Water Protection Bureau
Montana Pollutant Discharge Elimination System (MPDES) Fact Sheet

Permit Number:	MT0030155
Permittee:	City of Bozeman
Receiving Water:	Bozeman Creek (Sourdough Creek)
Facility Information:	
Name:	City of Bozeman Water Treatment Plant
Location:	45.59944° N, 111.02583° W 7024 Sourdough Canyon Road Bozeman, MT 59715
Contact:	Jill Miller, Interim Superintendent 7024 Sourdough Canyon Road Bozeman, MT 59715
Fee Information:	
Type of Facility:	
Number of Outfalls:	1 (for fee determination only)
Outfall Type:	001 – Process Wastewater
Outfall Location:	45.59881° N, 111.02819° W
Fact Sheet Date:	March 2020

I. Summary

The Montana Department of Environmental Quality (DEQ) proposes to renew the Montana Pollutant Discharge Elimination System (MPDES) permit for the City of Bozeman Water Treatment Plant (Bozeman WTP), MT0030155. This fact sheet documents the legal requirements and technical rationale that serve in the decision-making process involved with developing effluent limits, monitoring and reporting requirements, and special conditions which are specific to the City of Bozeman.

A. Permit Status

- January 1, 2015 — Previous permit (2015-Permit) became effective.
- May 2, 2019 — DEQ received MPDES permit renewal application (Forms 1 and 2E) and applicable fees
- May 23, 2019 — DEQ issued a notice of completeness and administratively extended the 2015-Permit past the expiration date
- December 31, 2019 — Expiration date for the 2015-Permit

B. Proposed Changes to Effluent Limits and Monitoring Requirements

- Upstream monitoring of fluoride and dissolved aluminum will be required.
- Effluent monitoring of fluoride will be included in this permit.
- Facility will be required to report both daily maximum and average monthly total residual chlorine (TRC) concentrations.
- TRC monitoring will be required daily only on when the lagoon is discharging to Outfall 001.
- Total suspended solids (TSS) limits will be corrected to an average monthly limit of 30 mg/L and a maximum daily limit of 45 mg/L.

II. Facility Information

The Bozeman WTP is the primary water treatment plant serving the City of Bozeman's population of 45,120. The treatment plant processes about 75% of the city's drinking water and the Lyman Creek Water Treatment Plant processes the remaining 25%. The Bozeman WTP is certified under DEQ's Public Water Supply Program (PWSID MT0000161) and is permitted to release domestic wastewater to groundwater under Montana Ground Water Pollution Control System Program (Permit # MTX000224).

A. Facility Description and Design Criteria

The Bozeman WTP has been operational since 1957. The plant was rebuilt during 2011-2014; the new plant went online in March 2014. In July 2019, the plant added a 5.3 million gallon storage tank to the potable water distribution system. The Bozeman WTP uses a membrane filtration treatment system with conventional pretreatment technology. The plant is designed to treat up to 22 million gallons of water per day (mgd) and discharges an average of 0.270 mgd. *Figure 1* provides an overview of the treatment process.

