Fact Sheet

The U.S. Environmental Protection Agency (EPA)
Proposes to Reissue a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants Pursuant to the Provisions of the Clean Water Act (CWA) to:

Denali National Park
Front Country Wastewater Treatment Plant

Public Comment Start Date: March 8, 2019
Public Comment Expiration Date: April 8, 2019

Technical Contact: John Drabek, P.E.
U.S. EPA Region 10
NPDES Permits Unit
206-553-8257
Drabek.john@epa.gov

The EPA Proposes To Reissue NPDES Permit
The EPA proposes to reissue the NPDES permit for the facility referenced above. The draft permit places conditions on the discharge of pollutants from the wastewater treatment plant 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.

This Fact Sheet includes:
- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions for the facility
- a map and description of the discharge location
- technical material supporting the conditions in the permit

State Certification
Since the U.S. has exclusive jurisdiction within Denali National Park, a Clean Water Act (CWA) Section 401 Certification from the Alaska Department of Environmental Conservation (ADEC) is not required to issue a final permit. However, as a downstream state, the EPA has provided the permit and fact sheet to ADEC pursuant to CWA Section 401(a)(2).

Public Comment
Persons wishing to comment on, or request a Public Hearing for the draft permit for this facility may do so in writing by the expiration date of the Public Comment period. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearings must be in writing and

should be submitted to the EPA as described in the Public Comments Section of the attached Public Notice.

After the Public Notice expires, and all comments have been considered, the EPA's regional Director for the Office of Water and Watersheds will make a final decision regarding permit issuance. If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If substantive comments are received, the EPA will address the comments and issue the permit. The permit will become effective no less than 30 days after the issuance date, unless an appeal is submitted to the Environmental Appeals Board within 30 days pursuant to 40 CFR 124.19.

Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting the EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday at the address below. The draft permits, fact sheet, and other information can also be found by visiting the Region 10 NPDES website at

US EPA Region 10
1200 Sixth Ave, Suite 155, OWW-191
Seattle, WA 98101
(206) 553-0523 or
Toll Free 1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permits are also available at:

U.S. EPA
Alaska Operations Office Federal Building
222 West 7th Ave
Anchorage, AK 99513-7588
(907) 271-5083 or
Toll Free: 1-800-781-0983 (in Alaska)

Alaska Department of Environmental Conservation
Division of Water
610 University Ave
Fairbanks AK 99709

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Acronyms

1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
30B3	Biologically-based design flow intended to ensure an excursion frequency of less than once every three years, for a 30-day average flow.
30Q10	30 day, 10 year low flow
ACR	Acute-to-Chronic Ratio
ADEC	Alaska Department of Environmental Conservation
AML	Average Monthly Limit
ASR	Alternative State Requirement
AWL	Average Weekly Limit
BA	Biological Assessment
BAT	Best Available Technology economically achievable
BCT	Best Conventional pollutant control Technology
BE	Biological Evaluation
BO or BiOp	Biological Opinion
BOD_5	Biochemical oxygen demand, five-day
BOD_{5u}	Biochemical oxygen demand, ultimate
BMP	Best Management Practices
BPT	Best Practicable
°C	Degrees Celsius
C BOD_5	Carbonaceous Biochemical Oxygen Demand
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflow
CV	Coefficient of Variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FDF	Fundamentally Different Factor
FR	Federal Register
Gpd	Gallons per day
HUC	Hydrologic Unit Code
IC	Inhibition Concentration
ICIS	Integrated Compliance Information System
I/I	Infiltration and Inflow

LA	Load Allocation
lbs/day	Pounds per day
LTA	Long Term Average
LTCP	Long Term Control Plan
mg/L	Milligrams per liter
Ml	Milliliters
ML	Minimum Level
µg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit or Method Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
N	Nitrogen
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observable Effect Concentration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
OWW	Office of Water and Watersheds
O&M	Operations and maintenance
POTW	Publicly owned treatment works
PSES	Pretreatment Standards for Existing Sources
PSNS	Pretreatment Standards for New Sources
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
RWC	Receiving Water Concentration
SIC	Standard Industrial Classification
SPCC	Spill Prevention and Control and Countermeasure
SS	Suspended Solids
SSO	Sanitary Sewer Overflow
s.u.	Standard Units
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
TSD	Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
TSS	Total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UV	Ultraviolet
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limit

WQS	Water Quality Standards
WWTP	Wastewater treatment plant

I. Background Information

A. General Information

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

Table 1. General Facility Information

NPDES Permit Number:	AK0053775
Applicant:	Denali National Park Front Country Wastewater Treatment Lagoon
Type of Ownership	WWTP
Physical Address:	Milepost 237 Parks Highway Denali National Park, AK 99755
Mailing Address:	P.O. Box 9 Denali National Park, AK 99755
Facility Contact:	Robert Young, Utility Systems Repair Operator, 907-683-9569 robert_young@NPS.gov
Operator Name:	Denali National Park and Preserve
Facility Location:	Latitude 63.730257° N Longitude 148.892105° W
Receiving Water	Nenana River in Denali Borough, Alaska
Facility Outfall	Latitude 63.7295° N Longitude 148.8748° W

B. Permit History

The Alaska Statehood Act, Section 11 states that the U.S. shall exercise exclusive jurisdiction in the [Denali National] Park "as now or hereafter constituted." Since the U.S. has exclusive jurisdiction within Denali National Park (DNP or Denali), the EPA is the permitting authority for this facility.

The most recent NPDES permit for the DNP Front Country Wastewater Treatment Plant (WWTP or facility) was issued on September 13, 2011. The permit became effective on September 14, 2011 and expired on September 14, 2016. An NPDES application for permit issuance was submitted by the permittee on March 14, 2016. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6, the permit has been administratively extended and remains fully effective and enforceable.

II. Facility Information

A. Treatment Plant Description

Service Area

DNP owns, operates and maintains the Front Country WWTP that treats domestic sewage from the Park. The collection system has no combined sewers. The facility serves a transient population estimated at 3,000 visitors per day with 180 employees. There are no major industries discharging to the facility.

Treatment Process

The design flow of the facility is 0.11 mgd. The reported actual flows from the facility range from 0.06 to 0.091 (average monthly flow).

The majority of influent to the plant is via gravity collection, with a small quantity coming from septage truck delivery. The Dual Power Multi Cell (DPMC) lagoon system operates and discharges about 153 days per year during the summer (May-September). Wastewater is collected, stored and then discharged in a batch process. The batch discharge typically takes 3 to 5 weeks, but could take slightly more or less time. The batch discharge typically occurs in August, but can also occur in September and possibly in July. During the winter months, influent flow is diverted to a winter storage lagoon. Because discharges are sent to the water storage lagoon during winter and the facility does not discharge from October through April, discharges are authorized only from May through September.

Most flow through the DPMC system occurs via gravity. Pumping is required to return wastewater stored in the winter storage lagoon to the DPMC for additional treatment. Flow from the system is to the complete mix cell, where the majority of biological treatment occurs. Mechanical aerators mix and aerate the cell.

Flow is then sent to stabilization cells for solids separation and storage. The number of cells in series is adjustable to meet expected hydraulic changes to 2030. Flow then goes to disinfection contact piping, for treatment with sodium hypochlorite. Dechlorination is accomplished with sodium bisulfite prior to discharge. Denali is investigating the use of ultraviolet radiation to replace sodium hypochlorite for disinfection.

A schematic of the wastewater treatment process and a map showing the location of the treatment facility and discharge are included in Appendix A. Because the design flow is less than 1 mgd, the facility is considered a minor facility.

