outdated information; fecal coliform bacteria monitoring frequency during the months of December 2010 and November 2010 were not as required in the permit; the receiving water monitoring reports did not include the date samples were analyzed; and a report showing river flow and ambient hardness had not been submitted with the permit reissuance application.

Table 2: Permit Limit Exceedances

Parameter	Units	Year	Month	Effluent Limit	Value Reported on DMR
pH	SU [a]	2006	May	6.5 – 9.0	6.2
		2011	March	6.5 – 9.0	6.3
		2011	May	6.5 – 9.0	6.0
		2011	November	6.5 – 9.0	6.4
		2011	December	6.5 – 9.0	6.0
BOD_5 Average Monthly	mg/L [b]	2007	September	30	36
		2009	March	30	33
		2009	August	30	34.3
		2009	September	30	65.3
		2012	April	30	31
		2013	March	30	41
		2013	April	30	38
BOD_5 Average Weekly	mg/L	2006	August	45	48
		2007	September	45	45.2
		2009	August	45	63.5
		2009	September	45	75.2
BOD_5 Maximum Daily	mg/L	2009	August	60	74.8
		2009	September	60	92.5

Parameter	Units	Year	Month	Effluent Limit	Value Reported on DMR
		2013	April	60	79
BOD_5 Percent Removal	% [c]	2009	January	Minimum 85	83.3
		2009	September	Minimum 85	81.1
TSS Average Monthly	mg/L	2009	February	30	31
		2012	March	30	37
		2012	April	30	48
		2012	May	30	40.4
		2013	April	30	42
TSS Average Weekly	mg/L	2012	March	45	46
		2012	April	45	55
		2012	May	45	50.3
		2013	April	45	66
TSS Maximum Daily	mg/L	2012	April	60	72
		2013	April	60	213
TSS Maximum Daily	lbs/day	2013	April	2452	3109
TSS Percent Removal	%	2008	December	Minimum 85	84.1
		2009	February	Minimum 85	82.7
		2009	April	Minimum 85	82
		2012	March	Minimum 85	84
		2012	April	Minimum 85	84
		2012	May	Minimum 85	79
		2013	April	Minimum 85	81
Maximum Daily Effluent Flow	mgd	2012	September	4.9	5.3

Notes:

a. SU = Standard pH units
b. mg/L = milligrams per liter
c. % = percent

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

The Clean Water Act (CWA) requires that the permit limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBEL) or water quality-based effluent limits (WQBEL). A TBEL is set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the water quality standards (WQS) of a water body are met. A WQBEL may be more stringent than a TBEL. The basis for the proposed effluent limits in the permit is provided in Section 4.3 and Appendices B through D of this document.

4.2 Basis for Effluent and Receiving Water Monitoring

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

The permit also requires the permittee to perform effluent monitoring required by the APDES Form 2A application, so that this data is available when the permittee applies for reissuance of their APDES permit. The permittee is responsible to conduct the monitoring and report results on DMRs or on the application for reissuance, as appropriate, to the Department.

4.3 Effluent Limits

The permit contains limits that are both TBELs and WQBELs. The Department first determines if TBELs are required to be incorporated into the permit. TBELs for publicly owned treatment works (POTWs), which apply to the publicly owned MWWTP, are derived from the secondary treatment standards found in Title 40 Code of Federal Regulations (40 CFR) §133.102 and (adopted by reference at 18 AAC 83.010(e)). The effluent limits imposed in this permit for BOD_5, BOD_5 percent removal, TSS, and TSS percent removal, are based on secondary treatment standards. For pollutants of concern with no associated TBELs, but that have reasonable potential to cause or contribute to an exceedance of water quality criteria, WQBELs are established to be protective of the designated uses of the receiving water. In cases where both TBELs and WQBELs are calculated, as is the case with pH in the permit, the more stringent limit is retained as the final permit effluent limit.

In the 2006 permit, calculated permit effluent limits for pH, fecal coliform bacteria, copper, and ammonia varied throughout the year to correspond to the seasonal variations of the Mendenhall River. In the 2014 APDES permit (2014 permit), the Department continues to consider the river's seasonal variations with respect to calculating and setting effluent limits for these parameters. However, the 2014 permit divides the year into hydrological similar time periods that are different than those used in the 2006 permit.

The 2006 permit divided the year into four time periods, November through May, June, July through September, and October. Following a review of 10 years of historic river flow data (October 3, 2002 through October 3, 2012), the Department has changed the number of hydrological divisions from the four divisions previously identified in the 2006 permit to two

identified for the 2014 permit and this fact sheet. Of the two temporal divisions identified, one, which includes the months of November through April, has lower dilution availability in the receiving water with average river flows from 110 cubic feet per second (cfs) to 445 cfs and the second division, which includes the months of May through October, has higher dilution availability in the receiving water with average river flows of 959 cfs to 3568 cfs. For the parameter of pH, the two annual divisions are modified. Additional discussion on pH is included later in this section.

This change to two temporal divisions in a year has resulted in effluent limit changes that apply to only a couple of months in the year. In particular are the months of May, June, and October. May was previously considered a month with low river flows but the Department has determined that May is more accurately characterized as a month having higher river flows. June and October each were considered previously to have unique hydrological river flows; however, the Department has determined that these two months have river flow rates that are within the higher flow range.

Effluent limit changes made in the 2014 permit as compared to the 2006 permit are:

- *pH* - The pH minimum daily effluent limits included in the 2014 permit are based on a modification of the two temporal divisions applied to other parameters. The modified divisions are November through June and July through October. A review of five years of data from August 2008 through July 2013 indicated that a pH minimum daily concentration of 6.5 SU can be achieved by the treatment plant during the months of November through June. This is consistent with the pH minimum daily effluent limits included in the 2006 permit with the exception of the daily minimum for the month of June which is more stringent in the 2014 permit than in the 2006 permit. The month of June was considered a unique hydrological time period in the 2006 permit and a pH minimum daily effluent limit of 6.4 SU was imposed. The same five years of data also indicated that the treatment plant can achieve a more stringent daily maximum limit of 8.5 SU year round. The 2006 permit established a pH maximum daily effluent limit based on secondary treatment TBELs and in the 2014 permit the pH maximum daily effluent limit is based on water quality criterion.
- *Fecal coliform bacteria* - Fecal coliform bacteria limits in the 2006 permit were contingent upon the average effluent/receiving water dilution ratio for a calendar month and whether chlorine was being used for total or partial disinfection. This approach resulted in tiered effluent limits for fecal coliform bacteria with only one effluent limit tier effective during a given month. Applicable fecal coliform bacteria effluent limits during the months of June through October were dependent on chlorine use alone and during the months of November through May both the calculated average monthly effluent/receiving water dilution ratio and chlorine use were used by the permittee to determine the applicable fecal coliform bacterial limits for the month.

  Currently, the MWWTP does not use chlorine for disinfection which eliminates the need for fecal coliform bacteria effluent limits to vary due to chlorine usage. In an effort to further simplify fecal coliform bacteria effluent limits in the 2014 permit, the Department reviewed the average effluent/receiving water dilution ratios used by the permittee to determine applicable fecal coliform bacteria effluent limits from August 2008 through July 2013. Submitted data indicated that during the months of November through May,

when the dilution ratio was a factor in determining applicable fecal coliform bacteria effluent limits, the same tier was used each month with the exception of two months, January 2009 and January 2010. During those two month, a lower calculated average dilution ratio resulted in lower fecal coliform bacteria effluent limits.

The fecal coliform bacteria effluent limits included in the 2014 permit are based on historic monthly river conditions and the permittee will not be required to calculate an effluent/receiving water dilution ratio to determine the applicable fecal coliform bacteria effluent limit. During the months of November through April, new river flow data indicates that the critical dilution is less than a 15:1 ratio. This ratio corresponds to the lowest tiered limit in the 2006 permit for the same months, and the tiered limit that was applied for the months of January 2009 and January 2010. The fecal coliform bacteria effluent limits included in the 2014 permit for months with lower available dilution (November through April) are more stringent than those applied during the 2006 permit cycle when the effluent/receiving water dilution ratio was calculated to be less than 15:1. To be consistent with requirements found in 18 AAC 83.530, an average weekly geometric limit has also been included in the 2014 permit for the months of November through April, which were not present in the 2006 permit.

The fecal coliform bacteria effluent limits included in the 2014 permit for months with higher available dilution (May through October) are more stringent than those applied during the 2006 permit cycle. The Department reviewed five years of data from August 2008 through July 2013 and determined that the MWWTP's treatment system can treat wastewater during the months of May through October to a level that can achieve a monthly geometric mean of 200 FC/100 mL, a maximum weekly geometric mean of 400 FC/100 mL, and a maximum daily count of 800 FC/100 mL.

- *Copper* - Copper limits for the months of May, June, and October are more stringent in the 2014 permit than those included in the 2006 permit. In the 2006 permit, the effluent copper limits during the month of May were consistent with the other months that were determined to have low river flows. The months of June and October did not have copper effluent limits but monitoring results were to be reported.

  There is an inverse relationship between river flow and river hardness, and metals, such as copper, are more toxic in soft water; therefore, water quality criteria becomes more stringent as the river flow increases. The change in effluent copper limits during the months of May, June, and October are a result of the determination that the river flows during these months are similar to other months with higher river flows. In the 2014 permit, all other months have copper effluent limits consistent with those set in the 2006 permit.

- *Ammonia* - Consistent with the rational above for available dilution for the month of May, the Department has determined that the discharge does not have the reasonable potential to cause or contribute to a violation of ammonia water quality criteria during the month of May; therefore, effluent limits for ammonia have been removed for the month of May. However, ammonia monitoring will continue and limits may be reinstated in the next permit if determined appropriate based on a review of ammonia data collected during the permit cycle. Ammonia limits in the 2014 permit for all other months are either more stringent or remain the same as the 2006 permit. The elimination of ammonia

effluent limits during the month of May is compliant with 18 AAC 83.480(b)(2). See Section 6.0, Antibacksliding, for further discussion.

- *Total residual chlorine* – As discussed in Section 2.1 of the fact sheet, the MWWTP discontinued the use of chlorine as a method of wastewater disinfection in June 2003 and there is no reason to believe chlorine is otherwise expected to be present in the effluent. Accordingly, there is no documented basis for concern warranting the continued inclusion of chlorine permit effluent limits; therefore, no chlorine effluent limits are included in the 2014 permit. See Section 6.0, Antibacksliding, for further discussion.
- *Chronic whole effluent toxicity (WET)* - An average monthly limit for chronic WET has been included in the 2014 permit for the months of November through April because the Department found that there is reasonable potential for chronic WET to exceed water quality criteria for chronic WET at the boundary of the mixing zone.

See Appendices B through D for more details on each of the changes. Table 3 summarizes the effluent limits and monitoring.