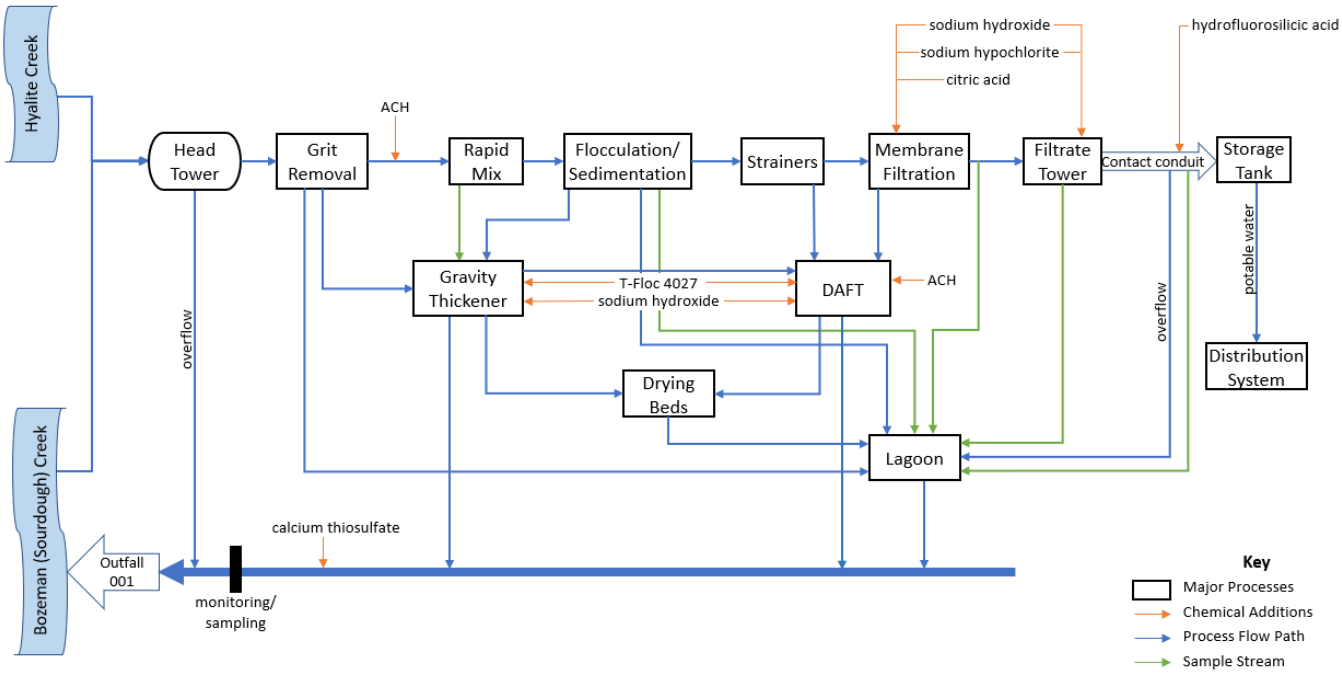

Figure 1: Bozeman WTP Process Diagram

B. Facility Description and Design

Intake and Pretreatment

- Raw water intake from Hyalite Creek and Bozeman Creek are combined before the head tower.
- Overflow from the head tower is discharged at Outfall 001, but is piped separately from the other facility wastewater and is not treated or monitored.
- Pretreatment includes grit removal, rapid mix, flocculation and sedimentation.

Treatment and Finishing

- Treatment includes strainers and membrane filtration system (including a clean-in-place system).
- Treated water then goes to a filtrate tower, contact conduit, and storage tank, before going to the potable water distribution system.

Residuals Handling and Waste Streams

- Residuals handling includes the gravity thickener, dissolved air flotation system (DAFT), drying beds, and a lined residuals lagoon (lagoon).
- Overflow from the sedimentation basin and contact conduit, decant from drying beds and grit removal system, and sample streams from the sedimentation basin, filtrate tower, after membrane filtration, and the contact conduit flow into the lagoon.
- The lagoon discharges to Outfall 001 every three to five days.
- Decant from the gravity thickener, liquid waste from the DAFT, and lagoon effluent are discharged directly to Outfall 001.
- Effluent is monitored by an electromagnetic flow meter located downstream of the confluence of all waste streams except the head tower overflow.
- Sampling of the effluent is performed about two feet downstream of the flow meter at the last point of control upstream of the outfall.

Chemical Additions

- *Aluminum chlorohydrate (ACH)* to promote coagulation
- *Citric acid* is used to dissolve contaminants that have adhered to membranes

- *Sodium hypochlorite* is used to clean membranes, provide the chlorine residual and disinfect finished water in the filtrate tower, and can be injected in the strainers during cleanings
- *Sodium hydroxide (caustic soda)* is used to clean membranes and to adjust the pH of water in the filtrate tower, gravity thickener, and DAFT
- *T-Floc 4027* is added upstream of the gravity thickener and the DAFT to promote thickening
- *Hydrofluorosilicic acid* is added at the end of the contact conduit to fluoridate finished water
- *Calcium thiosulfate (Captor)* is used to dechlorinate effluent prior to discharge
- *Polyaluminum chloride and sodium bisulfite* can be used instead of ACH and Captor, respectively, but plant operators do not plan on using these chemicals.
- *Sodium permanganate, sodium hydroxide, and sodium hypochlorite,* can be added before the rapid mix chamber and *powder activated carbon* can be added in the rapid mix chamber for additional pretreatment in the case of a wildfire.

C. Existing Permit Requirements

The effluent limits and monitoring requirements for the Bozeman WTP established in the 2015-Permit are presented in *Table 1*.

Table 1. 2015-Permit Limits and Monitoring Requirements

Parameter	Units	Maximum Daily Limit	Average Monthly Limit	Sample Frequency
Total Suspended Solids (TSS)	mg/L	30	45	1/Week
	lb/day	--	73	--
pH	s.u.	6.0 – 9.0 (1)		1/Week
Total Residual Chlorine (TRC)	mg/L	--	--	1/Day
Aluminum, dissolved	mg/L	0.30	0.11	1/Week
Flow	mgd	--	--	Continuous

(1) Reported as minimum and maximum values

D. Effluent Quality

The period of record (POR) that was selected was January 2015 – October 2019. Effluent data for the POR are considered representative of the facility's effluent quality because the Bozeman WTP has not undergone any major facility changes since the 2015-Permit was issued. *Table 2* summarizes effluent data at Outfall 001 for the POR as reported on discharge monitoring reports (DMRs), Form 2E, and the Bozeman WTP's daily log.