Outfall Description

The outfall is a diffuser located at the bank of the Nenana River inside the boundary of Denali National Park, at Latitude 63.7295° N, Longitude 148.8748° W.

Effluent Characterization

To characterize the effluent, the EPA evaluated the facility's application, discharge monitoring report (DMR) data, and additional data provided by the facility. The effluent quality is summarized in Table 2.

Table 2. Effluent Characterization

Parameter	Units	Maximum	Minimum
BOD, carbonaceous [5 day, 5 C]	mg/L	30	3
Chlorine, total residual	µg/L	154	0
Fecal coliform, MPN, EC med, 44.5 C	#/100 ml	11	1
Nitrogen, ammonia total [as N]	mg/L	87.6	0.4
pH		8.4	6.1
Solids, total suspended	mg/L	40	8.2
Temperature, water	deg. centigrade	21.2	16.2

Source: Monitoring from Denali 2016 - 2018

Compliance History

A summary of effluent violations is provided in Table 3.

Additional compliance information for this facility, including compliance with other environmental statutes, is available on Enforcement and Compliance History Online (ECHO). The ECHO web address for this facility is: https://echo.epa.gov/detailed-facility-report?fid=AK0053775&sys=ICP

The EPA conducted an inspection of the facility on August 21, 2014. This encompassed the wastewater treatment process, records review, operation and maintenance, and the collection system. Overall, the results of the inspection were the basis of the notice of violation and a Federal Facility Compliance Agreement (FFCA).

A FFCA between the Department of the Interior, National Park Service and the United States Environmental Protection Agency, Region 10 cited the following violations [reference CWA-10-2015-0143 dated August 2015 (FFCA)].

- Failed to properly maintain and implement comprehensive Quality Assurance Plan (QAP) procedures.
- Failed to finalize an updated QAP.
- Failed to sample the effluent for dissolved oxygen, nitrate nitrite, nitrogen, oil and grease, total dissolved solids, total Kjeldahl nitrogen and total phosphorus.
- Failed to conduct representative sampling of raw untreated sewage influent prior to storage and treatment in the winter storage cell.
- Violated the proper operation and maintenance provisions including an inoperable flow meter at the winter storage cell inlet, an inoperable grinder head, and improper calibration of the automated flow measurement equipment inside the chlorine injection vault.

- Failed to summit the dates of sample collection and analyses for flow, pH and temperature for June and September surface water sampling in 2012, 2013 and 2014.
- Failed to accurately summarize, calculate and report monitoring including total residual chlorine.
- Failed to create records that contain all of the required record elements for permit required sampling and/or analysis in 2012, 2013 and 2014.
- Failed to retain complete records of all monitoring information (e.g. sampling records, field log books and or field data sheets, laboratory bench sheets) related to sampling, analyses and DMRs.
- Failed to report exceedances of total residual chlorine (TRC).
- Between July 2012 and September 2014 the facility violated the 85% monthly removal limit for TSS 152 times.
- Between July 2012 and September 2014 the facility violated the $CBOD_5$ effluent limits 61 times.

Training of staff occurred in late 2015, QAP improvements were to be completed by November 15, 2015, and an updated QAP was to be developed and implemented by July 30, 2015. Improvement included internal procedures related to wastewater treatment facility operations, sampling and laboratory recordkeeping and updating of the QAP plans, all affecting the sampling results used in the reasonable potential analysis.

Table 3. Summary of Effluent Violations (2015 to 2018)

Parameter	Limit	Units	Number of Instances
BOD, carbonaceous [5 day, 5 C]	Weekly Average	mg/L	2
BOD, carbonaceous [5 day, 5 C]	Weekly Average	lb/d	1
BOD, carbonaceous [5 day, 5 C]	Monthly Average	mg/L	3
BOD, carbonaceous [5 day, 5 C]	Monthly Average	lb/d	2
BOD, carbonaceous, percent removal	Monthly Min	%	2
Chlorine, total residual	Daily Maximum	lb/day	2
Chlorine, total residual	Daily Maximum	ug/L	3
Chlorine, total residual	Monthly Average	lb/day	2
Chlorine, total residual	Monthly Average	ug/L	2
Fecal coliform, MPN, EC med, 44.5 C	MO GEOMN	#/100mL	2
Fecal coliform, MPN, EC med, 44.5 C	Weekly Average	#/100mL	3
Floating solids, waste or visible foam-visual	Monthly Max	N=0;Y=1	1
Flow, in conduit or thru treatment plant	Monthly Average	MGD	1
Nitrogen, ammonia total [as N]	Monthly Max	mg/L	1

Parameter	Limit	Units	Number of Instances
Oil and grease visual	Monthly Max	N=0;Y=1	1
pH	Inst Max	SU	2
pH	Inst Min	SU	2
Solids, suspended percent removal	Monthly Min	%	3
Solids, total suspended	Monthly Average	lb/d	3
Solids, total suspended	Monthly Average	mg/L	6
Solids, total suspended	Weekly Average	lb/d	1
Solids, total suspended	Weekly Average	mg/L	1

III. Receiving Water

In drafting permit conditions, the EPA must analyze the effect of the facility's discharge on the receiving water. The details of that analysis are provided later in this Fact Sheet. This section summarizes characteristics of the receiving water that impact that analysis.

A. Receiving Water

This facility discharges to the Nenana River in Denali Borough, Alaska located within Denali National Park.

B. Designated Beneficial Uses

This facility discharges to the Nenana River in the Nenana River Watershed (HUC 19040508). Even though the Alaska Water Quality Standards [18 AAC 70] do not apply directly to the waterbody, they do apply at the boundary of Denali National Park. As such, the Permit will contain requirements to assure Alaska Water Quality Standards are met. Alaska Water Quality Standards state in 18 AAC 70.050 that unless specifically designated for other uses in 18 AAC 70.230(e), all fresh waters of the State of Alaska are to be protected for the following uses:

Water supply for:

- Drinking, culinary and food processing
- Agriculture, including stock watering
- Aquaculture
- Industrial
- Contact recreation
- Growth and propagation of fish, shellfish, other aquatic life, and wildlife

C. Water Quality

The water quality for the receiving water is summarized in Table 4.

Table 4. Receiving Water Quality Data

Parameter		Units	Percentile	Value	Source
Temperature		°C	95th	12.74	Permittee
pH		Standard units	5th – 95th	8.02	Permittee
Ammonia		µg/L	maximum	1.32	Permittee

The individual data is shown below:

Monitoring Date	pH Standard units	Temperature °C	Ammonia µg/L
06/30/2014	6.2	6.3	0.26
09/30/2014	7.73	6.5	0.64
06/30/2015	7.17	14.3	0.21
09/30/2015	7.19	6.9	0.1
09/30/2016	7.35	7.2	0.1
06/30/2017	7.02	9.1	2
09/30/2017	8.14	7.1	
95th Percentile	8.02	12.7	1.3

D. Low Flow Conditions

The *Technical Support Document for Water Quality-Based Toxics Control* (hereafter referred to as the TSD) (EPA, 1991) recommends the flow conditions for use in calculating water quality-based effluent limits (WQBELs) using steady-state modeling. The TSD states that 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 and for ammonia the lowest 30 days in a 3 year period (30B3). Flow data were obtained from USGS Station 15518000, Nenana River near Healy AK, which was the station closest to the discharge point with more than ten continuous years of flow data. Flow units are cubic feet per second (cfs). Low flows were determined from EPA's DFLOW model for May through September, since Denali National Park only plans on discharging during this time period.

Critical low flows for the receiving water are summarized in Table 5. Critical Flows in Receiving Water.

Table 5. Critical Flows in Receiving Water

Season	1Q10 (CFS)	7Q10 (CFS)	30B3
Full year	237	240	220
May through September	413	483	221

Low flows are defined in Appendix B, Part C.