Table 3: Outfall 001 Effluent Limits and Monitoring Requirements

Parameter	Effluent Limits					Monitoring Requirements		
	Units	Minimum Daily	Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Flow	mgd	----	Report	----	4.9	Effluent	Continuous	Recorded
Dissolved Oxygen	mg/L	Report	----	----	Report	Effluent	1/Month	Grab
Temperature	°C [a]	----	Report	----	Report	Effluent	5/Week	Grab
BOD_5	mg/L	----	30	45	60	Effluent	2/Month [b]	24-hour Composite [c]
	lbs/day	----	1,226	1,839	2,452			Calculation [d]
BOD_5	mg/L	----	Report	----	----	Influent	2/Month [b]	24-hour Composite
BOD_5 Percent Removal	%	85	----	----	----	Effluent vs. Influent	1/Month	Calculation [e]
TSS	mg/L	----	30	45	60	Effluent	2/Month [b]	24-hour Composite
	lbs/day	----	1,226	1,839	2,452			Calculation
TSS	mg/L	----	Report	----	----	Influent	2/Month [b]	24-hour Composite
TSS Percent Removal	%	85	----	----	----	Effluent vs. Influent	1/Month	Calculation
pH (November 1 – June 30)	SU	6.5	----	----	8.5	Effluent	5/Week	Grab
pH (July 1 – October 31)	SU	6.3	----	----	8.5	Effluent	5/Week	Grab

Parameter	Effluent Limits					Monitoring Requirements		
	Units	Minimum Daily	Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Fecal Coliform Bacteria (FC) (November 1 – April 30)	FC/100 mL [f]	----	112 [g]	168 [g]	224 [h]	Effluent	2/Week	Grab
Fecal Coliform Bacteria (May 1 – October 31)	FC/100 mL	----	200 [g]	400 [g]	800 [h]	Effluent	1/Week	Grab
Total Ammonia as Nitrogen (N) (November 1 – April 30)	mg/L	----	28.5	----	40.5	Effluent	1/Month	24-hour Composite
	lbs/day	----	1165	----	1655			Calculation
Total Ammonia as N (May 1 – October 31)	mg/L	----	Report	----	Report	Effluent	1/Month	24-hour Composite
Copper - Total Recoverable (November 1 – April 30)	µg/L [i]	----	86.7	----	187.0	Effluent	1/Month	24-hour Composite
	lbs/day	----	3.54	----	7.63			Calculation
Copper - Total Recoverable (May 1 – October 31)	µg/L	----	44.5	----	95.8	Effluent	1/Month	24-hour Composite
	lbs/day	----	1.82	----	3.92			Calculation
Lead - Total Recoverable	µg/L	----	Report	----	Report	Effluent	3/Year [j]	24-hour Composite
Silver - Total Recoverable	µg/L	----	Report	----	Report	Effluent	3/Year [j]	24-hour Composite
Zinc - Total Recoverable	µg/L	----	Report	----	Report	Effluent	3/Year [j]	24-hour Composite
Whole Effluent Toxicity (WET) (November 1 – April 30)	TUc [k]	----	5.1	----	Report	Effluent	1/Year [l]	24-hour Composite
WET (May 1 – October 31)	TUc	----	Report	----	Report	Effluent	1/Year [l]	24-hour Composite
Hardness as $CaCO_3$	mg/L	----	Report	----	Report	Effluent	1/Month	24-hour Composite
Alkalinity as $CaCO_3$	mg/L	----	Report	----	Report	Effluent	1/Quarter [m]	24-hour Composite
Floating Solids or Visible Foam	Visual	----	----	----	Report	Effluent	1/Month	Visual

Parameter	Effluent Limits					Monitoring Requirements		
	Units	Minimum Daily	Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type

Notes:

a. ^{o}C = degree Celsius
b. Influent and effluent samples must be taken over approximately the same time period.
c. Composite samples must consist of at least eight grab samples collected at equally spaced intervals and proportionate to flow so that composite samples reflect influent/effluent quality during the compositing period.
d. lbs/day = pounds per day = [(parameter concentration in mg/L) x (facility design flow in mgd) x (conversion factor of 8.34)].
e. Minimum % Removal = [(monthly average influent concentration in mg/L – monthly average effluent concentration in mg/L) / (monthly average influent concentration in mg/L)] x 100.
f. FC/100 mL = colonies of fecal coliform bacteria per 100 milliliters
g. All fecal coliform 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 $(100 \times 200 \times 300)^{1/3} = 181.7$.
h. Not more than 10 percent of samples may exceed the daily maximum limit
i. µg/L = micrograms per liter
j. Lead, silver, and zinc must be sampled at least once during each of the following periods each year: January through April, May through August, and September through December. Results must be submitted with the April, August, and December DMRs.
k. TUc = toxic units, chronic
l. WET testing is to be conducted, at least, a total of twice per year, one sample must be taken between November through April and one sample must be taken between May through October.
m. Quarters are defined as January-March, April-June, July-September and October-December. Results for monitoring performed quarterly must be submitted with the DMR for the last month of the quarter: March, June, September, and December DMRs.

4.4 Effluent and Influent Monitoring

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

The permit requires monitoring of the effluent for flow, BOD_5, TSS, pH, fecal coliform bacteria, total ammonia as N, copper, and WET to determine compliance with the effluent limits. The permit also requires monitoring of the influent for BOD_5 and TSS to calculate monthly removal rates for these parameters. In addition, the permit includes requirements to monitor the effluent for lead, silver, and zinc in order to conduct future reasonable potential analyses during permit reissuance. The permit requires monitoring effluent for dissolved oxygen, hardness, and alkalinity to evaluate the characteristics of the effluent and supply information for permit reissuance.

Monitoring changes made in the 2014 permit as compared to the 2006 permit include:

- copper and hardness monitoring during the months of July through September have been reduced from twice per month to once per month;
- turbidity monitoring has been removed;
- total residual chlorine monitoring has been removed; and

- during the month of May, fecal coliform bacteria monitoring has been reduced from twice per week to once per week.

In the 2006 permit, EPA required more frequent effluent monitoring for copper during the months of July through September compared to the rest of the months in order to better assess the discharge's effect on water quality. The submitted effluent copper data combined with data from receiving water both upstream and downstream has been reviewed and it has been determined that the wastewater discharge does not have reasonable potential to cause or contribute to exceedances of copper water quality criteria in the water body. Therefore, the Department has determined that a sufficient copper dataset exists to reduce monitoring to once per month monitoring to assess copper's variability. Hardness monitoring frequency in the 2006 permit was coordinated with the frequency of copper monitoring because the toxicity of copper is hardness dependent. The coordinated frequency will continue in the 2014 permit and hardness monitoring is accordingly also reduced to once per month.

Turbidity water quality criterion for rivers are based on the natural conditions of the receiving water. Mendenhall River's turbidity is predominately influenced by glacier silt and to a lesser extent, residential impact. The average turbidity of the river, determined from data submitted during the 2006 permit cycle, is 99 nephelometric turbidity units (NTUs). Throughout the 2006 permit cycle, the effluent did not cause more than a 10% increase in turbidity in the receiving water and therefore did not exceed water quality criterion. The turbidity monitoring requirement has not been carried forward in the 2014 permit; however, the permittee is encouraged to continue monitoring effluent turbidity as part of their operational process to identify possible issues that may affect UV disinfection.

Total residual chlorine monitoring has been removed because chlorine is no longer used as part of the treatment plant's operation.

As discussed in Section 4.3 of this fact sheet, following a review of 10 years of historic river flow data the Department determined that the month of May is more accurately characterized as a month having higher river flows and therefore higher dilution availability. The reduction of fecal coliform bacteria effluent monitoring frequency from twice per week to once per week during the month of May is consistent with other months with high dilution availability

Table 3 above presents the effluent and influent monitoring requirements.

4.5 Additional Monitoring

In accordance with APDES Application Form 2A, Section 10, Section 11, and Supplement A, the permittee shall perform additional effluent monitoring of pollutants during the life of the permit and shall submit the results of this testing with their application requesting permit reissuance. A summary of the required monitoring has been included in Table 4. Monitoring of these pollutants performed to satisfy other monitoring requirements of this permit may be used to satisfy this specific monitoring requirement as long as the "different calendar year and season" criteria, specified on Form 2A, are met. The permittee shall consult and review Form 2A upon permit issuance to ensure that the required monitoring in the application will be completed prior to submitting a request for permit reissuance. The permittee is responsible for all submissions and activities required on the application Form 2A even if they are not summarized in the Table 4. A copy of Form 2A can be found at: http://dec.alaska.gov/water/wwdp/index.htm.

Table 4: Additional Effluent Monitoring for Reissuance Application

Parameter	Units	Sample Location	Sample Frequency	Sample Type
Ammonia (as N)	mg/L	Effluent	3 / 4.5 years [a]	24-hour Composite
Chlorine, Total Residual [b]	mg/L	Effluent	3 / 4.5 years	Grab
Dissolved Oxygen	mg/L	Effluent	3 / 4.5 years	Grab
Nitrate/Nitrite	mg/L	Effluent	3 / 4.5 years	24-hour Composite
Kjeldahl Nitrogen	mg/L	Effluent	3 / 4.5 years	24-hour Composite
Oil and Grease	mg/L	Effluent	3 / 4.5 years	Grab
Phosphorus	mg/L	Effluent	3 / 4.5 years	24-hour Composite
Total Dissolved Solids	mg/L	Effluent	3 / 4.5 years	24-hour Composite
Expanded Effluent Testing (from Supplement A, Form 2A)	varies	Effluent	3 / 4.5 years	Varies

Notes:
a. 3 / 4.5 years means three sample must be taken within four and one half years from the effective date of this permit.
b. Sampling and analyzing for total residual chlorine is not required if the facility does not use chlorine for disinfection, does not use chlorine elsewhere in the treatment process, and has no reasonable potential to discharge chlorine in the effluent.

4.6 Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limitations on WET when a discharge has reasonable potential to cause or contribute to an exceedance of a water quality criterion.

WET tests are laboratory tests that measure the total toxic effect of an effluent on living organisms. While quantities of individual pollutants can be analytically determined, these measurements alone may not be able to specifically identify observable toxic responses, biological availability, and complex interactions within the effluent. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. The two different durations of toxicity tests are acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

WET sampling and analysis is required to be conducted twice per year, once between the months of November and April and once between the months of May and October. During the months of November through April, the calculated critical available dilution is insufficient to ensure the toxicity water quality criterion will be met at the boundary of the mixing zone. Therefore, an average monthly chronic WET limit of 5.1 TUc has been included in the 2014 permit, which was not present in the 2006 permit. The 2014 permit requires a series of five dilutions be used when analyzing chronic WET.

4.7 Receiving Water Body Limits and Monitoring Requirements

As previously mentioned, the MWWTP discharges to the Mendenhall River through an outfall fitted with a diffuser located approximately 5,800 feet downriver of the Brotherhood Bridge and 1.4 miles upstream from the Gastineau Channel. River flows in the Mendenhall River vary seasonally with the lower flows occurring during the colder months of November through April and the higher flows occurring during the warmer months of May through October as a result of increased glacial melting. The lowest flows are associated with winter conditions. At the point of wastewater discharge, the river is tidally influenced; however, given the discharge's significant upstream distance from the tidally influenced salt water, tidal action in the area of the discharge is not significant. Nevertheless, during low river flows, a high tide can moderately direct the discharge plume upstream. Accordingly, the Department authorizes the mixing zone to extend upstream of the outfall's terminus, and has included requirements that upstream monitoring be conducted beyond the boundary of the authorized mixing zone to ensure results represent receiving water conditions free of influence from the wastewater discharge. See Section 5.4 of this document for the complete mixing zone analysis.

The 2006 permit authorized a mixing zone defined as rectangular in shape, centered over the diffuser, with a width of 30 meters and extending upstream and downstream from the diffuser a distance of 150 meters, to the full depth of the river. The 2006 permit required receiving water monitoring 150 meters upstream and 150 meters downstream of the point of discharge at approved locations corresponding to the boundary of the authorized mixing zone.

The 2014 permit continues to require monitoring of the receiving water at approved locations; however, because the size of the mixing zone has been reduced in length, the permittee must identify new locations. A mixing zone has been authorized for the parameters, fecal coliform bacteria, total ammonia, copper, lead, chronic WET, and pH. Except for lead and chronic WET, all other parameters mentioned in the preceding sentence must be monitored both upstream and downstream. Lead is only required to be monitored upstream because lead requires dilution to meet water quality criteria, but there is no corresponding reasonable potential for lead to exceed water quality criteria at the boundary of the mixing zone. Chronic WET will not be monitored in the receiving water as chronic WET testing already measures the effluent with respect to an established dilution series, which is consistent with the 2006 permit requirement. Downstream monitoring will demonstrate compliance with water quality criterion and upstream monitoring results will supply information on the receiving water.