Table 2. Effluent Characteristics for the POR – Outfall 001

Parameter	Units	Minimum Value	Maximum Value	Average Value(1)	Sample Size
TSS	mg/L	<1	49	3.8	252
	lb/day	0.0 (2)	114	8.1	252
pH	s.u.	7.46	8.97	8.23 (3)	252
TRC	mg/L	<0.02	0.10	0.024	1765
Aluminum, dissolved	mg/L	<0.009	0.13	0.012	252
Flow	mgd	0.094	1.87	0.27	1765

(1) For values reported below the detection limit, the detection limit was used in calculating the average
(2) Facility reported loading of 0 lb/day when TSS concentration was below the detection limit.
(3) Average of maximum and minimum reported values

E. Compliance History

Since the issuance of the 2015-Permit, one numeric exceedance was documented for TSS for the monitoring period ending on May 31, 2015. The exceedance was attributed to a process upset, and the facility instituted daily sampling procedures for the DAFT and gravity thickener to avoid future exceedances. The Bozeman WTP has had one inspection during the last permit cycle, on December 29, 2016. The facility was cited for incorrect reporting and improper analysis of samples. The Bozeman WTP took corrective actions to address the violations.

III. Receiving Water

The Bozeman WTP discharges wastewater to a 4.88-mile segment of the Bozeman Creek (Sourdough Creek) which flows from the confluence of Limestone Creek and Bozeman Creek to the mouth of the East Gallatin River. In 2013, a total maximum daily load (TMDL) was completed for the Lower Gallatin Planning Area, which includes Bozeman Creek. The waste load allocations (WLAs) established in the TMDL will apply to the Bozeman WTP as discussed in *Section III(C)* of this document.

A. Receiving Water Summary

The following information about the receiving water was used to develop water quality-based effluent limits.

- Water Use Classification: B-1
- Waterbody Name: Bozeman Creek (Sourdough Creek)
- Montana Stream Segment: MT41H003_040
- Watershed: Gallatin
- USGS Hydrologic Unit Code (HUC 12): 100200080904
- USGS Gauging Stations: none
- 7Q10: 2.28 mgd (3.53 cfs)
- Seasonal 14Q5: 7.50 mgd (11.6 cfs)
- Dilution Ratio: 3.9 : 1
- Ecoregion (for Nutrients): Middle Rockies
- Beneficial Use Status: Not fully supporting aquatic life or primary recreation
- Impairment Listing: 2018 Montana Water Quality Integrated Report
- Total Maximum Daily Load (TMDL): Lower Gallatin Planning Area, 2013
- Salmonids and Fish in Early Life Stages: Present

B. Water Use Classification

Montana water quality standards define water use classifications for state waters and the numeric and narrative standards that protect those uses. Bozeman Creek is classified as B-1 according to Montana Water Use Classifications. In order to protect the beneficial uses, state waters classified B-1 are to be maintained suitable for:

- drinking, culinary, and food processing purposes, after conventional treatment;
- bathing, swimming, and recreation;
- growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and
- agricultural and industrial water supply.

C. Impairments

Montana's 2018 Water Quality Integrated Report lists segment MT41H003_040 (Bozeman Creek) as not fully supporting aquatic life or primary contact recreation with the likely causes of impairment listed below.

Probable causes of impairments:

- Alteration in stream-side or littoral vegetative covers
- Chlorophyll-a
- *E. coli*
- Total nitrogen
- Sedimentation-siltation

Alteration in stream-side or littoral vegetative cover are not associated with point source discharge, and *E. coli*, chlorophyll-a, and nitrogen are not expected to be present in the WTP's effluent. Of the causes of impairment, the Bozeman WTP is only likely to be a potential source of sedimentation-siltation as discussed in *Section VI(A)*.

D. Applicable Water Quality Standards

Each waterbody classification has numeric and narrative water quality standards designed to ensure that beneficial uses are protected. Discharges to B-1 classified waters are subject to the following water quality standards:

- Administrative Rules of Montana 17.30 Subchapter 6
- Department Circular DEQ-7, Numeric Water Quality Standards
- Department Circular DEQ-12A, Base Numeric Nutrient Standards and DEQ-12B Nutrient Variance

Dischargers are subject to:

- Administrative Rules of Montana 17.30 Subchapter 5; Mixing Zones
- Administrative Rules of Montana 17.30 Subchapter 7; Nondegradation of Water Quality

E. Ambient Water Quality

DEQ uses upper bound of the interquartile range (75th percentile) of the available data for a given pollutant to determine the assimilative capacity of the receiving water.