IV. Effluent Limitations and Monitoring

Table 6, presents the existing effluent limits and monitoring requirements.

Table 7, below, presents the proposed effluent limits and monitoring requirements in the draft permit.

Table 6. Existing Permit - Effluent Limits and Monitoring Requirements

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Parameters With Effluent Limits							
Flow, mgd	Flow	0.11	--	--	Effluent	Continuous	Recorder
Five-Day Carbonaceous Biochemical Oxygen Demand (CBOD5)	mg/L	25	40	--	Influent and Effluent	1/month	Grab
	lbs/day	22.9	36.7	--			Calculation[1]
BOD_5 Percent Removal	%	85 (minimum)	--	--	--	1/month	Calculation[2]
Total Suspended Solids (TSS)	mg/L	30	45	--	Influent and Effluent	1/month	Grab
	lbs/day	27.5	41.3	----			Calculation[1]
TSS Percent Removal	%	85 (minimum)	--	--	--	1/month	Calculation[2]
Total Residual Chlorine	µg/L	8.0	--	18.0	Effluent	Daily	Grab
	lbs/day	0.01	--	0.02		Daily	Calculation[1]
Fecal Coliform	#/100 ml	20[3]	40[3]	--	Effluent	1/month	Grab
pH	std units	Between 6.5 – 8.5			Effluent	3/week	Grab
Total Phosphorus	mg/L	--	--	--	Effluent	1/year in permit years 2, 3 and 4[4]	Grab
Nitrate plus Nitrite Nitrogen	mg/L	--	--	--	Effluent	1/year in permit years 2, 3 and 4[4]	Grab

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Total Dissolved Solids	mg/L	--	--	--	Effluent	1/year in permit years 2, 3 and 4[4]	Grab
Total Kjeldahl Nitrogen	mg/L	--	--	--	Effluent	1/year in permit years 2, 3 and 4[4]	Grab
Dissolved Oxygen	mg/L	--	--	--	Effluent	1/year in permit years 2, 3 and 4[4]	Grab
Total Ammonia (as N)	mg/L	--	--	--	Effluent	1/month	Grab
Temperature	ºC	--	--	--	Effluent	1/month	Grab

1. Loadings are calculated by multiplying the concentration in mg/L by the flow in mgd and a conversion factor of 8.34.
2. Percent removal is calculated using the following equation:
   (average monthly influent – average monthly effluent) / average monthly influent.
3. The permittee must report the geometric mean fecal coliform concentration. If any value used to calculate the geometric mean is less than 1, the permittee must round that value up to 1 for purposes of calculating the geometric mean. No more than 10% of the fecal coliform samples analyzed during a calendar month may exceed 40 FC/100 ml.
4. Monitoring required as per NPDES Permit Application Form 2A.

Table 7. Draft Permit - Effluent Limits and Monitoring Requirements

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Parameters With Effluent Limits							
Flow, mgd	Flow	0.11	--	--	Effluent	Continuous	Recorder
Five-Day Carbonaceous Biochemical Oxygen Demand (CBOD5)	mg/L	25	40	--	Influent and Effluent	1/week	Grab
	lbs/day	22.9	36.7	--			Calculation[1]
BOD_5 Percent Removal	%	85 (minimum)	--	--	--	1/month	Calculation[2]
Total Suspended Solids (TSS)	mg/L	30	45	--	Influent and Effluent	1/week	Grab
	lbs/day	27.5	41.3	----			Calculation[1]

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
TSS Percent Removal	%	85 (minimum)	--	--	--	1/month	Calculation[2]
Total Residual Chlorine[5]	µg/L	8.0		18.0	Effluent	Daily	Grab
	lbs/day	0.01		0.02			Calculation[1]
Fecal Coliform Bacteria	#/100 ml	20[3]	40[3]	--	Effluent	1/week	Grab
pH	std units	Between 6.5 – 8.5			Effluent	3/week	Grab
Total Ammonia (as N)	mg/L	2.5	5.4	--	Effluent	1/month	Grab
	lbs/day	2.3	5.0	--			
Narrative	There shall be no discharge of floating solids, visible foam in other than trace amounts, or oily wastes that produce a sheen on the surface of the receiving water.				Effluent	1/month	Visual
Report Parameters							
Permit Application Effluent Testing Data[4]	--				Effluent	1/year	--

1. Loadings are calculated by multiplying the concentration in mg/L by the flow in mgd and a conversion factor of 8.34.
2. Percent removal is calculated using the following equation:
   (average monthly influent – average monthly effluent) / average monthly influent.
3. The permittee must report the geometric mean fecal coliform concentration. If any value used to calculate the geometric mean is less than 1, the permittee must round that value up to 1 for purposes of calculating the geometric mean. No more than 10% of the fecal coliform samples analyzed during a calendar month may exceed 40 FC/100 ml.
4. Effluent Testing Data - See NPDES Permit Application Form 2A, Part B.6 for the list of pollutants to be included in this testing. The Permittee must use sufficiently sensitive analytical methods in accordance with Part I.B.5 of this permit.
5. The limits for chlorine are not quantifiable using EPA-approved analytical methods. The minimum level (ML) for chlorine is 50 µg/L for this parameter. The EPA will use 50 µg/L as the compliance evaluation level for this parameter. The permittee will be in compliance with the total residual chlorine limitations if the average monthly and maximum daily concentrations are less than 50 µg/L and the average monthly and maximum daily mass loadings are less than 0.5 lbs/day.

The changes to the permit are for pH and ammonia. The pH upper limit is reduced from 9.0 to 8.5. In addition, the EPA has added ammonia limits.

A. Basis for Effluent Limits

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available

technology. A water quality-based effluent limit is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than technology-based effluent limits.

B. Pollutants of Concern

Pollutants of concern are those that either have technology-based limits or may need water quality-based limits. The EPA identifies pollutants of concern for the discharge based on those which:

- Have a technology-based limit
- Have an assigned wasteload allocation (WLA) from a TMDL
- Had an effluent limit in the previous permit
- Are present in the effluent monitoring. Monitoring data are reported in the application and DMR and any special studies
- Are expected to be in the discharge based on the nature of the discharge

The wastewater treatment process for this facility includes both primary and secondary treatment, as well as disinfection with chlorination. Pollutants expected in the discharge from a facility with this type of treatment, include but are not limited to: five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), fecal coliform bacteria, total residual chlorine (TRC), pH and ammonia,

Based on this analysis, pollutants of concern are as follows:

- BOD_5
- TSS
- Fecal Coliform Bacteria
- TRC
- pH
- Ammonia

C. Technology-Based Effluent Limits

Federal Secondary Treatment Effluent Limits

The CWA requires POTWs to meet performance-based requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," which POTWs were required to meet by July 1, 1977. The EPA has developed and promulgated "secondary treatment" effluent limitations, which are found in 40 CFR 133.102. These technology-based effluent limits apply to certain municipal WWTPs and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. The federally promulgated secondary treatment effluent limits are listed in Table 8. For additional information and background refer to Part 5.1 *Technology Based Effluent Limits for POTWs* in the Permit Writers Manual.

Table 8. Secondary Treatment Effluent Limits

Parameter	30-day average	7-day average
BOD_5	30 mg/L	45 mg/L
TSS	30 mg/L	45 mg/L
Removal for BOD_5 and TSS (concentration)	85% (minimum)	---
pH	within the limits of 6.0 - 9.0 s.u.	
Source: 40 CFR 133.102		

$CBOD_5$

During the last permit development the permittee requested that BOD_5 be replaced with $CBOD_5$ to eliminate test interference from nitrogenous oxygen demand. The EPA replaced BOD_5 limitations (30 mg/L monthly average and 45 mg/L weekly average) with comparable $CBOD_5$ limitations (25 mg/L monthly average and 40 mg/L weekly average) as allowed at the option of the NPDES permitting authority per 40 CFR 133.102(a)(4). $CBOD_5$ is continued as the parameter to measure oxygen demand.

Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, except under certain conditions. The regulation at 40 CFR 122.45(b) requires that effluent limitations for POTWs be calculated based on the design flow of the facility.

The mass based limits are expressed in pounds per day and are calculated as follows:

Mass based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.34[1]

Since the design flow for this facility is 0.11 mgd, the technology based mass limits for BOD_5 and TSS are calculated as follows:

BOD_5

Average Monthly Limit = 25 mg/L × 0.11 mgd × 8.34 = 22.9 lbs/day

Average Weekly Limit = 40 mg/L × 0.11 mgd × 8.34 = 36.7 lbs/day

TSS

Average Monthly Limit = 30 mg/L × 0.11 mgd × 8.34 = 27.5 lbs/day

Average Weekly Limit = 45 mg/L × 0.11 mgd × 8.34 = 41.3 lbs/day

[1] 8.34 is a conversion factor with units (lb ×L)/(mg × gallon×10^6)

D. Water Quality-Based Effluent Limits

Statutory and Regulatory Basis

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards. Discharges to State or Tribal waters must also comply with limitations imposed by the State or Tribe as part of its certification of NPDES permits under section 401 of the CWA. The NPDES regulation 40 CFR 122.44(d)(1) implementing Section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State or Tribal water quality standard, including narrative criteria for water quality. Effluent limits must also meet the applicable water quality requirements of affected States other than the State in which the discharge originates, which may include downstream States (40 CFR 122.4(d), 122.44(d)(4), see also CWA Section 401(a)(2)).

The regulations require the permitting authority to make this evaluation using procedures which 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. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation for the discharge in an approved TMDL. If there are no approved TMDLs that specify wasteload allocations for this discharge; all of the water quality-based effluent limits are calculated directly from the applicable water quality standards.

Reasonable Potential Analysis and Need for Water Quality-Based Effluent Limits

The EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (*TSD*) to determine reasonable potential. 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 EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit.

In some cases, a dilution allowance or mixing zone is permitted. A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and within which certain water quality criteria may be exceeded (EPA, 2014). While the criteria may be exceeded within the mixing zone, the use and size of the mixing zone must be limited such that the waterbody as a whole will not be impaired, all designated uses are maintained and acutely toxic conditions are prevented.

The equations used to conduct the reasonable potential analysis and calculate the water quality-based effluent limits are provided in Appendix B. Only data following the corrective actions by Denali for the FFCA were used (i.e. 2016-2018). This is because the FFCA caused improvements in the QAP that could affect both effluent and surface water monitoring values due to sample handling, preservation and holding time requirements

Reasonable Potential and Water Quality-Based Effluent Limits

The reasonable potential and water quality-based effluent limit for specific parameters are summarized below. The calculations are provided in Appendix C.

Ammonia

Ammonia criteria are based on a formula which relies on the pH and temperature of the receiving water, because the fraction of ammonia present as the toxic, un-ionized form increases with increasing pH and temperature. Therefore, the criteria become more stringent as pH and temperature increase. The table below details the equations used to determine water quality criteria for ammonia. The analysis is based on six samples.

Table 9. Ammonia Criteria

Total ammonia nitrogen criteria (mg N/L):
Annual Basis
Based on IDAPA 58.01.02

INPUT	
1. Receiving Water Temperature (deg C):	12.7
2. Receiving Water pH:	8.02
3. Is the receiving water a cold water designated us	Yes
4. Are non-salmonid early life stages present or abse	Present
OUTPUT	
Total ammonia nitrogen criteria (mg N/L):	
Acute Criterion (CMC)	**5.41**
Chronic Criterion (CCC)	**2.36**

Acute Criteria Equation: Cold Water

$$CMC = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$$

Acute Criteria Equation: Warm Water

$$CMC = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$$

Chronic Criteria: Cold Water, Early Life Stages Present

$$CCC = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \bullet MIN(2.85, 1.45 \cdot 10^{0.028(25-T)})$$

Chronic Criteria: Cold Water, Early Life Stages Absent

$$CCC = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \bullet 1.45 \cdot 10^{0.028(25-T)})$$

A mixing zone for ammonia was not considered in evaluating the impact of the discharge on the receiving water because of the erratic effluent quality (0.4 mg/L to 87.4 mg/L) that in some cases exceeds what would be expected in untreated wastewater. A reasonable potential calculation showed that the facility discharge would have the reasonable potential to cause or contribute to a violation of the water quality criteria for ammonia. Therefore, the draft permit contains water quality-based effluent limits for ammonia. See Appendices B and C for reasonable potential and effluent limit calculations for ammonia.

pH

The most stringent water quality criterion for pH is for the protection of aquatic life and aquaculture water supply. The pH criteria for these uses state that the pH must be no less than 6.5 and no greater than 8.5 standard units. Mixing zones are generally not granted for pH, therefore the most stringent water quality criterion must be met before the effluent is discharged to the receiving water. Therefore the most stringent water quality criterion must be met before the effluent is discharged to the receiving water. The draft permit requires that the effluent have a pH of no less than 6.5 and no greater than 8.5 standard units. Out of 16 reported values only one pH value was outside this range.

Fecal Coliform

As stated in the fact sheet for the existing Denali permit, the Environmental Assessment prepared for the facility, March 2008, notes that the facility is making a commitment to meet drinking water standards (p. 51). Alaska drinking water quality standards for fecal coliform

require that in a 30 day period, the geometric mean may not exceed 20 FC/100 ml, and not more than 10% of the samples can exceed 40 FC/100 ml. Therefore, the draft permit requires that the effluent comply with a monthly geometric mean of 20 FC/100 ml and a weekly geometric mean of 40 FC/100 ml.

Chlorine

The Alaska Water Quality Standards establish an acute criterion of 19 µg /L, and a chronic criterion of 11 µg/L for the protection of aquatic life. A reasonable potential calculation showed that the discharge from the facility would not have the reasonable potential to cause or contribute to a violation of the water quality criteria for chlorine. See Appendix C.

Residues

The Alaska Water Quality Standards require that surface waters of the State be free from floating, suspended or submerged matter of any kind in concentrations impairing designated beneficial uses. The draft permit contains a narrative limitation prohibiting the discharge of such materials.

E. Antibacksliding

Section 402(o) of the Clean Water Act and federal regulations at 40 CFR §122.44 (l) generally prohibit the renewal, reissuance or modification of an existing NPDES permit that contains effluent limits, permit conditions or standards that are less stringent than those established in the previous permit (i.e., anti-backsliding) but provides limited exceptions. For explanation of the antibacksliding exceptions refer to Chapter 7 of the Permit Writers Manual *Final Effluent Limitations and Anti-backsliding*.

None of the exceptions to anti-backsliding apply to Denali. Further, Denali has attained the existing chlorine limits and is assessing switching to ultraviolet radiation for disinfection. Therefore the existing chlorine limits remain unchanged in the reissued permit.

V. Monitoring Requirements

A. Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality.

The permit also requires the permittee to perform effluent monitoring required by the NPDES Form 2A application, so that these data will be available when the permittee applies for a renewal of its NPDES permit.

The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for renewal, as appropriate, to the EPA.

B. Effluent 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. Permittees have the option of taking more frequent samples than are required

under the permit. These samples must be used for averaging if they are conducted using the EPA-approved test methods (generally found in 40 CFR 136) or as specified in the permit.