The permit also requires monitoring of temperature, hardness, dissolved oxygen, and alkalinity upstream beyond the influence of the facility's discharge to gather necessary receiving water data for future permit issuances. Receiving water monitoring of pH and temperature have been retained in the 2014 permit to determine ammonia criterion for future permit issuances and hardness monitoring has also been carried forward to determine criteria for hardness dependent metals. Alkalinity is required to be monitored at the upstream location so data will be available to calculate pH in the receiving water when mixed with the effluent.

Receiving water monitoring requirements for copper have been reduced from four times per year to twice per year, lead monitoring has been brought forward from the 2006 permit, and silver and zinc monitoring have been discontinued. A review of concentrations for these metals over five years (between August 2008 and July 2013) in the receiving water downstream of the MWWTP

outfall and in the effluent indicate that MWWTP effluent discharges have not resulted in or contributed toward any exceedances of water quality criteria for copper, lead, silver, and zinc.

The 2006 permit required the permittee to report Mendenhall River flow data recorded at USGS gauge # 15052900 (Brotherhood Bridge gauge). However, the subject USGS gauge did not produce reliable flow data as it was (1) within the tidal zone of the Mendenhall River; (2) located in an area susceptible to dramatic annual changes due to riverbank erosion, riverbed scouring, and river course changes; and, (3) although this gauge was installed by USGS, it did not receive regular calibration or maintenance. Flow data from USGS gauge # 15052500 (Mendenhall River gauge), which is located upstream of Brotherhood Bridge, used together with measurements from USGS gauge # 15052800 (Montana Creek gauge), provide 10 years of reliable information used to calculate water quality criteria for hardness dependent metals and to conduct reasonable potential analyses (RPA) for this permit. Currently, the Montana Creek gauge is no longer available (taken out of service in October, 2012); however, the historical dataset of daily flows from Montana Creek (data available for August 1, 1965 through October 3, 2012), combined with flow data from the Mendenhall River gauge are representative of the range of flows reasonably expected for this river. The 2014 permit discontinues the requirement to report daily river flow data from the Brotherhood Bridge gauge.

Receiving water monitoring is to take place during low tide and during periods of effluent discharge from the facility when practicable. Monitoring data collected from receiving waters must be compiled and submitted annually in the Annual Receiving Water Monitoring Summary Report per Section 1.5.9 of the permit. Data submitted in the report will be used to confirm that water quality criteria is being met at the boundary of the mixing zone and to supply receiving water data for future permit issuance. Table 5 details receiving water monitoring requirements.

Table 5: Receiving Water Body Monitoring Requirements

Parameter	Units	Sampling Location(s)	Sampling Frequency	Sample Type	Reporting Limits [a]
Temperature	°C	Upstream [b] and Downstream [c]	1/Month	Grab	---
Fecal Coliform Bacteria [d]	FC/100 mL	Upstream and Downstream	1/Month	Grab	1.0
Total Ammonia as N	mg/L	Upstream and Downstream	4/Year [e]	Grab	0.05
pH	SU	Upstream and Downstream	1/Month	Grab	---
Copper – Dissolved [f]	µg/L	Upstream and Downstream	2/Year [g]	Grab	2.0
Lead – Dissolved [f]	µg/L	Upstream	2/Year [g]	Grab	2.0
Hardness as $CaCO_3$	mg/L	Upstream and Downstream	1/Month	Grab	10
Dissolved Oxygen	mg/L	Upstream and Downstream	1/Month	Grab	---

Parameter	Units	Sampling Location(s)	Sampling Frequency	Sample Type	Reporting Limits [a]
Alkalinity as $CaCO_3$	mg/L	Upstream	1/Month	Grab	10

Notes:

a. Permittee must use analytical test methods that achieve a reporting limit equivalent to or less than the values in this column.
b. Location of sampling must be upstream of the point of discharge, beyond the mixing zone boundary, and taken during periods of low tide.
c. Location of sampling must be 100 meters downstream of the diffuser, at the boundary of the authorized mixing zone.
d. All mixing zone fecal coliform 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.
e. Of the requisite four samples per year, two samples must be taken during November through April in different months and two samples must be taken during May through October in different months.
f. Analysis for copper and lead in the receiving water must be as a dissolved metal.
g. Of the requisite two samples per year, one sample must be taken between November 1 and April 30, and one sample must be taken between May 1 and October 31.

5.0 RECEIVING WATER BODY

The permittee discharges treated domestic wastewater effluent into Mendenhall River at latitude 58° 21'43" N, longitude 134° 35' 53" W. The WQS at 18 AAC 70.020(a) classifies the Mendenhall River as being protected for the following freshwater uses: Classes (1) (A), (B), and (C) for use in water supply (drinking, culinary and food processing, agriculture, aquaculture, and industrial), water recreation (contact and secondary recreation), and growth and propagation of fish, shellfish, other aquatic life and wildlife.

5.1 Low Flow Conditions

The *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (EPA, 1991) and the WQS recommend the flow conditions for use in calculation WQBELs using steady-state modeling. The TSD and WQS state that WQBELs intended to protect aquatic life uses should be based on the lowest seven-day average flow rate expected to occur once every 10 years (7Q10) for chronic criteria and the lowest one-day average flow rate expected to occur once every 10 years (1Q10) for acute criteria. Because the chronic criterion for ammonia is based on a 30-day average concentration, the 30B3 has been used for the chronic ammonia criterion instead of the 7Q10. The 30B3 is a biologically-based design flow intended to ensure an excursion frequency of once every three years for a 30-day average flow rate. The 7Q10, 1Q10, and 30B3 have been calculated for the two identified hydrological seasons.

DEC analyzed 10 years of Mendenhall River flow data from October 3, 2002 through October 3, 2012. Monthly averages, minimum flows, and maximum flows were determined by combining the flows from the USGS gauges #15052500 at Mendenhall River, upstream from the MWWTP discharge, and Montana Creek gauge #15052800, also upstream from the treatment plant but further downstream than gauge #15052500. The Department determined that dividing the year into two seasons, November through April and May through October, results in a permit

optimally aligned with historical flow data in the Mendenhall River. Seasonal low flows calculated for the Mendenhall River in the 2014 permit are summarized in Table 6.

The Mendenhall River is influenced by tidal action at the point of wastewater discharge from the MWWTP. When the tide starts to come in, additional water available for dilution is present at the discharge location. However, when determining low river flow, it was determined that the most critical time for the discharge is during low river flow, when the tide is out. Therefore, available dilution and the mixing zone was determined using low river flow only.

Table 6: Low Flows in the Mendenhall River at the Point of Discharge

	1Q10 (cfs)	7Q10 (cfs)	30B3 (cfs)
Critical Flows, November – April	30	35	49
Critical Flows, May - October	183	292	561

5.2 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the 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 water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each water body.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The Mendenhall River has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Mendenhall River must be protected for all freshwater designated use classes listed in 18 AAC 70.020(a), and also listed in Section 5.0 of this document.

5.3 Water Quality Status of Receiving Water

Any part of a water body for which the water quality does not or is not expected to meet applicable water quality criteria is defined as a "water quality limited segment" and placed on the state's impaired water body list. The Mendenhall River is not included on any of the impaired water body lists catalogued in the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.

5.4 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, as amended through June 26, 2003, the Department may authorize a mixing zone in a permit. The permittee submitted a mixing zone application, modeling predictions, and summary report to the Department on June 29, 2012 and requested a mixing zone for copper, lead, silver, zinc, ammonia, fecal coliform bacteria, and chronic WET. The permittee utilized CORMIX, a hydrodynamic mixing zone model, to predict concentrations of pollutants of interest potentially present in MWWTP effluent.

The Department reviewed the CORMIX models submitted by the permittee and conducted additional CORMIX modeling for pollutants: fecal coliform bacteria, ammonia, copper, lead, and chronic WET. Models were performed by the Department to simulate conditions during the two river flow scenarios. Based on the modeling, a review of the application, and other submitted data, the Department is authorizing a chronic and an acute mixing zone.

The Department authorizes a chronic mixing zone for: fecal coliform bacteria, pH, ammonia, chronic toxicity, copper, and lead. The Department authorizes a smaller, initial acute mixing zone for ammonia, and copper.

Appendix E, Mixing Zone Analysis Checklist, outlines regulatory criteria that the Department must consider when analyzing a mixing zone request. These regulatory criteria include: the size of the mixing zone, treatment technology, existing uses of the water body, human consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met for the Department to authorize a mixing zone. The following sections summarize the Department's mixing zone analysis.

Size In sizing the mixing zone, available dilution during critical flow conditions and the size of the bounded area of the river were taken into consideration. Dilution factors were determined for each hydrological seasons by comparing the ratio of critical river flow to discharge flow. All dilution factors are calculated with the discharge flow rate set equal to MWWTP's design flow of 4.9 mgd. For each of the two seasons, (November - April and May – October) there are three values for the dilution factor: one based on the 1Q10 flow rate of the receiving water and used to determine reasonable potential (RP) and wasteload allocations for acute aquatic life criteria, one based on the 7Q10 flow rate of the receiving water and used to determine RP and wasteload allocations for chronic aquatic life criteria (except ammonia) and conventional pollutants, and one based on the 30B3 flow rate of the receiving water and used to determine RP and wasteload allocations for the chronic ammonia criterion. This resulted in a total of six different dilution factors under initial consideration, as summarized in Table 7 below.

Table 7: Effluent Dilution Factors

Season	Acute (1Q10)	Chronic (7Q10)	Chronic (30B3)
November-April	5.0	5.6 [a]	7.5
May-October	25.1	39.5	75.0

Note:
a. Dilution value = 5.6 was also used in setting chronic fecal coliform bacteria effluent limits.

Receiving water and facility-specific variables were entered into the CORMIX model to determine the behavior of the effluent as it mixes with the receiving water. A range of variables were considered while modeling boundary conditions including, but not limited to: positioning of the outfall structure, diffuser and effluent port diameters, effluent discharge velocity, river flows, the temperature and pH of the effluent and river, effluent pollutant concentrations, and receiving water pollutant concentration. Conservative (i.e. 99th percentile of effluent pollutant concentrations and maximum effluent flow rate) conditions were used as effluent input variables.

The CORMIX modeling results were used to determine the length and width of the discharge plume at the point each of the dilutions in Table 7 were achieved. Also taken into consideration were the dilutions actually available due to the restriction of the river's width. Where the limitation of the width of the river resulted in a dilution less than the calculated critical dilution(s) presented in Table 7 above, the lesser dilution(s) and plume size(s) were used. Table 8 shows the dilutions that were used to determine RP and, if required, calculate effluent WQBELs.

Table 8: Dilutions Factors Used

Season	Acute (1Q10)	Chronic (7Q10)	Chronic (30B3)
November-April	5.0	5.6	7.5
May-October	18 [a]	35 [a]	35 [b]

Notes:
a. These dilutions are based on river width restrictions as well as flow.
b. More dilution is available; however, ammonia does need more dilution to meet water quality criteria.

Through CORMIX modeling it was determined that a chronic mixing zone centered over the diffuser and extending 100 meters upstream and 100 meters downstream with a width of 30 meters has an available dilution of 35 during the months of May through October. The mixing zone was sized using river flow conditions during the months of May through October; however RP and WQBELs for the lower river flow months, November through April, have been determined using the lower available dilutions noted in Table 8.

The 99th percentile of the pollutants of concern plus seasonal receiving water conditions were input into the CORMIX model to confirm that chronic water quality criteria for fecal coliform bacteria, pH, ammonia, chronic toxicity, copper, and lead will be met at and beyond the boundary of the authorized chronic mixing zone regardless of the season.