The Bozeman WTP was required to monitor aluminum concentrations in Bozeman Creek in the 2009-Permit. The 75th percentile of dissolved aluminum was calculated using 12 samples collected by the Bozeman WTP from 2009-2014. Eight "non detect" results for Bozeman Creek were reported at a Reporting Limit (RL) of 0.005 mg/L. Ambient water quality data for Bozeman Creek are summarized in *Table 3*.

Table 3. Bozeman Creek Ambient Water Quality

Parameter	Units	75th Percentile	Minimum Value	Maximum Value	Sample Size
Aluminum, dissolved	mg/L	0.02	<0.005	0.19	12

F. Low Flow

In the 2015-Permit, the 7Q10 for Bozeman Creek was calculated as 1.3 mgd. Due to limited streamflow data upstream of the WTP's outfall, DEQ utilized USGS StreamStats to calculate the seven-day low flow recurring every 10 years (7Q10) and the seasonal 14-day low flow recurring every five years (14Q5) for this permit renewal. Hyalite Creek is close to Bozeman Creek and has a large historical dataset, similar land use, hydrology, and drainage, and an active stream gage. Thus, low flow data from Hyalite Creek were compared to the StreamStats generated values for Bozeman Creek. DEQ typically uses the lower 90% interval of the low flow statistic generated by StreamStats as the recommended low flow permit value because standard error in low flow estimates is usually high. However, based on the comparison between the two streams, DEQ determined that the lower 90% interval of the low flow statistic for Bozeman Creek was overly conservative and that the median low flow values were the most appropriate. For this permit renewal, DEQ will use the median low flow values of 2.28 mgd (3.53 cfs) for the 7Q10 and 7.50 mgd (11.6 cfs) for the 14Q5.

IV. Technology-Based Effluent Limits

A. Scope and Authority

Technology-based effluent limits (TBELs) are the minimum effluent quality required in MPDES permits and are developed based on currently available treatment technologies. The state of Montana has adopted industry-specific TBELs known as Effluent Limit Guidelines (ELGs), but no ELGs have been promulgated for drinking water treatment plants. When ELGs have not been developed for an industry, permit limits may be developed based on best professional judgement. Developing a permit limit using best professional judgement requires consideration of the same statutory factors that EPA would use to develop a national ELG and applicant-specific circumstances.

B. Concentration-Based Limits

The Bozeman WTP has had TSS concentration limits of 30 mg/L monthly average and 45 mg/L daily maximum since at least the 1996-issued permit. (In the 2015-Permit, DEQ proposed maintaining these TBELs but the values were inadvertently switched for the final limits). The WTP has also had a pH limit in the range of 6.0-9.0 s.u. over the same time period.

Under the guidance of a 1977 EPA Region VII policy and a 1987 draft model permit package for the water supply industry, the majority of permits recently issued by DEQ to WTPs have TSS limits of 45 mg/L daily maximum and 30 mg/L monthly average and pH in the range of 6.0-9.0 s.u.

The Bozeman WTP's TBELs were modeled after the National Secondary Standards (NSS) applied to municipal wastewater lagoons which DEQ has recognized have a similar level of treatment to water treatment plants. NSS limits are expressed as a weekly and monthly averages, however the state of Montana has determined that daily maximum and average monthly limits are more appropriate for facilities that are not publicly owned treatment works. The Bozeman WTP will retain its pH limit from the previous permit. The TSS limits will be 45 mg/L MDL and 30 mg/L AML.

C. Mass-Based Limits

Pollutants limits must be expressed in terms of mass when appropriate and feasible. The mass loading limits for TSS were calculated as follows:

$$\text{Average Monthly Load Limit} = \text{Max. Monthly Average Flow for POR} \bullet \text{Proposed Average Monthly Concentration Limit} \bullet \text{Conversion Factor}$$

$$\text{TSS Average Monthly Load Limit} = 0.6022 \text{ mgd} \bullet 30 \frac{\text{mg}}{\text{L}} \bullet 8.34 \frac{\text{lb·L}}{\text{Mgal·mg}} = \mathbf{151} \frac{\mathbf{lb}}{\mathbf{day}}$$

D. Nondegradation Load Allocations

Montana's nondegradation of water quality policy applies to new or increased pollution sources. Sources that exceed the limits established in their current permit are considered new or increased sources. Nondegradation load limits are compared to actual loading to determine if a facility is a new or increased source.