Monitoring Changes from the Previous Permit

Since the Nenana River is fully supporting designated uses including temperature effluent monitoring for temperature is discontinued.

Monitoring for BOD_5, TSS and ammonia is increased from once per month to once per week to increase the quality of the wastewater characterization and to insure compliance with the weekly effluent limitations.

The Nenana River has been characterized for flow, pH, temperature, total ammonia as nitrogen and fecal coliform during the last permit cycle. Therefore receiving water monitoring has been discontinued.

C. Electronic Submission of Discharge Monitoring Reports

The draft permit requires that the permittee submit DMR data electronically using NetDMR. NetDMR is a national web-based tool that allows DMR data to be submitted electronically via a secure Internet application.

The EPA currently conducts free training on the use of NetDMR. Further information about NetDMR, including upcoming trainings and contacts, is provided on the following website: https://netdmr.epa.gov. The permittee may use NetDMR after requesting and receiving permission from EPA Region 10.

VI. Sludge (Biosolids) Requirements

The EPA separates wastewater and sludge permitting. The EPA has authority under the CWA to issue separate sludge-only permits for the purposes of regulating biosolids. The EPA may issue a sludge-only permit to each facility at a later date, as appropriate.

Until future issuance of a sludge-only permit, sludge management and disposal activities at each facility continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program. The Part 503 regulations are self-implementing, which means that facilities must comply with them whether or not a permit has been issued.

VII. Other Permit Conditions

A. Quality Assurance Plan

The facility is required to update the Quality Assurance Plan (QAP) within 180 days of the effective date of the final permit. The Quality Assurance Plan must include of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting. The plan must be retained on site and be made available to the EPA upon request.

B. Operation and Maintenance Plan

The permit requires the facility 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 and implement an operation and maintenance plan for their facility within 180 days of the effective date of the final permit. The plan must be retained on site and made available to the EPA upon request.

C. Sanitary Sewer Overflows and Proper Operation and Maintenance of the Collection System

SSOs are not authorized under this permit. The permit contains language to address SSO reporting and public notice and operation and maintenance of the collection system. The permit requires that the permittee identify SSO occurrences and their causes. In addition, the permit establishes reporting, record keeping and third party notification of SSOs. Finally, the permit requires proper operation and maintenance of the collection system.

The following specific permit conditions apply:

Immediate Reporting – The permittee is required to notify the EPA of an SSO within 24 hours of the time the permittee becomes aware of the overflow. (See 40 CFR 122.41(l)(6))

Written Reports – The permittee is required to provide the EPA a written report within five days of the time it became aware of any overflow that is subject to the immediate reporting provision. (See 40 CFR 122.41(l)(6)(i)).

Third Party Notice – The permit requires that the permittee establish a process to notify specified third parties of SSOs that may endanger health due to a likelihood of human exposure; or unanticipated bypass and upset that exceeds any effluent limitation in the permit or that may endanger health due to a likelihood of human exposure. The permittee is required to develop, in consultation with appropriate authorities at the local, county, tribal and/or state level, a plan that describes how, under various overflow (and unanticipated bypass and upset) scenarios, the public, as well as other entities, would be notified of overflows that may endanger health. The plan should identify all overflows that would be reported and to whom, and the specific information that would be reported. The plan should include a description of lines of communication and the identities of responsible officials. (See 40 CFR 122.41(l)(6)).

Record Keeping – The permittee is required to keep records of SSOs. The permittee must retain the reports submitted to the EPA and other appropriate reports that could include work orders associated with investigation of system problems related to a SSO, that describes the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the SSO. (See 40 CFR 122.41(j)).

Proper Operation and Maintenance – The permit requires proper operation and maintenance of the collection system. (See 40 CFR 122.41(d) and (e)). SSOs may be indicative of improper operation and maintenance of the collection system. The permittee may consider the development and implementation of a capacity, management, operation and maintenance (CMOM) program.

The permittee may refer to the Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems (EPA 305-B-05-002). This guide identifies some of the criteria used by the EPA inspectors to evaluate a collection system's management, operation and maintenance program activities.

Owners/operators can review their own systems against the checklist (Chapter 3) to reduce the occurrence of sewer overflows and improve or maintain compliance.

D. Environmental Justice

As part of the permit development process, the EPA Region 10 conducted a screening analysis to determine whether this permit action could affect overburdened communities. "Overburdened" communities can include minority, low-income, tribal, and indigenous populations or communities that potentially experience disproportionate environmental harms and risks. The EPA used a nationally consistent geospatial tool that contains demographic and environmental data for the United States at the Census block group level. This tool is used to identify permits for which enhanced outreach may be warranted.

The WWTP is not located within or near a Census block group that is potentially overburdened. The draft permit does not include any additional conditions to address environmental justice.

Regardless of whether a WWTP is located near a potentially overburdened community, the EPA encourages permittees to review (and to consider adopting, where appropriate) Promising Practices for Permit Applicants Seeking EPA-Issued Permits: Ways To Engage Neighboring Communities (see https://www.federalregister.gov/d/2013-10945). Examples of promising practices include: thinking ahead about community's characteristics and the effects of the permit on the community, engaging the right community leaders, providing progress or status reports, inviting members of the community for tours of the facility, providing informational materials translated into different languages, setting up a hotline for community members to voice concerns or request information, follow up, etc.

For more information, please visit https://www.epa.gov/environmentaljustice and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.

E. Design Criteria

The permit includes design criteria requirements. This provision requires the permittee to compare influent flow to the facility's design flow and prepare a facility plan for maintaining compliance with NPDES permit effluent limits when the flow exceeds 85% of the design criteria values for three consecutive months.

F. Pretreatment Requirements

The EPA is the Approval Authority for Alaska POTWs. Since the facility does not have an approved POTW pretreatment program per 40 CFR 403.8, the EPA is also the Control Authority of industrial users that might introduce pollutants into the facility.

Special Condition II.D. of the permit reminds the Permittee that it cannot authorize discharges which may violate the national specific prohibitions of the General Pretreatment Program.

Although, not a permit requirement, the Permittee may wish to consider developing the legal authority enforceable in Federal, State or local courts which authorizes or enables the POTW to apply and to enforce the requirement of sections 307 (b) and (c) and 402(b)(8) of the Clean Water Act, as described in 40 CFR 403.8(f)(1). Where the POTW is a municipality, legal

authority is typically through a sewer use ordinance, which is usually part of the city or county code. The EPA has a Model Pretreatment Ordinance for use by municipalities operating POTWs that are required to develop pretreatment programs to regulate industrial discharges to their systems (EPA, 2007). The model ordinance should also be useful for communities with POTWs that are not required to implement a pretreatment program in drafting local ordinances to control nondomestic dischargers within their jurisdictions.

G. Standard Permit Provisions

Sections III, IV and V of the draft permit contain standard regulatory language that must be included in all NPDES permits. The standard regulatory language covers requirements such as monitoring, recording, and reporting requirements, compliance responsibilities, and other general requirements.

VIII. Other Legal Requirements

A. Endangered Species Act

The Endangered Species Act requires federal agencies to consult with National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. USFWS lists 14 animal species in Alaska as endangered or threatened, none of which inhabit freshwater. No federally listed species are found within the project area and no critical habitat has been designated in the vicinity. Therefore, the EPA has determined that issuance of this permit will have no effect on any threatened or endangered species in the vicinity of the discharge, and consultation is not required under Section 7 of the Endangered Species Act.

B. Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires the EPA to consult with NOAA Fisheries when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

NOAA Alaska Fisheries has designated EFH for several species, although Pacific Salmon are the only species that inhabit freshwater during their life cycle; and NOAA's EFH descriptions refer to freshwaters identified in Alaska Department of Fish and Game's Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes. That Catalog identifies the Nenana River as a migrational corridor for anadromous fish, including salmon. However, that corridor does not extend as far upstream (south) as the discharge outfall from the Denali Park WWTP.

The EPA has determined that issuance of this permit will have no effect on EFH in the vicinity of the discharge.

C. State Certification

Since the facility discharges to waters within Denali National Park, the EPA does not need to seek State certification from ADEC.

Since EPA utilized Alaska Water Quality Standards in determining permit requirements, water quality in Alaska beyond the borders of Denali National Park should not be affected by the issuance of this permit.

D. Antidegradation

Since the limits are as stringent or more stringent than the existing permit there will be no degradation of the water quality in the Nenana River.

E. Permit Expiration

The permit will expire five years from the effective date.

IX. References

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. US Environmental Protection Agency, Office of Water, EPA/505/2-90-001.

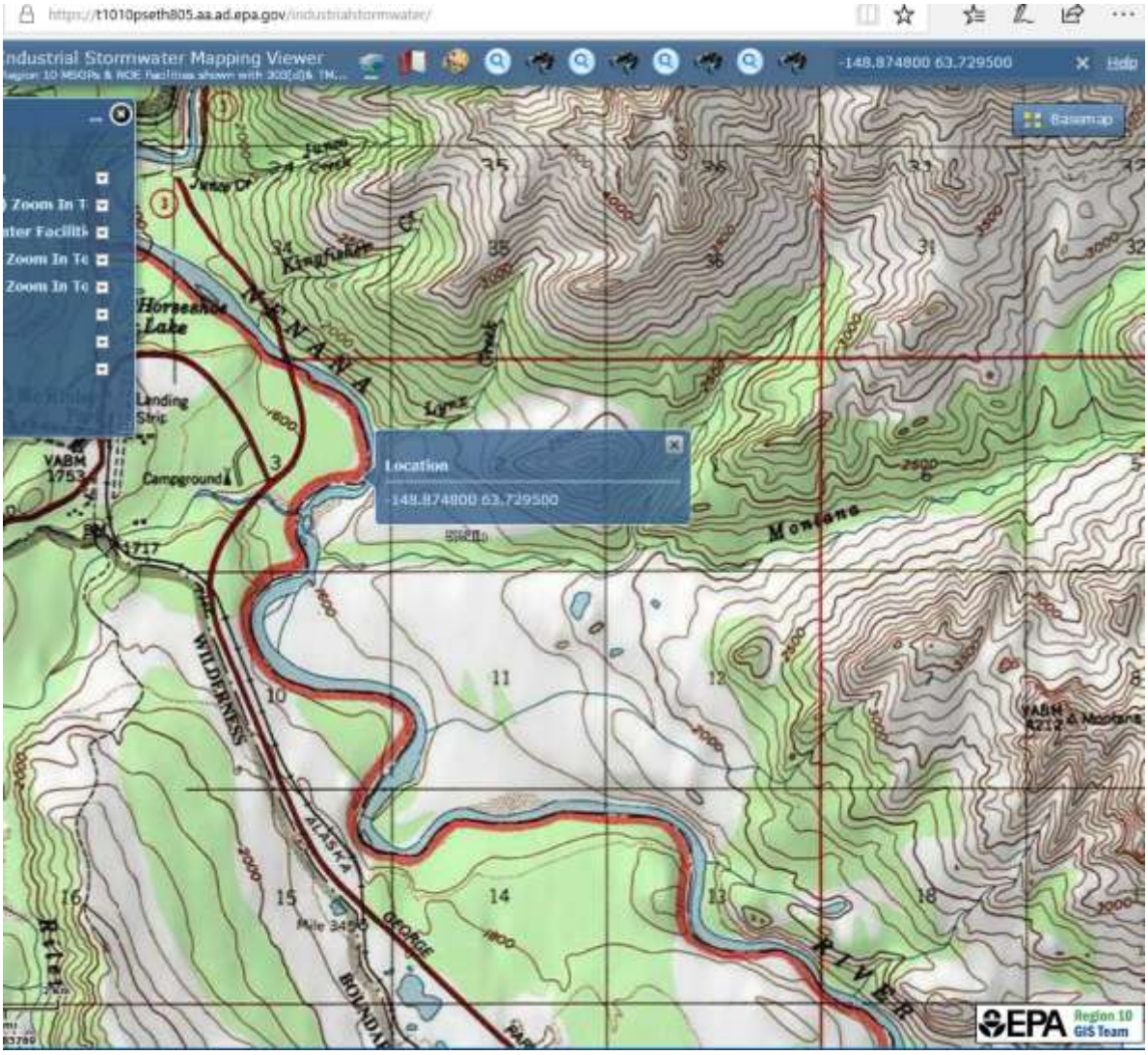
https://www3.epa.gov/npdes/pubs/owm0264.pdf

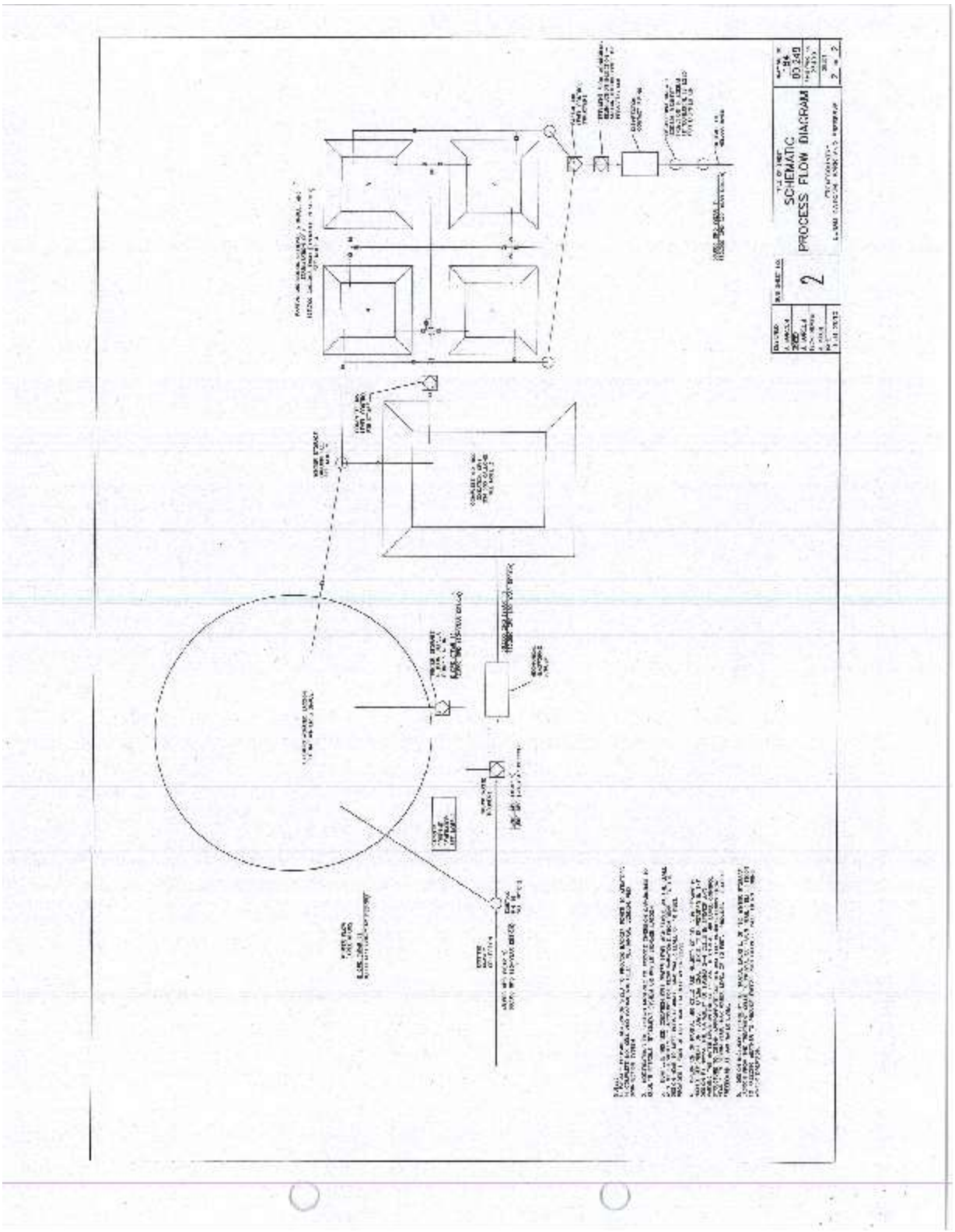
Water Pollution Control Federation. Subcommittee on Chlorination of Wastewater. *Chlorination of Wastewater*. Water Pollution Control Federation. Washington, D.C. 1976.