A smaller, initial acute mixing zone is sized to prevent lethality to passing organisms, while a chronic mixing zone is sized to protect the ecology of the water body as a whole. According to EPA (1991), 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 a concentration 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 average exposure is not to exceed the acute criterion. Based on the Mendenhall River's ambient flow velocities and the short time interval between effluent being discharged and compliance with the acute water quality criteria (65 seconds), it is improbable that any organism would be exposed to the discharge plume for greater than 15 minutes.

Acute dilutions were calculated using the MWWTP's design flow and the 1Q10 river flow calculated for each of the two determined hydrological seasons. Through CORMIX modeling it was determined that an acute mixing zone centered over the diffuser and extending six meters upstream and six meters downstream with a width of 10 meters has an available dilution of five during the months of November through April. This dilution has been applied to all pollutants of concern and the modeling demonstrates that acute water quality criteria for all pollutants of concern will be met at the boundary of the acute mixing zone.

In accordance with 18 AAC 70.255, as amended through June 2003, the Department determined that the authorized size of the mixing zone for the MWWTP wastewater discharge is appropriate.

Technology In accordance with 18 AAC 70.240(a)(3), as amended through June 2003, the Department finds that available evidence demonstrates that effluent from the MWWTP will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements.

Wastewater operations at the MWWTP generally meet and occasionally exceed secondary treatment requirements. The facility system includes preliminary treatment of influent by fine screening and grit removal followed by clarification, treatment by one of eight SBRs where it is treated using aeration blowers, jet circulation pumps and UV disinfection. The treatment methods incorporated at the MWWTP are commonly employed and accepted for treatment of similar discharges throughout the United States.

Low Flow Design In accordance with 18 AAC 70.255(f), Appendix C describes the process used to determine if the discharge authorized in the permit has the reasonable potential to cause or contribute to a violation of a water quality criterion. Appendix C, Tables C- 2 and C-3 compares maximum projected effluent concentrations for the acute (1Q10) and chronic (7Q10) mixing zones to their respective criterion.

In establishing final permit limits and modeling mixing zones, DEC assumes steady state exposure conditions and “worst case” effluent and receiving water conditions. Chronic criteria are modeled with design flows for effluent together with critical receiving water flows at 7Q10 levels, and exposures for acute criteria are modeled at design flows for effluent and 1Q10 critical receiving water flow.

Existing Use In accordance with 18 AAC 70.245, as amended through June 2003, the mixing zone has been appropriately sized to fully protect the existing uses listed is Section 5.0 of this fact sheet. The existing uses have been maintained and protected under the terms of the previous permit. The permit reissuance application does not propose any changes that would likely result in a lower quality effluent and the size of the mixing zone has been reduced in this permit issuance. The Department has determined that the existing uses and biological integrity of the water body will be maintained and fully protected under the terms of the permit.

Human Consumption In accordance with 18 AAC 70.250(b)(2) and (b)(3), as amended through June 2003, 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 has been no indication that established fishing or shellfish harvesting has been precluded by the discharge, and signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption and primary contact recreation should not take place in the mixing zone. The Department finds that the permit requirements will be protective of the water body’s uses.

Spawning Areas In accordance with 18 AAC 70.255(h), as amended through June 2003, the mixing zone is not authorized in a known spawning area for anadromous fish or resident fish spawning beds. The Mendenhall River is included in the Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes as Stream No. 111-50-10500, and is

catalogued for the presence of chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead trout, and Dolly Varden char. Adult salmonids, which enter the river in late summer and fall, primarily use the lower habitats as a migration corridor as they return to spawn in clear water tributary and headwater streams during the spring (ADF&G, 2011). The lower portion of the Mendenhall River, in the vicinity of the discharge, is characterized as a migratory corridor for salmonids entering and leaving the system, but is not characterized as a spawning area.

Human Health In accordance with 18 AAC 70.250 and 18 AAC 70.255, as amended through June 2003, the mixing zone authorized in the permit shall be protective of human health and will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. Under the conditions of the permit, the pollutants discharged will not produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor will the pollutants discharged preclude or limit established processing activities of commercial, sport, personal-use, or subsistence fish and shellfish harvesting.

An analysis of the effluent testing data that was included with the MWWTP wastewater discharge application and the results of the RPA conducted on pollutants of concern indicate that the level of treatment at MWWTP is protective of human health. The quality of the effluent is expected to meet water quality criteria in the receiving water. (See Appendix C)

Aquatic Life and Wildlife In accordance with 18 AAC 70.250 and 18 AAC 70.255, as amended through June 2003, pollutants for which the mixing zone will be authorized will not accumulate in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, cause permanent or irreparable displacement of indigenous organisms, or result in a reduction in fish or shellfish population levels. Based on a review of effluent data (including WET testing results), outfall structure and location, mixing zone modeling, and river velocities at the point of discharge, the Department concludes that the discharge will meet all water quality criteria at the boundary of and outside the mixing zone.

Endangered Species In accordance with 18 AAC 70.250(a)(2)(D), as amended through June 2003, the Department finds that the authorized mixing zone will not cause an adverse effect on threatened or endangered species. Impacts to overall water quality and any threatened or endangered species therein, are not expected based on the size of the mixing zone, the discharge characteristics, and the river velocities associated with the receiving water. The National Marine Fisheries Service, in a letter dated August 31, 2012, and the United States Fish and Wildlife Service, in a signed email dated August 17, 2012, indicated that while several Endangered Species Act (ESA)-listed species occur in the Mendenhall River vicinity and downstream waters, plant operations will not adversely impact any designated or proposed critical habitat or Essential Fish Habitat (EFH). Additional ESA and EFH information is included in Sections 9.1 and 9.2 of this document.

6.0 ANTIBACKSLIDING

18 AAC 83.480 requires that “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."

Effluent limitations may be relaxed under two categories as allowed under 18 AAC 83.480 (CWA §402(o)) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation. CWA §303(d)(4)(A) states that, for water bodies where the water quality does not meet applicable water quality standards, effluent limitations may be revised under two conditions; the revised effluent limitation must ensure the attainment of the water quality standard (based on the water body's total maximum daily load or the WLA) or the designated use which is not being attained is removed in accordance with the water quality standard regulations.
CWA §303(d)(4)(B) states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, water quality-based effluent limitations may be revised as long as the revision is consistent with the State's antidegradation policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or effluent limitation guidelines.

The 2014 permit eliminates effluent limits for ammonia during the month of May and eliminates all effluent limits for total residual chlorine. Effluent limitations for all other pollutants are as stringent as or more stringent than those in the 2006 permit.

Following a review of new information gathered during the 2006 permit cycle, the Department has determined that the discharge from the MWWTP does not have the reasonable potential to cause or contribute to a violation of ammonia water quality criteria at the boundary of the mixing zone during the month of May; therefore, effluent limits for ammonia have been removed for the month of May. The Department reviewed new river flow rates and reported average monthly effluent/receiving water dilution ratios the permittee submitted for each month since it was first required in the 2006 permit. For the month of May, 76:1 was the lowest reported dilution ratio, which is well above the dilution ratio required (7.3:1) to meet ammonia water quality criteria. Based on this new information, the elimination of ammonia effluent limits during the month of May is compliant with 18 AAC 83.480(b)(2). All other ammonia effluent limits in the 2014 permit are either more stringent or remain the same as the 2006 permit.

The MWWTP has not used chlorine in the treatment process since the installation of the UV disinfection system prior to issuance of the 2006 permit. Chlorine effluent limits in the 2006 permit applied only if chlorine was added to the effluent for total or partial disinfection. Chlorine effluent limits were included in the 2006 permit to allow CBJ to disinfect its effluent should the UV system fail. Throughout the 2006 permit cycle the UV disinfection system has proved to be reliable and the use of chlorine has not been needed. The removal of effluent limits for total residual chlorine is consistent with the requirements applied during the 2006 permit cycle.

Monitoring frequency of copper and hardness during the months of July through September have been reduced from twice per month to once per month and the monitoring of fecal coliform bacteria during the month of May has been reduced from twice per week to once per week.

Due to the inverse relationship between river flow and hardness, and the increase in the toxicity of copper as hardness decreases, water quality criteria for copper is more stringent during times of high river flows. However, as river flow rates increase more dilution becomes available which can offset the increased toxicity of copper. The 2006 permit required monitoring of copper and hardness in the effluent more frequently during the summer months with the highest river flows, July through September, in

order to better assess the discharge's effect on water quality. Following a review of copper data submitted during the 2006 permit cycle and in accordance with EPA's *Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies* [1996], the Department has determined that a reduction in copper and hardness monitoring during the months of July through September is justified.

See fact sheet Sections 4.3 and 4.4 for discussions on the basis for conditions in the 2014 permit (e.g. monitoring) that have changed from the 2006 permit issuance.

7.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy. The 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 water body, or portion of a water body, 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. The Mendenhall River 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. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 water body.

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 follows:

1. **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 of water quality is necessary.

   The MWWTP is the largest of three wastewater treatment facilities serving CBJ. As such, MWWTP is responsible for treating roughly two-thirds of the wastewater produced by the steadily increasing CBJ resident population base (27,034 people in July 1990 growing to 32,164 people in July 2011) and supporting businesses. According to Juneau's Economic Development Council, Juneau's annual increase in population has been higher than for the state as a whole over the last five years with an increase of more than 1.5% per year. Continued operation of the MWWTP is essential for protecting human health and the environment from the adverse effects of untreated domestic wastewater.

The Department concludes that the operation of the MWWTP and the authorization of the discharge are necessary to accommodate the important economic development of CBJ and that the finding is met.

2. **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.

The permit reissuance application does not propose any changes that would likely result in wastewater of lower quality to be discharged from the MWWTP than has been discharged under previously issued NPDES permits. The water quality criteria in 18 AAC 70.020 are the basis for the permit effluent limits and serve the specific purposes of protecting the existing and designated uses. Modeling results and the results of monitoring data submitted during the previous permit cycle indicate that discharges authorized by the permit conform to the requirements of 18 AAC 70.020.

The Department has not established or adopted site-specific criteria for the Mendenhall River. Therefore, criteria allowed by 18 AAC 70.235 have not been violated by issuance of this permit.

An average monthly chronic WET limit has been established for the months of November through April to ensure the applicable water quality criteria in 18 AAC 70.030 will be met at the boundary of the authorized mixing zone. During the months of May through October, analyses showed that there is no reasonable potential for chronic WET to cause or contribute to an excursion of applicable water quality criterion. The permit requires accelerated testing of chronic toxicity if WET effluent limits are exceeded, and if the accelerated tests also exceed the WET limit, the permit requires further action to investigate and identify the cause of toxicity. The Department has concluded that water quality criteria for chronic WET will be met at the boundary of the mixing zone and the applicable criterion of 18 AAC 70.030 will not be violated.

The Department has determined that this finding is met.

3. **18 AAC 70.015(a)(2)(C).** The resulting water quality will be adequate to fully protect existing uses of the water.

A list of the uses Mendenhall River is protected for can be found in this fact sheet, Section 5.0. WQSs, upon which the permit effluent limits are based, serve the specific purpose to protect existing and designated uses of the receiving waters. Accordingly, permit effluent limits restrict the MWWTP discharge which ensures that water quality criteria will not be exceeded at the end of pipe, or beyond the boundary of the authorized mixing zone.

The Department concludes the water quality of the receiving waters will be adequate to protect all existing uses and therefore this finding is satisfied.

4. **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.