Table 4. Comparison of Nondegradation and Actual Mass Loading

Nondegradation Load Allocation		Average Monthly Load (lb/day)				
Parameter	Load (lb/day)	2015	2016	2017	2018	2019
TSS	73	12.3	7.9	5.5	7.3	7.2
Data obtained from DMRs for the POR, January 2015 – October 2019.						

As shown in *Table 4*, the Bozeman WTP did not exceed their nondegradation load allocation during the POR, and will not be considered a new or increased source. The calculated mass-based limit from the 2015-Permit was 73 lb/day, which is lower than average monthly load limit of 151 lb/day calculated in *Section IV(C)*. In accordance with nondegradation policy, the Bozeman WTP will be required to comply with the monthly load limit of 73 lb/day.

E. Proposed Technology-Based Effluent Limits

As discussed in *Section IV(C)* and summarized in *Table 5*, the renewed permit has proposed TBELs for TSS based on NSS and will retain pH TBELs from the 2015-Permit.

Table 5. Technology-Based Effluent Limits – Outfall 001

Parameter	Units	Maximum Daily Limit	Average Monthly Limit
TSS	mg/L	45	30
	lb/day	--	73
pH	s.u.	6.0 – 9.0 (instantaneous)	

V. Water Quality-Based Effluent Limits

A. Scope and Authority

MPDES permits must include water quality-based effluent limits (WQBELs) when TBELs do not sufficiently protect state waters. Permits must include limits on all pollutants which will cause, or have reasonable potential to cause, an excursion of water quality standards. Montana water quality standards define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses. Discharge from the Bozeman WTP must comply with the general prohibitions which require that state waters, including mixing zones, be free from substances which will:

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter), or globules of grease or other floating materials;
(c) produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
(e) create conditions which produce undesirable aquatic life.

B. Pollutants of Concern

Pollutants and parameters are identified as a pollutant of concern (POC) for the following reasons:

- Listed as TBELs;
- Identified as needing WQBELs in the previously issued permit;
- Identified as present in effluent monitoring or otherwise expected present in the discharge; or
- Associated with impairment which may or may not have a wasteload allocation (WLA) in a TMDL

DEQ must incorporate WLAs developed during the TMDL process into MPDES permits. *Table 6* summarizes the POCs identified for the Bozeman WTP. Identification of a POC is not an indication that a WQBEL is necessary, but an indication that further evaluation is required.

Table 6. Parameters of Concern for WQBELs

Parameter	Basis for Identification
Conventional Pollutants	
TSS	TBEL, TMDL
pH	TBEL
Toxic Pollutants	
Total Residual Chlorine (TRC)	Required monitoring, previous permit
Aluminum, dissolved	WQBEL, previous permit
Fluoride	Expected present

C. Mixing Zones

A mixing zone is an area where dilution of effluent occurs, and certain water quality standards may be exceeded. DEQ sets the available dilution flow on a parameter-by-parameter basis to assess reasonable potential (RP) and to achieve acute, chronic, and human health standards. Any mixing zone that is granted must be clearly defined, be of the smallest practicable size, have a minimum practicable effect on water uses, and comply with nondegradation policy. Mixing zones are not granted for parameters with TBELs. Acute aquatic life (acute) standards for any parameter may not be exceeded in any portion of the mixing zone unless DEQ finds that allowing minimal initial dilution will not threaten or impair existing beneficial uses. Previously allowed mixing zones will remain designated in a renewed permit unless there is evidence that they will impair existing or anticipated uses.

The Bozeman WTP will be allowed an alternative mixing zone for TRC as discussed below and summarized in *Table 7*.

Alternative Mixing Zone

DEQ has determined that an alternative mixing zone for total residual chlorine (TRC) for acute and chronic standards. Allowing a limited mixing zone for acute standards will not threaten or impair existing beneficial uses because TRC is not a persistent pollutant and typically exhibits a first-order rate of decay in the receiving water. The Bozeman WTP will be granted an alternative mixing zone for TRC with 1% dilution of the 7Q10 for acute standards and 10% dilution of the 7Q10 for chronic and human health standards and. Beginning at the point of discharge, the TRC mixing zone will extend 10 ft downstream for acute standards and 100 ft downstream for chronic and acute standards.