EPA. 2010. *NPDES Permit Writers' Manual*. Environmental Protection Agency, Office of Wastewater Management, EPA-833-K-10-001. September 2010. https://www3.epa.gov/npdes/pubs/pwm_2010.pdf

EPA. 2014. Water Quality Standards Handbook Chapter 5: General Policies. Environmental Protection Agency. Office of Water. EPA 820-B-14-004. September 2014. https://www.epa.gov/sites/production/files/2014-09/documents/handbook-chapter5.pdf

Appendix A. Facility Information




SCHEMATIC
PROCESS FLOW DIAGRAM
2

Appendix B. Reasonable Potential and Water Quality-Based Effluent Limit Formula

A. Reasonable Potential Analysis

The EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991) to determine reasonable potential. 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 EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit.

Mass Balance

For discharges to flowing water bodies, the maximum projected receiving water concentration is determined using the following mass balance equation:

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

where,

- C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)
- C_e = Maximum projected effluent concentration
- C_u = 95th percentile measured receiving water upstream concentration
- Q_d = Receiving water flow rate downstream of the effluent discharge = Q_e+Q_u
- Q_e = Effluent flow rate (set equal to the design flow of the WWTP)
- Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

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

$$C_d = \frac{C_e \times Q_e + C_u \times Q_u}{Q_e + Q_u} \qquad \text{Equation 2}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with 100% of the receiving stream.

If the mixing zone is based on less than complete mixing with the receiving water, the equation becomes:

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

Where:

% MZ = the percentage of the receiving water flow available for mixing.

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water concentration and,

$$C_d = C_e \qquad \text{Equation 4}$$

A dilution factor (D) can be introduced to describe the allowable mixing. Where the dilution factor is expressed as:

$$D = \frac{Q_e + Q_u \times \%MZ}{Q_e} \qquad \text{Equation 5}$$

After the dilution factor simplification, the mass balance equation becomes:

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

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 follows:

$$C_d = \frac{CF \times C_e - C_u}{D} + C_u \qquad \text{Equation 7}$$

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.

The above equations for C_d are the forms of the mass balance equation which were used to determine reasonable potential and calculate wasteload allocations.

Maximum Projected Effluent Concentration

When determining the projected receiving water concentration downstream of the effluent discharge, the EPA's Technical Support Document for Water Quality-based Toxics Controls (TSD, 1991) recommends using the maximum projected effluent concentration (Ce) in the mass balance calculation (see equation 3, page C-5). To determine the maximum projected effluent concentration (Ce) the EPA has developed a statistical approach to better characterize the effects of effluent variability. The approach combines knowledge of effluent variability as estimated by a coefficient of variation (CV) with the uncertainty due to a limited number of data to project an estimated maximum concentration for the effluent. Once the CV for each pollutant parameter has been calculated, the reasonable potential multiplier (RPM) used to derive the maximum projected effluent concentration (Ce) can be calculated using the following equations:

First, the percentile represented by the highest reported concentration is calculated.

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

where,

p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 99% = 0.99

and

$$RPM = \frac{C_{99}}{C_{P_n}} = \frac{e^{Z_{99} \times \sigma - 0.5 \times \sigma^2}}{e^{Z_{P_n} \times \sigma - 0.5 \times \sigma^2}} \qquad \text{Equation 9}$$

Where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile)
Z_{Pn} = z-score for the P_n percentile (inverse of the normal cumulative distribution function at a given percentile)

CV = coefficient of variation (standard deviation ÷ mean)

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

$$C_e = (RPM)(MRC) \qquad \text{Equation 10}$$

where MRC = Maximum Reported Concentration

Maximum Projected Effluent Concentration at the Edge of the Mixing Zone

Once the maximum projected effluent concentration is calculated, the maximum projected effluent concentration at the edge of the acute and chronic mixing zones is calculated using the mass balance equations presented previously.

Reasonable Potential

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant.

B. WQBEL Calculations

Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis. To calculate the wasteload allocations, C_d is set equal to the acute or chronic criterion and the equation is solved for C_e. The calculated C_e is the acute or chronic WLA. Equation 6 is rearranged to solve for the WLA, becoming:

$$C_e = WLA = D \times (C_d - C_u) + C_u \qquad \text{Equation 11}$$

Idaho's water quality criteria for some metals are expressed as the dissolved fraction, but the Federal regulation at 40 CFR 122.45(c) requires that effluent limits be expressed as total recoverable metal. Therefore, the EPA must calculate a wasteload allocation in total recoverable metal that will be protective of the dissolved criterion. This is accomplished by dividing the WLA expressed as dissolved by the criteria translator, as shown in equation 12. The criteria translator (CT) is equal to the conversion factor, because site-specific translators are not available for this discharge.

$$C_e = WLA = \frac{D \times (C_d - C_u) + C_u}{CT} \qquad \text{Equation 12}$$

The next step is to compute the "long term average" concentrations which will be protective of the WLAs. This is done using the following equations from the EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a \times e^{(0.5\sigma^2 - z\sigma)} \qquad \text{Equation 13}$$

$$LTA_c = WLA_c \times e^{(0.5\sigma_4^2 - z\sigma_4)} \qquad \text{Equation 14}$$

where,

σ^2 = $\ln(CV^2 + 1)$

Z_{99} = 2.326 (z-score for the 99th percentile probability basis)
CV = coefficient of variation (standard deviation ÷ mean)
σ_4^2 = $\ln(CV^2/4 + 1)$

For ammonia, because the chronic criterion is based on a 30-day averaging period, the Chronic Long Term Average (LTAc) is calculated as follows:

$$LTA_c = WLA_c \times e^{(0.5\sigma_{30}^2 - z\sigma_{30})} \quad \text{Equation 15}$$

where,

σ_{30}^2 = $\ln(CV^2/30 + 1)$

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits as shown below.

Derive the maximum daily and average monthly effluent limits

Using the TSD equations, the MDL and AML effluent limits are calculated as follows:

$$MDL = LTA \times e^{(z_m\sigma - 0.5\sigma^2)} \quad \text{Equation 16}$$

$$AML = LTA \times e^{(z_a\sigma_n - 0.5\sigma_n^2)} \quad \text{Equation 17}$$

where σ, and σ^2 are defined as they are for the LTA equations above, and,

σ_n^2 = $\ln(CV^2/n + 1$
z_a = 1.645 (z-score for the 95th percentile probability basis)
z_m = 2.326 (z-score for the 99th percentile probability basis)
n = number of sampling events required per month. With the exception of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of ''n'' should is set at a minimum of 4. For ammonia, In the case of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of ''n'' should is set at a minimum of 30.