The methods of prevention, control, and treatment the Department finds to be most effective and reasonable are currently in use at the facility and include meeting federal (40 CFR 133) and State (18 AAC 72.050) secondary treatment requirements as well as disinfecting the effluent prior to discharge. The type of treatment employed at MWWTP is similar in nature to other like facilities and their discharges throughout the United States (U.S.), including Alaska. The SBR system

used by the facility was selected to meet the need for a relative compact system and for its treatment efficiencies.

The MWWTP has both a QAPP and Operations and Maintenance (O&M) Plan to ensure protocol for discharging adequately treated wastewater is followed to the extent feasible. Both plans are required to be kept updated. The 2014 permit requires that a Facility Plan be developed over the course of the permit cycle to evaluate existing conditions, and identify and prioritize short- and long-term needs and improvements. The Department concludes that the most effective and reasonable methods of pollution prevention, control, and treatment will be applied and therefore the finding is satisfied.

5. **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 *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*, dated July 2010. Accordingly, there are three parts to the definition:

   (A) any federal technology-based effluent limitation guidelines identified in 40 CFR § 125.3 and 40 CFR §122.29, as amended through August 15, 1997, both adopted by reference at 18 AAC 83.010;

   (B) minimum treatment standards in 18 AAC 72.040; and

   (C) any treatment requirements 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 effluent limit guidelines, 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 authorized domestic wastewater discharge is in compliance with the minimum treatment standards found in 18 AAC 72.050 as reflected by the permit limits specifying secondary treatment standards.

   The third part includes any more stringent treatment required by state law, including 18 AAC 70 and 18 AAC 72. The correct operation of equipment, water quality monitoring, implementation of secondary treatment standards for the domestic wastewater discharge (40 CFR 133 and 18 AAC 72.050), and implementation of applicable best management practices (BMPs) will control the discharge and satisfy all applicable state requirements.

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

8.0 OTHER PERMIT CONDITIONS

8.1 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 180 days of the effective date of the final permit. Additionally, the permittee must submit a letter to the Department within 180 days of the effective date of the permit stating that the plan has been implemented within the required time frame. 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 permittee is required to amend the QAPP whenever any procedure addressed by the QAPP is modified. The plan shall be retained on-site and made available to the Department upon request.

8.2 Operation and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limits, monitoring requirements, and all other permit requirements at all times. The permittee is required to develop or update and implement an O&M Plan for its facility within 180 days of the effective date of the final permit. If an O&M Plan has already been developed and implemented, the permittee need only to review the existing plan to make sure it is up to date and all necessary revisions are made. The plan must be reviewed annually and retained on site and made available to the Department upon request.

8.3 Facility Plan

The permittee is required to develop, over the course of the permit cycle, a Facility Plan evaluating MWWTP's existing condition and identifying near- and long-term needs and potential improvements to ensure that the MWWTP continues to provide environmentally responsible waste treatment and disposal services to CBJ. The Facility Plan shall develop a strategy to address present and projected future problems and/or needs for a time period of 10-20 years. The Facility Plan shall evaluate existing systems and design capacities using current conditions and determine adequacy of the facility's treatment process, maintenance program, process control measures, operating procedures, and record management. The Facility Plan shall also evaluate anticipated future wasteloads and flows, identify potential deficiencies and/or problems, and evaluate whether and when infrastructure changes or upgrades should be initiated.

The Facility Plan must be submitted to the Department with the permit reissuance application 180 days before permit expiration.

8.4 Pretreatment Requirements

The results of the 2002 industrial user survey indicated that the MWWTP receives wastewater from only one significant industrial user (SIU), the Alaska Brewing Company. MWWTP's Effluent Mixing Zone Analysis (Tetra Tech, 2012) listed a second "significant user", Lemon Creek Correctional Center/Industrial Laundry Facility. The Department determined that though the Correctional Facility discharged an average daily volume of 15,244 gallons to the MWWTP during 2012, this quantity is below the regulatory threshold to be considered a SIU according to 40 CFR §403.3(v), adopted by reference in 18 AAC 83.010(g)(2).

The MWWTP is subject to general pretreatment regulations in subparts of 40 CFR §403 applicable to POTWs that receive wastewater from sources subject to National Pretreatment Standards (see 40 CFR 403.1 "Purpose and Applicability."). However, current conditions as regulated in this permit and the pretreatment activities already in place are sufficient to manage the discharge. The Department is not requiring State approval of a pretreatment program at this time.

8.5 Standard Conditions

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

9.0 OTHER LEGAL REQUIREMENTS

9.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions. However, the Department values input from these agencies and has voluntarily contacted the agencies to notify them of the development of the permit and to obtain a list of threatened and endangered species near the discharge. On August 16, 2012 emails requesting comments from USFWS and NOAA were sent out.

DEC received a response by email on August 17, 2012 from USFWS regarding potential effects to threatened or endangered species in the vicinity of the MWWTP discharge. USFWS stated that there are no species listed under the Endangered Species Act as threatened or endangered within the jurisdiction of the Fish and Wildlife Service in Southeast Alaska.

DEC received a mailed response August 31, 2012 from NMFS regarding potential effects to threatened or endangered species in the vicinity of the MWWTP discharge. NMFS stated that two listed species are found in the vicinity of the project area. The endangered humpback whale (*Megaptera novaengliae*) can be found in nearby bodies of marine water including Fritz Cove, Lynn Canal, Favorite Channel and Saginaw Channel. The threatened eastern Distinct Population Segment of Stellar sea lion (*Eumetopias jubatus*) is also found in these areas. There are no critical habitat areas for these species designated in the vicinity of the MWWTP or its discharge area. The nearest critical habitat area, Benjamin Island, is located about 20 miles northwest of the project area in marine waters.

9.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when

a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding permitting actions; however, DEC contacted NMFS to notify them of the issuance of this permit and to obtain listings of EFH near the subject discharge.

NMFS was contacted on August 16, 2012, to confirm preliminary findings of several EFH identified in the Mendenhall River. Based on existing information provided by NMFS, the following species have been identified as having EFH in the Mendenhall River and in the vicinity downstream of the discharge (NMFS, 2012b):

- Chinook salmon (marine juvenile, marine immature, maturing adult life stages)
- Chum salmon (marine juvenile, marine immature, maturing adult life stages)
- Coho salmon (marine juvenile, marine immature, maturing adult life stages)
- Pink salmon (marine juvenile, marine immature, maturing adult life stages)
- Sockeye salmon (marine juvenile, marine immature, maturing adult life stages)

In addition, since Mendenhall River is a freshwater system, the Alaska Department of Fish and Game's (ADFG) "Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes" and associated Atlas are the appropriate documents for determining EFH in freshwaters of Alaska. The discharge and mixing zone location are not in areas of documented salmon spawning, but salmon do use the segment of the river as a migratory corridor.

9.3 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.

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.

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'.

9.4 Permit Expiration

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

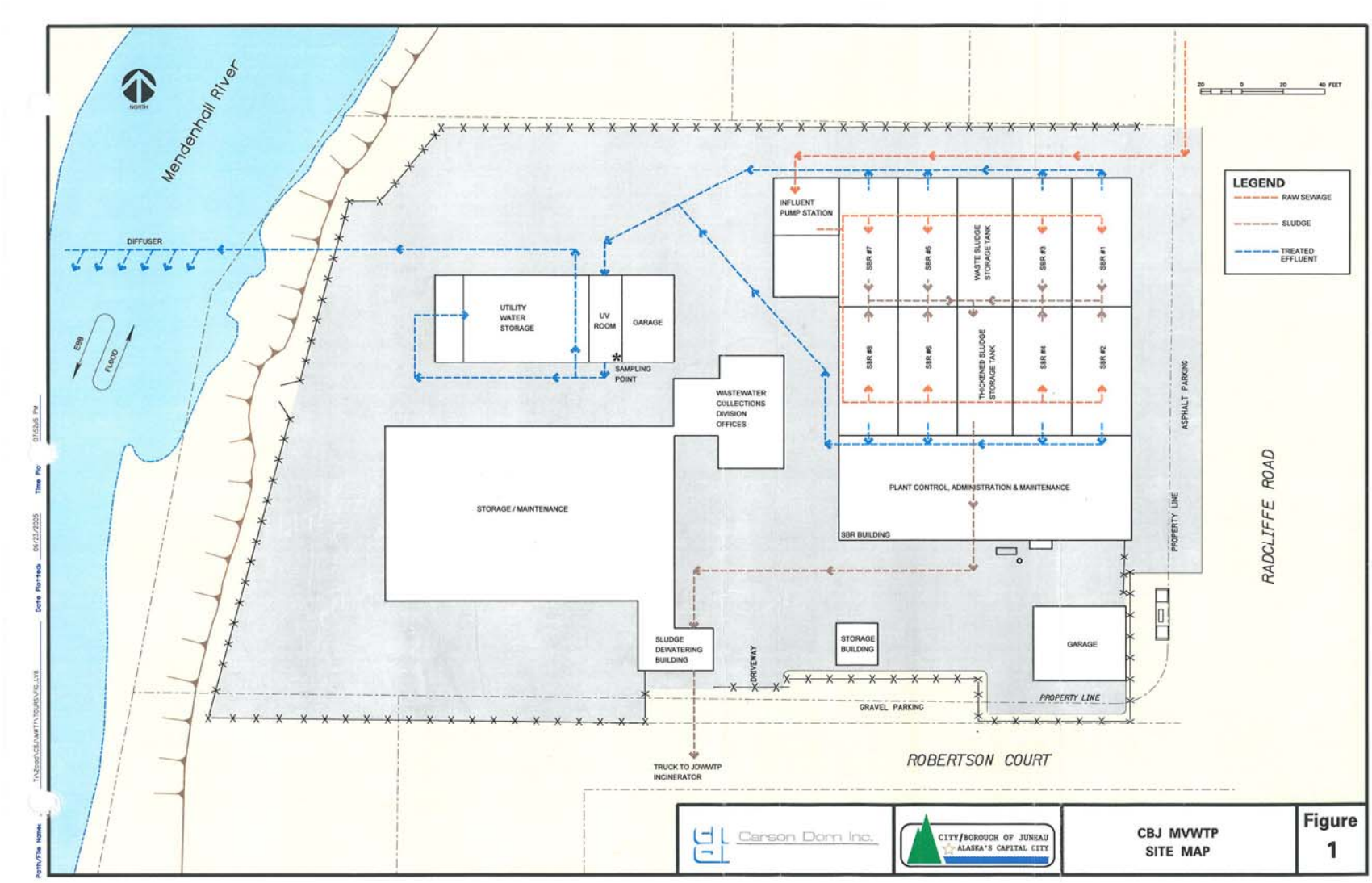
10.0 REFERENCES

1. Alaska Department of Environmental Conservation, *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.
2. Alaska Department of Environmental Conservation, *Interim Antidegradation Implementation Methods*, Policy and Procedure 05.03.103, July 14, 2010.
3. Alaska Department of Environmental Conservation, *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
4. Alaska Department of Fish and Game. (ADF&G). *Technical Report No. 11-03. Juvenile Salmonid presence in the Mendenhall River, Juneau, Alaska*. May 2011.
5. EPA 1991. *Technical Support Document for Water Quality-based Toxics Control*. US Environmental Protection Agency, Office of Water, the Department/505/2-90-001.
6. EPA April 19, 1996, *Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies*, (EPA/833/B-96-001)
7. National Marine Fisheries Service (NMFS), Alaska Region, Protected Resources Division, Email correspondence. August 16, 2012.
8. Tetra Tech, 2012. City and Borough of Juneau. Mendenhall Wastewater Treatment Plant Effluent Mixing Zone Analysis.
9. NMFS, Office of Habitat Conservation, 2012. Essential Fish Habitat Mapper. Retrieved from http://www.habitat.noaa.gov/protection/efh/habitatmapper.html

APPENDIX A. FACILITY INFORMATION

Figure 1: Mendenhall Wastewater Treatment Plant, Location Relative to Mendenhall River

Figure 2: Mendenhall Wastewater Treatment Plant Process Flow Diagram



APPENDIX B. BASIS FOR EFFLUENT LIMITS

The Clean Water Act (CWA) requires a Publicly Owned Treatment Works (POTWs) to meet effluent limits based on available wastewater treatment technology, specifically, the secondary treatment standards found in Title 40 Code of Federal Regulations (CFR) 40 CFR 133, adopted by reference in Alaska Administrative Code (AAC) 18 AAC 83.010(c)(9)(e). The Department may find, by analyzing the effect of an effluent discharge on the receiving water body, that secondary treatment effluent limits alone are not sufficiently stringent to meet State of Alaska water quality criteria found at 18 AAC 70. In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBEL), which are designed to ensure that the water quality standards (WQS) of the receiving water body are met.