Table 7. Mixing Zone Summary

Parameter	Standard	Allowed Dilution	Mixing Zone Length
Alterative Mixing Zone			
TRC	Acute	1%	10 ft
	Chronic	10%	100 ft
	Human Health	10%	100 ft

D. Reasonable Potential Analysis

DEQ uses the statistical approach outlined in Chapter 3 of EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD) and a steady-state mass balance equation solved for C_r (*Equation 1)* to determine if there is reasonable potential (RP) for an individual parameter to exceed water quality standards. The main steps for determining RP are described below.

$$C_r = \frac{C_s \bullet Q_s + C_d \bullet Q_d}{Q_r} \qquad (Equation\ 1)$$

Where:

C_r = in-stream pollutant concentration after discharge (calculated)

C_s = receiving water ambient pollutant concentration (75th percentile of ambient water quality data)

Q_s = receiving water critical flow (dilution • 7Q10 or seasonal 14Q5 for nutrients)

C_d = critical effluent pollutant concentration (C_{max} • TSD 3-2 multiplier)

Q_d = critical effluent flow (acute: maximum of maximum daily flow, chronic and human health: maximum of monthly average flow)

Q_r = in-stream flow after discharge ($Q_s + Q_d$)

1. Calculation of C_d

The projected critical effluent pollutant concentration (C_d) is calculated using the maximum reported effluent concentration for the POR (C_{max}) and the TSD 3-2 multiplier. The TSD 3-2 multiplier is used to account for effluent variability. C_d calculations are summarized in *Table 8*.

- The multiplier is determined using the coefficient of variation (CV) of the effluent data and the 95th percentile confidence interval and probability bases of the effluent data.
- A CV of 0.6 is used if there are less than 10 samples
- The TSD 3-2 multiplier is set to 1 if the sample size is greater than 58.

Table 8. Projected Critical Effluent Concentration (C_d)

Parameter	CV	Sample Size →	TSD 3-2 Multiplier	• C_{max}	= **C_d**
TRC	0.41	1765	1.00	0.10 mg/L	**0.10 mg/L**

2. Calculation of Q_s

The receiving water flow (Q_s) with dilution is calculated by multiplying the 7Q10 low flow of Bozeman Creek by the dilution allowed for each parameter as discussed in *Section V(C)*. For parameters with no allowed dilution, Q_s=0. Q_s calculations are shown in *Table 9*.

Table 9. Receiving Water Critical Flow (Q_s)

Parameter		7Q10	• Dilution	= **Q_s**
TRC	Acute	2.28 mgd	1%	**0.023 mgd**
	Chronic	2.28 mgd	10%	**0.23 mgd**
	Human Health	2.28 mgd	10%	**0.23 mgd**

3. Determination of Q_d

The critical effluent flow (Q_d) for a non-POTWs is determined from the maximum reported effluent flow for the POR.

- Acute: Q_d = maximum of maximum effluent flow = 1.866 mgd
- Chronic and human health: Q_d = maximum of monthly average effluent flow = 0.602 mgd

4. Calculation of C_r and RP Determination

The in-stream pollutant concentration after mixing (C_r) is calculated using *Equation 1*. If C_r > WQS there is RP and a WQBEL is needed.

The ambient pollutant concentration (C_s) for TRC is assumed to be zero because there is no known source of TRC upstream of the Bozeman WTP and TRC dissipates rapidly in the receiving water.

In the final step of the RP analysis, C_r is compared to the water quality standard (WQS). *Table 10* shows the C_r calculation and final RP determination. TRC demonstrated RP to exceed water quality standards, and a WQBEL will be developed for this parameter.

Table 10. Reasonable Potential Analysis

Parameter		**Pollutant Concentration after Discharge (C_r)** (C_s • Q_s + C_d • Q_d) / Q_r					**Reasonable Potential (RP)** C_r	< or >	WQS	**RP?**
		(mg/L)	(mgd)	(mg/L)	(mgd)	(mgd)	(mg/L)		(mg/L)	
TRC	Acute	0.00	0.023	0.10	1.87	1.89	0.099	>	0.019	**Yes**
	Chronic	0.00	0.23	0.10	0.602	0.830	0.073	>	0.011	**Yes**
	Human Health	0.00	0.23	0.10	0.602	0.602	0.073	<	4.00	**No**

E. WQBELs for Pollutants with RP

WQBELs are expressed as maximum daily limits (MDLs) and average monthly limits (AMLs). DEQ uses the statistical approach outlined in Chapter 5 of the TSD and a steady-state mass balance equation solved for C_d (*Equation 2)* to determine the limits for each parameter.