C. Critical Low Flow Conditions

The low flow conditions of a water body are used to determine water quality-based effluent limits. The TSD requires criteria be evaluated at the following low flow receiving water conditions.

Acute aquatic life	1Q10 or 1B3
Chronic aquatic life	7Q10 or 4B3
Non-carcinogenic human health criteria	30Q5
Carcinogenic human health criteria	harmonic mean flow
Ammonia	30B3 or 30Q10
1. The 1Q10 represents the lowest one day flow with an average recurrence frequency of once in 10 years. 2. The 1B3 is biologically based and indicates an allowable exceedence of once every 3 years. 3. The 7Q10 represents lowest average 7 consecutive day flow with an average recurrence frequency of once in 10 years. 4. The 4B3 is biologically based and indicates an allowable exceedance for 4 consecutive days once every 3 years. 5. The 30Q5 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 5 years.	

6. The 30Q10 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 10 years.
7. The harmonic mean is a long-term mean flow value calculated by dividing the number of daily flow measurements by the sum of the reciprocals of the flows.

Appendix C. Reasonable Potential and WQBEL Calculations

Reasonable Potential Analysis (RPA) and Water Quality Effluent Limit (WQBEL) Calculations

Facility Name	
Facility Flow (mgd)	0.11
Facility Flow (cfs)	0.17

Critical River Flows (CFS) (IDAPA 58.01.02 03. b)		Annual Crit. Flows	Seasonal Low Flow	Seasonal High Flow	Annual Crit. Flows
Aquatic Life - Acute Criteria - Criterion Max. Concentration (CMC)	**1Q10**	413			413.0
Aquatic Life - Chronic Criteria - Criterion Continuous Concentration (CCC)	**7Q10 or 4B3**	483			483.0
Ammonia	**30B3/30Q10** (seasonal)				--
Human Health - Non-Carcinogen	**30Q5**	221			221.0
Human Health - carcinogen	**Harmonic Mean Flow**				--

DF at defined percent of river flow allow	25%	**607.7**	Note: Acute and Chronic dilution factors used for mixed
DF at defined percent of river flow allow	25%	**710.6**	

Receiving Water Data		Notes:	Annual Crit. Flows	Seasonal Low Flow	Seasonal High Flow
Hardness, as mg/L $CaCO_3$	= 100 mg/L	5th % at critical flows			
Temperature, °C	Temperature, °C	95th percentile	12.74		
pH, S.U.	pH, S.U.	95th percentile	8.02		

Pollutants of Concern			AMMONIA, default: cold water, fish early life stages present	AMMONIA, default: cold water, fish early life stages present	AMMONIA, default: cold water, fish early life stages	CHLORINE (Total Residual)
Effluent Data	**Number of Samples in Data Set (n)**		6			8
	Coefficient of Variation (CV) = Std. Dev./Mean (default CV = 0.6)		0.69			1.1
	Effluent Concentration, µg/L (Max. or 95th Percentile) - (C_e)		86,200			45.15
	Calculated 50th % Effluent Conc. (when n>10), Human Health Only					
Receiving Water Data	**90th Percentile Conc., µg/L - (C_u)**		1.05			
	Geometric Mean, µg/L, Human Health Criteria Only					
Applicable Water Quality Criteria	Aquatic Life Criteria, µg/L	Acute	5,407	--	--	19.
	Aquatic Life Criteria, µg/L	Chronic	2,364	--	--	11.
	Human Health Water and Organism, µg/L		--	--	--	--
	Human Health, Organism Only, µg/L		--	--	--	--
	Metals Criteria Translator, decimal (or default use Conversion Factor)	Acute				--
		Chronic				--
	Carcinogen (Y/N), Human Health Criteria Only		--	--	--	--
Percent River Flow Default Value = **0%**	**Aquatic Life - Acute**	**1Q10**	0%	--	--	1%
	Aquatic Life - Chronic	7Q10 or 4B3				1%
		30B3 or 30Q10				1%
	Human Health - Non-Carcinogen and Chronic Ammonia	30Q5	0%	--	--	1%
	Human Health - Carcinogen	Harmonic Mean				1%
Calculated Dilution Factors (DF) (or enter Modeled DFs)	Aquatic Life - Acute	1Q10	1.0	--	--	25.3
	Aquatic Life - Chronic	7Q10 or 4B3				29.4
		30B3 or 30Q10				1.0
	Human Health - Non-Carcinogen and Chronic Ammonia	30Q5	1.0	--	--	14.0
	Human Health - Carcinogen	Harmonic Mean				1.0

Aquatic Life Reasonable Potential Analysis

σ	$\sigma^2=\ln(CV^2+1)$		0.624	--	--	0.891
P_n	$=(1\text{-confidence level})^{1/n}$, where confidence level =	**99%**	0.464	--	--	0.562
Multiplier (TSD p. 57)	$=\exp(z\sigma-0.5\sigma^2)/\exp[\text{normsinv}(P_n)\sigma-0.5\sigma^2]$, where	**99%**	4.5	--	--	6.9
Statistically projected critical discharge concentration (C_e)			389358	--	--	311.65
Predicted max. conc.(ug/L) at Edge-of-Mixing Zone		Acute	389358	--	--	12.33
(note: for metals, concentration as dissolved using conversion factor as translator)		Chronic	389358	--	--	10.61
Reasonable Potential to exceed Aquatic Life Criteria			**YES**	**--**	**--**	**NO**

Aquatic Life Effluent Limit Calculations

Number of Compliance Samples Expected per month (n)			4			
n used to calculate AML (if chronic is limiting then use min=4 or for ammonia min=30)			4	--	--	--
LTA Coeff. Var. (CV), decimal	(Use CV of data set or default = 0.6)		0.690	--	--	--
Permit Limit Coeff. Var. (CV), decimal	(Use CV from data set or default = 0.6)		0.690	--	--	--
Acute WLA, ug/L	$C_d = (\text{Acute Criteria} \times MZ_a) - C_u \times (MZ_a\text{-}1)$	Acute	5,407	--	--	--
Chronic WLA, ug/L	$C_d = (\text{Chronic Criteria} \times MZ_c) - C_u \times (MZ_c\text{-}1)$	Chronic	2,364	--	--	--
Long Term Ave (LTA), ug/L	$\text{WLAc} \times \exp(0.5\sigma^2\text{-}z\sigma)$, Acute	**99%**	1,538	--	--	--
(99th % occurrence prob.)	$\text{WLAa} \times \exp(0.5\sigma^2\text{-}z\sigma)$; ammonia n=30, Chronic	**99%**	1,779	--	--	--
Limiting LTA, ug/L	used as basis for limits calculation		1,538	--	--	--
Applicable Metals Criteria Translator (metals limits as total recoverable)						--
Average Monthly Limit (AML), ug/L , where % occurrence prob =		**95%**	**2,524**	**--**	**--**	**--**
Maximum Daily Limit (MDL), ug/L , where % occurrence prob =		**99%**	**5,407**	**--**	**--**	**--**
Average Monthly Limit (AML), mg/L			**2.52**	**--**	**--**	**--**
Maximum Daily Limit (MDL), mg/L			**5.4**	**--**	**--**	**--**
Average Monthly Limit (AML), lb/day			**2.32**	**--**	**--**	**--**
Maximum Daily Limit (MDL), lb/day			**4.96**	**--**	**--**	**--**