Secondary treatment effluent limits for POTWs do not limit every parameter that may be present in the effluent. Technology-based effluent limits (TBEL) have only been developed for biochemical oxygen demand, 5-day (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 entering the POTW (e.g., industrial facilities, as well as residential areas may discharge into the POTW). When TBELs do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a water quality criteria for the water body. If a pollutant causes or contributes to an exceedance of a water quality criteria, a WQBEL for the pollutant must be established in the permit.

B.1 Secondary Treatment Effluent Limits

The CWA requires a POTW to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as secondary treatment, which all POTWs were required to meet by July 1, 1977. As mentioned above, the Department has adopted the secondary treatment effluent limits, which are found in 40 CFR 133.102. The secondary treatment TBELs apply to all POTWs and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133, the State of Alaska requires maximum daily limits of 60 milligrams per liter (mg/L) for BOD_5 and TSS in its own secondary treatment regulations (18 AAC 72.990). The secondary treatment standards of 40 CFR 133 are more prescriptive than the 18 AAC 72.990 standards (i.e., the 40 CFR 133 standards also include minimum percent removal requirements for BOD_5 and TSS) and are the final TBELs included in the permit as listed in Table B-1.

Table B- 1: Secondary Treatment Effluent Limits

Parameter	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Range
BOD_5	30 mg/L	45 mg/L	60 mg/L	---
TSS	30 mg/L	45 mg/L	60 mg/L	---
Removal Rates for BOD_5 and TSS	85% (minimum)	---	---	---
pH	---	---	---	6.0 – 9.0 SU [a]

Notes:
a. SU = Standard pH units

B.1.1 Mass-Based Limits

The regulation at 18 AAC 83.540 requires that effluent limits be expressed in terms of mass, if possible. The regulation at 18 AAC 83.520 requires that effluent limits for a POTW be calculated based on the design flow of the facility. The mass based limits are expressed in pounds per day (lbs/day) and for the Mendenhall Wastewater Treatment Plant (MWWTP), with a design flow of 4.9 million gallons per day (mgd), the calculations are as follows:

Mass based limit (lbs/day) = concentration limit (mg/L) × design flow (mgd) × 8.341[1]

The BOD_5 and TSS mass based limits for the permit are:

Average Monthly Limit = 30 mg/L x 4.9 (mgd) x 8.34 = 1226 lbs/day

Average Weekly Limit = 45 mg/L x 4.9 (mgd) x 8.34 = 1839 lbs/day

Maximum Daily Limit = 60 mg/L x 4.9 (mgd) x 8.34 = 2452 lbs/day

B.2 Water Quality – Based Effluent Limits

B.2.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS.
18 AAC 70.090 requires that permits include terms and conditions to ensure water quality 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 water quality criteria are met and must be consistent with any available wasteload allocation (WLA).

B.2.2 Reasonable Potential Analysis

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

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

[1] 8.341 is a conversion factor with units (lb x L) / (mg x gallon x 10^6)

B.2.3 Procedure for Deriving Water Quality-Based Effluent Limits

The *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (EPA, 1991) and the WQS recommend the flow conditions for use in calculating WQBEL using steady-state modeling. The TSD and WQS state the WQBELs intended to protect aquatic life uses should be based on the lowest seven-day average flow rate expected to occur once every ten years (7Q10) for chronic criteria and the lowest one-day average flow rate expected to occur once every ten years (1Q10) for acute criteria.

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 water quality criterion or a total maximum daily load in the receiving water body. If a mixing zone is authorized in the permit, the WQBELs apply at all points outside the mixing zone.

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

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.

B.2.4 Specific Water Quality-Based Effluent Limits

B.2.4.1 Toxic Substances

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

As discussed in Section 4.3 of the fact sheet, the Department evaluated five years of data detailing ambient receiving water and effluent concentrations of copper, lead, silver, and zinc to determine if there was reasonable potential for the metals contained in the MWWTP effluent to cause or contribute to an excursion of water quality criteria in the receiving water body. The toxicities of these four metals vary with the hardness of the water. Therefore, the water quality criteria for these metals also vary with hardness. The Department used updated hardness numbers for calculating the metals water quality criteria that are different than those used by EPA in the 2006 permit issuance and those used by the permittee in the mixing zone application. The Department's updated calculations resulted in different calculated water quality criteria. Formulas from *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances* were used to calculate applicable criteria. The hardness of the receiving water when mixed with the effluent was applied in the formulas (detailed in Tables B-2 and B-3) using the equation:

$$(E_{Hd} - R_{Hd}) / \text{dilution} + R_{Hd}$$

Where,

E_{Hd} represents effluent hardness

R_{Hd} is the predicted river hardness for a given season.

Since toxicity decreases (and numeric water quality criteria increase) as hardness increases, the 5th percentile of effluent hardness data submitted during the five years evaluated (56 mg/L) was used to represent the effluent hardness. Data shows that the ambient hardness in the Mendenhall River varies inversely to the river's flow. During low river flows the hardness is higher than hardness reported during high river flows. Because the year has been divided into two hydrological seasons due to the Mendenhall River flow rates variability, different receiving water hardness values were used for each season.

River hardness values and flow rates taken on the same day were correlated and used to predicted hardness for the 1Q10 and 7Q10 for each season. Each of the predicted hardness were then multiplied by the 5th percentile ratio of the actual hardness to the predicted hardness to get a reasonable worst-case hardness values for the 1Q10 and 7Q10 flow rates for each season.

Tables B-2 and B-3 present the calculations for metal criteria. The reasonable potential analyses for metals did not show a reasonable potential to exceed water quality criteria in the water body at the boundary of the authorized mixing zone. A summary of the reasonable potential analysis is provided in Appendix C.

Table B- 2: Calculation of Metals Criteria, November - April

Parameter		Criterion Formula	Hardness Used (mg/L)	Criterion (µg/L) [a] (as Dissolved Metal)
Copper	Acute	(exp(0.9422*ln[hardness]-1.700))*0.960	731	87.5
	Chronic	(exp(0.8545*ln[hardness]-1.702))*0.960	633	43.4
Lead	Acute	(exp(1.273*ln[hardness]-1.460))*0.501	731	515
	Chronic	(exp(1.273*ln[hardness]-4.705))*0.522	633	17.4
Silver	Acute	(exp(1.72*ln[hardness]-6.52))*0.850	731	98.4
	Chronic	NA	NA	NA
Zinc	Acute	(exp(0.8473*ln[hardness]+0.884))*0.978	731	632
	Chronic	(exp(0.8473*ln[hardness]+0.884))*0.986	633	564
Note: a. µg/L = micrograms per liter				

Table B- 3: Calculation of Metals Criteria, May - October

Parameter		Criterion Formula	Hardness Used (mg/L)	Criterion (µg/L) (as Dissolved Metal)
Copper	Acute	(exp(0.9422*ln[hardness]-1.700))*0.960	117	15.5
	Chronic	(exp(0.8545*ln[hardness]-1.702))*0.960	70	6.6
Lead	Acute	(exp(1.273*ln[hardness]-1.460))*0.769	117	76.3
	Chronic	(exp(1.273*ln[hardness]-4.705))*0.842	70	1.7
Silver	Acute	(exp(1.72*ln[hardness]-6.52))*0.850	117	4.2
	Chronic	NA	NA	NA
Zinc	Acute	(exp(0.8473*ln[hardness]+0.884))*0.978	117	134
	Chronic	(exp(0.8473*ln[hardness]+0.884))*0.986	70	87.6

B.2.4.2 Floating, Suspended or Submerged Matter, including Oil and Grease

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

B.2.4.3 pH

TBELs exist for pH as well as water quality criteria. The water quality criteria, found at 18 AAC 70.020(b)(6), for water supply, aquaculture; water contact recreation; and growth and propagation of fish, shellfish, other aquatic life, and wildlife are the most stringent standards for pH. These standards state that fresh waters, "May not be less than 6.5 or greater than 8.5."

Because pH is based on logarithms, determining a receiving water plus effluent pH concentration cannot be calculated the same as would other parameters. The calculation of pH for the mixture of the two flows is based on the procedures described in *Technical Guidance of Supplementary Stream Design Conditions for Steady State Modeling*, Environmental Protection Agency (EPA 1988).

B.2.4.4 Dissolved Oxygen

The criteria for agricultural water supply are the most stringent standards for dissolved oxygen (DO). The standards at 18 AAC 70.020(b)(3)(A)(iii) require that "DO must be greater than 7 mg/L in receiving waters; the concentration of total dissolved gas may not exceed 110% of saturation at any point of sample collection." The standards at 18 AAC 70.020(b)(3)(C) require that "DO must be greater than 7 mg/L in waters used by anadromous or resident fish. In no case may DO be less than 5 mg/L to a depth of 20 centimeters (cm) in the interstitial waters of gravel used by anadromous or resident fish for spawning. For waters not used by anadromous or resident fish, DO must be greater than or equal to 5 mg/L. In no case may DO be greater than 17 mg/L. The concentration of total dissolved gas may not exceed 110% of saturation at any point of sample collection."

B.2.4.5 Fecal Coliform Bacteria

The criteria at 18 AAC 70.020(b)(2) for waters designated for use as water supply for drinking, culinary, and food processing purposes are the most stringent standards for fecal coliform bacteria. The standards require that in a 30-day period, the geometric mean of samples may not exceed 20 colonies of fecal coliform bacteria per 100 mL (FC/100 mL), and not more than 10% of the total samples may exceed 40 FC/100 mL.

Though TBELs for fecal coliform bacteria do not exist in regulations, POTWs that employ ultraviolet (UV) disinfection have demonstrated the capability of achieving a monthly geometric mean of 400 FC/100 mL, a weekly geometric mean of 800 FC/100 mL, and a maximum daily count of 1200 FC/100 mL on a regular basis. If sufficient dilution and assimilative capacity exists in the receiving water, the fecal coliform bacteria limits

mentioned in the preceding paragraph can be applied. Following an evaluation of the previous five years of fecal coliform bacteria effluent data from the MWWTP, DEC determined that the plant can achieve more stringent limits.

For the months of November through April, the chronic mixing zone dilution of 5.6, derived from the 7Q10 river flow, has been applied to assure the 20 FC/100 mL and 40 FC/100 mL water quality criteria are met at the boundary of the mixing zone during critical conditions. This resulted in an average monthly geometric mean limit of 112 FC/100 mL, an average weekly geometric mean of 168 FC/100 mL, and a maximum daily limit of 224 FC/100 mL. For the months of May through October DEC has determined that the plant can treat wastewater to a level that can achieve a monthly geometric mean of 200 FC/100 mL, a maximum weekly geometric mean of 400 FC/100 mL, and a maximum daily count of 800 FC/100 mL. Dilution is available to meet these limits and the authorized mixing zone is as small as practicable.