The variables are defined the same way in *Equation 1* and *Equation 2* except for C_r and C_d. In *Equation 1* the C_d is calculated based on the maximum effluent concentration of a pollutant and C_r is calculated from the mass balance equation. In *Equation 2* C_d is calculated from the mass balance equation and the water quality standard is used for C_r. The major WQBEL development steps are described below.

$$\text{WLA} = C_d = \frac{C_r \bullet Q_r - C_s \bullet Q_s}{Q_d} \qquad Equation\ 2$$

Where:

C_d = effluent pollutant concentration (calculated)

C_s = receiving water background pollutant concentration (75th percentile of ambient water quality data)

Q_s = receiving water flow (dilution • 7Q10 or seasonal 14Q5 for nutrients)

C_r = in-stream pollutant concentration after discharge (water quality standard)

Q_r = in-stream flow after discharge ($Q_s + Q_d$)

Q_d = effluent flow (acute: maximum of daily flow

chronic and human health: maximum monthly average flow)

1. Calculation of Wasteload Allocation (WLA)

The WLA is the concentration of a pollutant that a permittee can discharge while assuring that applicable water quality standards are attained in the receiving water. In WQBEL development, the effluent pollutant concentration (C_d) equals the WLA. WLA calculations for each parameter are summarized in *Table 11*. The WLA for a pollutant is determined as follows:

- For parameters with no allowed dilution, the WLA is equal to the water quality standard (WQS).
- For impaired waterbodies, WLAs may be determined from a TMDL.
- For all other parameters, the WLA is calculated using *Equation 2*.

Table 11. Wasteload Allocation Calculation

Parameter		(C_r • Q_r − C_s • Q_s) / Q_d = **WLA**					
		(mg/L)	(mgd)	(mg/L)	(mgd)	(mgd)	(mg/L)
TRC	Acute	0.019	1.89	0.0	0.023	1.87	**0.019**
	Chronic	0.011	0.83	0.0	0.23	0.602	**0.015**
	Human Health	4.00	0.83	0.0	0.23	0.602	**5.51**

2. Calculation of Long-Term Average Concentration (LTA)

The LTA is the long-term average effluent concentration of a pollutant which accounts for variability in the data to ensure that water quality standards are met in the receiving water. LTA calculations are summarized in *Table 12*.

- The TSD 5-1 multiplier is determined using the CV and the 99th percentile occurrence probability for all parameters except nutrients, and the 95th percentile for nutrients.
- WQBELs are based on a single performance expectation for a facility, so acute and chronic LTAs for a parameter are compared and the most protective LTA is used to calculate the MDL and AML.

Table 12. Long-Term Average Calculation							
Parameter		CV	→ TSD 5-1 Multiplier	• WLA	= LTA	**Most Protective LTA**
		(mg/L)	(mgd)	(mgd)	(mg/L)	(mg/L)
TRC	Acute	0.41	0.43	0.019	0.008	**0.008**
	Chronic	0.41	0.63	0.015	0.010	

3. Calculation of MDLs and AMLs

WQBELs are expressed as MDLs and AMLs in permits which reflect long-term and short-term exposure to a pollutant. AML and MDL calculations are summarized in *Table 13*.

- The AML and MDL are calculated based on the lowest LTA and the TSD 5-2 multiplier which is determined using the CV, and the 99th percentile occurrence probability for the MDL and the 95th percentile occurrence probability for the AML.
- The AML and MDL are then compared to the human health WLA. If the human health WLA is the most protective, then both the AML and MDL are set equal to the human health WLA.
- In this case, the acute aquatic life standard for TRC yields the most protective MDL and AML and the human health WLA will not be used for final WQBEL calculation

Table 13. WQBEL Calculation							
Parameter		CV	Samples per month	→ TSD 5-2 Multiplier	• Most Protective LTA	=	**WQBEL**
		(mg/L)		(mgd)	(mgd)		(mg/L)
TRC	MDL	0.41	30	2.31	0.008		**0.019**
	AML	0.41	30	1.13			**0.009**

VI. Final Pollutant Evaluation

A. Conventional Pollutants

pH: pH is a typical effluent quality indicator for drinking water treatment plants and is regulated through TBELs. TBELs provide adequate protection of water quality, and no WQBELs will be required for this parameter.

- Instantaneous maximum and minimum must be in the range of 6.0-9.0 s.u.
- Weekly effluent monitoring will be required.

Total Suspended Solids (TSS): TSS is a typical effluent quality indicator for drinking water treatment plants and is regulated through TBELs. The Bozeman WTP will be required to comply with the nondegradation load of 73 lb/day (0.2 tons TSS/year), discussed in *Section IV(D)*. The nondegradation load is more protective than the waste load allocation (WLA) of 39 tons sediment/year established in the TMDL. TBELs provide adequate protection of water quality, and no WBELs will be required.