B.2.4.6 Total Residual Chlorine

The MWWTP does not use chlorine for disinfection, thus there are no effluent limits for total residual chlorine in the permit. The MWWTP has not used chlorine in its treatment process since the installation of an UV disinfection system. Therefore the proposed permit no longer contains effluent limits for total residual chlorine.

B.2.4.7 Total Ammonia (as Nitrogen)

The WQS contain criteria for the protection of aquatic life from the toxic effects of ammonia. Because the Mendenhall River is known to be a migratory corridor for salmonids, ammonia criteria has been applied which are protection of salmonids, including early life stages. The criteria for ammonia is dependent on pH and temperature because the fraction of ammonia present as the toxic, unionized form increases with increasing pH and temperature; therefore, the ammonia criteria are also pH and temperature dependent. Receiving water data for temperature and pH collected from August 2008 through July 2013 were evaluated. The 85th percentile for pH, for the entire year (7.6 SU) was used to represent reasonable worst-case conditions. The chronic ammonia criterion for water with fish early life stages present is a function of both pH and temperature; however, only temperatures greater than 14 degrees Celsius (^{O}C) affect the criterion. The temperature of the Mendenhall River is consistently below 14 ^{O}C and a single pH is used to represent the worst-case condition for the entire year. As a result, the chronic criterion for total ammonia does not have seasonal variation. Ammonia acute criterion is based on pH only. With a single pH representing the worst-case condition for the year, the acute criterion also does not have seasonal variation.

Data collected by the permittee from August 2008 through July 2013 were evaluated to determine whether there was reasonable potential for ammonia to cause or contribute to an exceedance of the criteria. Ammonia concentrations exceed the applicable water quality criteria at the end of the pipe; however, no reasonable potential was found for ammonia at the boundary of the authorized chronic or acute mixing zones. The permit continues to require monthly monitoring of ammonia throughout the year and permit limits set in the 2006 permit for the months of November through April have been retained as the plant has demonstrated the ability to meet the ammonia limits as well as to meet the requirements of 18 AAC 83.480 stating that effluent limitations, standards, or conditions must be at least as

stringent as the final effluent limitations, standards, or conditions in the previous permit. Ammonia limits for the month of May have been removed, which is discussed in Section 4.3 and Section 6.0 of this document.

Table B-4 details the equations used to determine water quality criteria for ammonia and Section B.2.4.11 and Table B-8 summarizes the selection of limits.

Table B- 4: Water Quality Criteria for Ammonia

	Acute Criteria	Chronic Criteria
Equations	$\frac{0.275}{1+10^{7.204-pH}}+\frac{39}{1+10^{pH-7.204}}$	$\left[\frac{0.0577}{1+10^{7.688-pH}}+\frac{2.487}{1+10^{pH-7.688}}\right]\times MIN\left(2.85, 1.45\times 10^{0.028\times(25-T)}\right)$
Results	11.4 mg/L	3.98 mg/L

B.2.5 Selection of Most Stringent Limits

B.2.5.1 BOD_5 and TSS

The permit proposes technology-based effluent limits for BOD_5 and TSS.

B.2.5.2 pH

Water quality criteria for pH, between 6.5 SU and 8.5 SU, are the most stringent WQBELs for pH and shall be applied at the end of the pipe during the months of November through June. During the months of July through October the minimum daily limit has been reduced to 6.3 SU based on plant performance. This minimum daily limit is still above TBEL mandated limit for pH of 6.0 SU and pH water quality criteria will be met at the boundary of the mixing zone.

Table B- 5: Selection of pH Permit Limits, November - June

	Minimum Daily (SU)	Maximum Daily (SU)
Technology Based Limits	6.0	9.0
Water Quality-Based Limits	6.5	8.5
Selected Limits	6.5	8.5

Table B- 6: Selection of pH Permit Limits, July - October

	Minimum Daily (SU)	Maximum Daily (SU)
Technology Based Limits	6.0	9.0
Water Quality-Based Limits	6.3	8.5
Selected Limits	6.3	8.5

B.2.5.3 Fecal Coliform Bacteria

A monthly geometric mean of 200 FC/100 mL, a weekly geometric mean of 400 FC/100 mL, and a maximum daily count of 800 FC/100 mL are appropriate limits for the MWWTP for the months of May through October when high river flows supply the necessary dilution to be protective of the applicable water quality criteria. From November through April, the Department determined that more stringent fecal coliform bacteria effluent limits are necessary due to the lower river flows. This determination is consistent with the 2006 permit.

Table B- 7: Selection of Fecal Coliform Bacteria Permit Limits

	Average Monthly (FC/100 mL)	Average Weekly (FC/100 mL)	Maximum Daily (FC/100 mL)
UV-Based Limits	400	800	1200
Selected Limits November - April	112	------	224
Selected Limits May - October	200	400	800

B.2.5.4 Ammonia

WQBEL for ammonia were calculated for the months of November through April using updated data collected during the previous permit cycle. These newly calculated limits were then compared to those limits set in the 2006 permit and the more stringent limits have been applied in the 2014 permit.

Table B- 8: Selection of Effluent Ammonia Limits for November - April

	Average Monthly Limit (mg/L)	Maximum Daily Limit (mg/L)
2006 Permit Limits	28.5	48.0
WQBEL	29.5	40.5
Selected Limits	28.5	40.5

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 to cause or contribute to a violation of Alaska Water Quality Standards (WQS). The Department used the process described in the *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (Environmental Protection Agency (EPA), 1991) and DEC's guidance, *Reasonable Potential Procedure for Water Quality-Based Effluent Limits*, *APDES Permit* (January 2009) to determine the reasonable potential for any pollutant to exceed a water quality criterion.

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

C.1 Mass Balance

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

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

where,

C_d = Receiving water body concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = 95th percentile measured receiving water body upstream concentration

Q_d = Receiving water body flow rate downstream of the effluent discharge = $Q_e + Q_u$

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

Q_u = Receiving water body low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

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 stream. If a mixing zone based on a percentage of the critical flow in the receiving stream is authorized based on the assumption of incomplete mixing with the receiving water body, the equation becomes:

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

where MZ is the fraction of the receiving water body 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 water body 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 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 water quality standard, the discharge cannot cause or contribute to a water quality violation for that pollutant. In this case, the mixing or dilution factor (% MZ) is equal to zero and the mass balance equation is simplified to $C_d = C_e$.

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

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

After the dilution factor simplification, this becomes:

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

If the criterion is expressed as dissolved metal, the effluent concentrations are measured in total recoverable metal and must be converted to dissolved metal as shown in Equation C-7.

$$C_d = \left[\frac{CF \times C_e - C_U}{D}\right] + C_U \quad \text{(Equation C-7)}$$

Where C_e is expressed as total recoverable metal, C_u and C_d are expressed as dissolved metal, and CF is a conversion factor used to convert between dissolved and total recoverable metal. Equations C-6 and C-7 are the forms of the mass balance equation which were sued to determine reasonable potential and calculated wasteload allocations.

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 95th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving water body concentration.

Since there are a limited number of data points available, the 95th percentile is calculated by multiplying the maximum reported effluent concentration by a "reasonable potential multiplier" (RPM). The RPM is the ratio of the 99th percentile concentration to the maximum reported effluent concentration and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from 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.

Using the equations in Section 3.3.2 of the TSD, the RPM for chronic whole effluent toxicity (WET) is calculated as follows.

The percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - confidence\ level)^{1/n} \quad \text{(Equation C-8)}$$

Where,

p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 95% = 0.95

The data set contains 10 WET effluent samples, therefore:

$$p_{10} = (1 - 0.95)^{1/10}$$

$$p_{10} = 0.741$$

This means that we can say, with 95% confidence that the maximum reported effluent chronic WET concentration is greater than the 74th percentile.

The RPM is the ratio of the 95th percentile concentration (at the 95% confidence level) to the maximum reported effluent concentration. This is calculated as follows:

$$RPM = \frac{C_{95}}{C_p} \quad \text{(Equation C-9)}$$

Where,

$$C = e^{(z\sigma - 0.5\sigma^2)} \quad \text{(Equation C-10)}$$

Where,

$$\sigma^2 = \ln(CV^2 + 1) \quad \text{(Equation C-11)}$$

$$\sigma = \sqrt{\sigma^2}$$

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

z = the inverse of the normal cumulative distribution function at a given percentile

In the case of chronic WET:

CV = coefficient of variation = 0.261

$\sigma^2 = \ln(CV^2 + 1) = 0.066$

$\sigma = \sqrt{\sigma^2} = 0.26$

$Z_{95} = 1.64$ for the 95th percentile

$Z_{74} = 0.647$ for the 74 percentile (from z-table)

$C_{95} = \exp(1.64 \times 0.26 - 0.5 \times 0.066) = 1.48$

$C_{74} = \exp(0.647 \times 0.26 - 0.5 \times 0.066) = 1.14$

$RPM = C_{95}/C_{74} = 1.48/1.14$

RPM = 1.29

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

$$C_e = (RPM) \times (MRC) \quad \text{(Equation C-12)}$$

Where,

MRC = Maximum Reported Concentration

In the case of chronic WET,

C_e = (1.29)(5 toxic units, chronic (TUc)) = 6.45 or 6.5 TUc (maximum projected effluent concentration)

Comparison with ambient criteria for chronic toxicity

In order to determine if reasonable potential exists for this discharge to violate the ambient criteria, the highest projected concentrations at the boundary of the mixing zone are compared with the ambient criteria. During the months of November through April, the available mixing zone dilution is 5.6. For chronic WET:

Maximum projected effluent concentration (6.45 TUc) / available dilution (5.6) = 1.15 TUc

Chronic: 1.15 TUc > 1.0 TUc (chronic WET criteria) **YES**, there is a reasonable potential to violate

Since there is a reasonable potential for the effluent to cause an exceedance of chronic toxicity water quality criterion for protection of aquatic life, a water quality-based effluent limit for chronic toxicity is required. See Appendix D for that calculation.

C.3 Upstream (Ambient) Concentration of Pollutant

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 used as an estimate of the worst case. Data collected from monitoring locations upstream above the boundary of the authorized mixing zone were used to represent ambient concentrations for ammonia, metals, and fecal coliform bacteria. There is not data available for chronic WET concentrations in the ambient receiving water, thus, it is assumed that ambient concentrations of chronic WET is zero. These values were used in the reasonable potential analyses.

Table C-1 summarizes the calculation of the maximum project effluent concentration. Tables C-2 and C-3 show the comparison of the maximum projected effluent concentrations to their respective criteria with the appropriate dilution applied. The most stringent criterion is the lower of the acute and the chronic criteria.

Table C- 1: Calculating Maximum Projected Effluent Concentration

Parameter	Units	Max. Reported Effluent Conc. [a]	Number of Samples	CV	RPM	Max Projected Effluent Conc. (C_e) [a]	Conversion Factor	Max Projected Effluent Metals Conc. (C_e) [b]
Total Ammonia as Nitrogen	mg/L [c]	25	59	0.225	1.0 [d]	25	-----	-----
Copper -Acute	µg/L [e]	36.9	60	0.273	1.0 [d]	36.9	0.960	35.4
-Chronic	µg/L	36.9	60	0.273	1.0 [d]	36.9	0.960	35.4
Lead -Acute	µg/L	1.44	15	0.451	1.37	1.97	0.571	1.12
-Chronic	µg/L	1.44	15	0.451	1.37	1.97	0.537	1.05
Silver -Acute	µg/L	1.0	15	0.424	1.35	1.35	0.850	1.15
Zinc -Acute	µg/L	50	15	0.417	1.34	67	0.978	65.5
-Chronic	µg/L	50	15	0.417	1.34	67	0.986	66.1
Fecal Coliform Bacteria	FC/100 mL [f]	675	463	2.545	1.0 [d]	675	-----	-----
Chronic WET	TUc	5.0	10	0.261	1.29	6.46	-----	-----

Notes:

a. Metals as total recoverable
b. Metals converted to dissolved
c. mg/L = milligrams per liter
d. A calculated multiplier of less than 1.0 has been set equal to 1.0 because the RPA is used to statistically predict a possible maximum concentration in the future.
e. µg/L = micrograms per liter
f. FC/100 mL = colonies of fecal coliform bacteria per 100 mL

Table C- 2: Reasonable Potential Determination, November - April

Parameter	Maximum Projected Effluent Conc. (C_e) [a]	Effluent Flow (Q_e) cfs [b]	Upstream Conc. (C_u) [a]	Receiving Water Flow (Q_u) cfs	Dilution Ratio (D) [c]	Maximum Conc. at Boundary of Mixing Zone (C_d) [a]	Criterion Aquatic Life Fresh Water [a]	Does C_d Exceed Criteria ?
Total Ammonia as N – chronic (mg/L)	25	7.58	0.4	49	7.5	3.7	3.98	No
Total Ammonia as N – acute (mg/L)	25	7.58	0.4	30	5.0	5.3	11.4	No
Copper – chronic (µg/L)	35.4	7.58	5.15	35	5.6	10.6	43.4	No
Copper – acute (µg/L)	35.4	7.58	5.15	30	5.0	11.2	87.5	No
Lead – chronic (µg/L)	1.12	7.58	0.22	35	5.6	0.4	17.4	No
Lead – acute (µg/L)	1.05	7.58	0.22	30	5.0	0.4	515	No
Silver – acute (µg/L)	1.15	7.58	0.10	30	5.0	0.3	98.4	No
Zinc – chronic (µg/L)	65.5	7.58	4.98	35	5.6	15.9	564	No
Zinc – acute (µg/L)	66.1	7.58	4.98	30	5.0	17.1	632	No

Fecal Coliform Bacteria (FC/100mL)	675	7.58	9.2	35	5.6	128	20	Yes
Chronic WET (TUc)	6.46	7.58	0	35	5.6	1.15	1.0	Yes

Notes:
a. All metals concentrations are as dissolved
b. Flow daily maximum limit is 4.9 million gallons per day (mgd) = 7.58 cubic feet per second (cfs)
c. See Section 5.4 and Table 8 of this document for discussion on the dilution ratio used.

Table C- 3: Reasonable Potential Determination, May - October

Parameter	Maximum Projected Effluent Conc. (C_e) [a]	Effluent Flow (Q_e) cfs [b]	Upstream Conc. (C_u) [a]	Receiving Water Flow (Q_u) cfs	Dilution Ratio (D) [c]	Maximum Conc. at Boundary of Mixing Zone (C_d) [a]	Criterion Aquatic Life Fresh Water [a]	Does C_d Exceed Criteria?
Total Ammonia as N – chronic (mg/L)	25	7.58	0.4	561	35	1.1	3.98	No
Total Ammonia as N – acute (mg/L)	25	7.58	0.4	183	18	1.8	11.4	No
Copper – chronic (µg/L)	35.4	7.58	5.15	292	35	6.0	6.6	No
Copper – acute (µg/L)	35.4	7.58	5.15	183	18	6.8	15.5	No
Lead – chronic (µg/L)	1.12	7.58	0.22	292	35	0.26	1.7	No
Lead – acute (µg/L)	1.05	7.58	0.22	183	18	0.29	76	No
Silver – acute (µg/L)	1.15	7.58	0.10	183	18	0.13	4.2	No
Zinc – chronic (µg/L)	65.5	7.58	4.98	292	35	6.7	87.6	No
Zinc – acute (µg/L)	66.1	7.58	4.98	183	18	8.4	134	No
Fecal Coliform Bacteria (FC/100mL)	675	7.58	9.2	292	35	28	20	Yes
Chronic WET (TUc)	6.46	7.58	0	292	35	0.18	1.0	No

Notes:
a. All metals concentrations are as dissolved
b. Flow daily maximum limit is 4.9 mgd = 7.58 cfs
c. See Section 5.4 and Table 8 of this document for discussion on the dilution ratio used.

APPENDIX D. EFFLUENT LIMIT CALCULATION

Once the Alaska Department of Environmental Conservation (the Department or DEC) determines that the effluent has a reasonable potential to exceed a water quality criterion, a water quality-based effluent limit (WQBEL) for the pollutant is developed. The first step in calculating a permit limit is development of a waste load allocation (WLA) for the pollutant.

D.1 Mixing Zone-based WLA

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

Acute and chronic aquatic life standards apply over different time frames and may have different mixing zones; therefore it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. 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.2 "End-of-Pipe" WLAs

In many cases, there is no dilution available, either because the receiving water body exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee's discharge does not contribute to an exceedance of the criterion. 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.3 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (Environmental Protection Agency (EPA), 1991) to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability using the coefficient of variation (CV), sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.

The maximum daily limit is based on the CV of the data and the probability basis, while the average monthly limit is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95 percent for average monthly limit calculation and 99 percent for the maximum daily limit calculation.

The following is a summary of the steps to derive water quality-based effluent limits for pollutants that have a reasonable potential to exceed water quality criteria. Chronic whole effluent toxicity (WET) is used as an example.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic WLAs (WLA_{acute} or $WLA_{chronic}$) using the following equation:

1. $Q_d C_d = Q_e C_e + Q_u C_u$

Q_d = downstream flow = $Q_u + Q_e$
C_d = aquatic life criteria that cannot be exceeded downstream
Q_e = effluent flow
C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = upstream flow
C_u = upstream background concentration of pollutant

Rearranging the above equation to determine the effluent concentration (C_e) or WLA results in the following:

2. $$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e} = \frac{C_d(Q_u + Q_e) - Q_u C_u}{Q_e}$$

when C_u is zero, this equation becomes:

3. $$C_e = WLA = \frac{Q_d C_d}{Q_e}$$

With a dilution factor of 5.6, the equation becomes

4. WLA = 5.6 * C_d

For example, for chronic WET for the chronic WLA, the calculation is:

$C_e = WLA_{chronic} = 5.6 * 1.0 = 5.6$

Only chronic WET is being calculated so there is no acute WLA:

$C_e = WLA_{acute} =$

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

LTA_{acute} and $LTA_{chronic}$ concentrations are calculated from the acute and chronic WLAs using the following equations:

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$\sigma^2 = \ln(CV^2 + 1)$

z = 2.326 for 99th percentile probability basis

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

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

z = 2.326 for 99th percentile probability basis

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

The calculations for chronic WET are provided below. Only chronic toxicity is being calculated because there is only chronic water quality criterion for WET.

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$$\sigma^2 = \ln\left(\frac{0.261^2}{4} + 1\right)$$

$$\sigma^2 = 0.0169$$

$$z = 2.326 \; for \; 99^{th} \; percentile \; probability \; basis$$

$$LTA_{chronic} = 4.2$$

Step 3 - Most Limiting LTA

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limits. In the example of chronic WET the $LTA_{chronic}$ is the more limiting. The TSD recommends using the 95th percentile for the average monthly limit (AML) and the 99th percentile for the maximum daily limit (MDL).

Step 4 - Calculate the Permit Limits

The MDL and the AML are calculated as follows:

$$MDL = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

z = 2.326 for 99th percentile probability basis

CV= coefficient of variation

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

z = 1.64 for 95th percentile probability basis

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

n = number of sampling events required per month

The MDL and the AML for chronic WET are calculated as follows:

$$MDL = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$\sigma^2 = \ln(CV^2 + 1)$

$\sigma^2 = \ln(0.261^2 + 1)$

$\sigma^2 = 0.066$

$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$

CV = coefficient of variation

MDL = 7.4 TUc

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

$$\sigma^2 = \ln\left(\frac{0.261^2}{4} + 1\right)$$

$\sigma^2 = 0.0169$

$z = 1.645\ for\ 95^{th}\ percentile\ probability\ basis$

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

n = number of sampling events required per month for chronic toxicity is the default of 4.

AML = 5.1 TUc

Table D- 1: Summary of Effluent Limit Calculations

Parameter	Season	Units	Most Stringent WQS	Dilution	CV	$WLA_{chronic}$	$LTA_{limiting}$	MDL	AML
Chronic WET	November – April	TUc	1.0	5.6	0.261	5.6	4.2	-----	5.1
Ammonia	November – April	mg/L	3.98	7.5	0.225	27	25	40.5	29.5

Calculated ammonia WQBELs for the months of November through April were compared to limits imposed in the 2006 permit and the more stringent limits were applied in the 2014 permit. See Table B-8 of the fact sheet for the comparison and selection of ammonia limits.

A reasonable potential analysis of effluent copper concentrations resulted in a determination that though applicable water quality criteria for copper was exceeded at the point of discharge, there is no reasonable potential for copper to exceed or contribute to an exceedance of water quality criteria at the boundary of the authorized mixing zone. WQBELs for copper, based on data collected during the 2006 permit cycle, were not applied in this permit because calculated limits were less stringent than those imposed in the 2006 permit. Copper limits from the 2006 permit are applied in the 2014 permit.

Fecal coliform bacteria limits for the months of November through April were calculated using the water quality criterion as a geometric mean, 20 FC/100 mL, and the critical dilution factor for this time period of 5.6. 18 AAC 83.530 states that discharge permit effluent limits must, unless impracticable, be stated as an average weekly and average monthly discharge limitations for a POTW. Due to the lack of guidance available for calculating weekly geometric mean limits for bacteria, the weekly geometric mean for fecal coliform bacteria in this permit follows the precedent set by the secondary treatment standards at 18 AAC 83.605 for BOD_5 and TSS. The weekly average limit equals 1.5 times the calculated monthly average limit. For this permit:

Fecal coliform bacteria weekly geometric mean limit = 1.5 X 112 FC/100 mL = 168 FC/100 mL.

APPENDIX E. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

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.

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving water body (e.g. flow and flushing rates) - Permit writer performs modeling exercise and documents analysis in Fact Sheet at: ►APPENDIX C ►Section 5.4 Mixing Zone Analysis - describe what was done to reduce size.	•Technical Support Document for Water Quality Based Toxics Control •Fact Sheet, Appendix C •Fact Sheet, Appendix D • 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)	Y
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet at Section 5.4 Mixing Zone Analysis. Attach additional documents if necessary.		18 AAC 70.240 (a)(3)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	• Fact Sheet Section 5.1	18 AAC 70.255(f)	Y
Existing Use	Does the mixing zone…	Fact Sheet Section 5.4, Mixing Zone Analysis, Existing Use		
	(1) partially or completely eliminate an existing use of the water body outside the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the water body? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the water body to ensure full protection of uses of the water body outside the proposed mixing zone? **If no, then mixing zone prohibited.**		18 AAC 70.250(a)(3)	Y
	(4) cause an environmental effect or damage to the ecosystem that the department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**		18 AAC 70.250(a)(4)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Human Consumption	Does the mixing zone…	Fact Sheet Section 5.4, Mixing Zone Analysis, Human Consumption		
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(2)	
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…	Fact Sheet Section 5.4, Mixing Zone Analysis, Spawning Areas		
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**		18 AAC 70.255 (h)	Y
Human Health	Does the mixing zone…	Fact Sheet Section 5.4, Mixing Zone Analysis, Human Health		

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**		18 AAC 70.250 (a)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**			Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**		18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**		18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…	Fact Sheet Section 5.4, Mixing Zone Analysis, Aquatic Life and Wildlife		
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(2)(A-C)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**			Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**			Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**		18 AAC 70.250(b)(1)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(2)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Section 5.4, Mixing Zone Analysis, Endangered Species Applicant or permit writer requests list of T/E spp from USFWS prior to drafting permit conditions.	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y