- Concentration: MDL= 45 mg/L, AML= 30 mg/L
- Load: AML=73 lb/day
- Weekly effluent monitoring will be required.

B. Toxic Pollutants

Total Residual Chlorine (TRC): The Bozeman WTP uses sodium hypochlorite for disinfection of potable water, and TRC is known to be present in the effluent. As shown in *Table 9*, the Bozeman WTP has RP to exceed water quality standards and it will be subject to WQBELs developed in *Section V*. TRC is only expected to be present in the WTP's effluent when the residuals lagoon discharges to the outfall. Because of this fact, the WTP will only be required to monitor daily if the lagoon is discharging to Outfall 001. If there is no lagoon discharge in a calendar day, the WTP will not be required to sample for TRC on that day.

- MDL= 0.019 mg/L, AML= 0.009 mg/L
- Daily effluent monitoring will be required only on days that the residuals lagoon discharges to Outfall 001.
- Results reported as less than the or equal to DEQ's RRV of 0.10 mg/L will be considered in compliance with this limit.

Aluminum, dissolved: The Bozeman WTP uses aluminum chlorohydrate (ACH) as a coagulant to improve flocculation and sedimentation, and aluminum is known to be present in the WTP's effluent. The 2015-Permit limits will be retained based on DEQ's determination that the use of ACH in the treatment process results in reasonable potential to exceed water quality standards. Consistent with the 2015-Permit, the Bozeman WTP will be granted a standard mixing zone of with a 25% dilution allowed for chronic parameters and a mixing zone length of 300 ft. Maintaining the limits from the previous permit will prevent degradation of the receiving water and comply with anti-backsliding requirements.

- MDL= 0.30 mg/L, AML= 0.11 mg/L
- Weekly effluent monitoring will be required.
- Quarterly ambient monitoring will be required.

Fluoride: The Bozeman WTP fluoridates finished water in the filtrate tower using hydrofluorosilicic acid. Fluoride is expected to be present in the effluent because the WTP has samples streams that originate at the filtrate tower and contact conduit. These sample streams flow into the lagoon which intermittently discharges to Outfall 001. Ambient and effluent water quality data for fluoride were unavailable, so it was not possible to assess RP. Since fluoride is only be expected to be present in the lagoon discharge, effluent fluoride samples should only be collected on days that the lagoon discharges to the outfall.

- Quarterly ambient and effluent monitoring will be required.
- Effluent sampling must be conducted when the lagoon is discharging to Outfall 001.

VII. Final Effluent Limits

The final effluent limits are a combination of TBELs and WQBELs developed in *Section IV* and *Section V*, respectively. Effluent limitations and conditions of reissued permits must be at least as stringent as those in the existing permit, with certain exceptions. DEQ considered the proposed permit limits to ensure that they did not violate anti-backsliding policies. The final effluent limits in *Table 14* will be applied to the discharge at Outfall 001 beginning on the permit effective date and lasting through the term of the permit. Discharge from the Bozeman WTP must not violate the general prohibitions set forth in ARM 13.30.637.

Table 14. Final Effluent Limits – Outfall 001

Parameter	Units	Maximum Daily Limit [1]	Average Monthly Limit [1]
Total Suspended Solids (TSS)	mg/L	45	30
	lb/day	--	73
pH	s.u.	6.0 – 9.0[2]	
Total Residual Chlorine (TRC)	mg/L	0.019[3]	0.009[3]
Aluminum, Dissolved	mg/L	0.30	0.11

[1] See definitions in Part V of the permit for explanation of terms.
[2] Instantaneous minima and maxima. Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit.
[3] Values reported as less than the or equal to DEQ's RRV of 0.10 mg/L will be considered in compliance with this limit.

VIII. Monitoring and Reporting Requirements

Monitoring requirements are based on the type of treatment facility and the method of discharge. The Bozeman WTP must comply with the sampling and reporting requirements listed below.

- Analysis must meet any Required Reporting Values (RRVs) listed in Circular DEQ-7 unless otherwise specified, in writing, by DEQ.
- For the duration of the permit, the Bozeman WTP must submit NetDMRs results for each month by the 28th of the following month.
- Samples shall be collected, preserved and analyzed in accordance with approved procedures listed in 40 CFR 136.

A. Effluent Monitoring

Effluent monitoring requirements for the Bozeman WTP are presented in *Table 15*.

- The facility must monitor their effluent at the last point of control prior to discharge at Outfall 001, but prior to dilution from the head tower overflow.
- Samples should reflect the typical volume and nature of discharge of the facility.
- All analytical results below the method detection limit should be reported as "non-detect" (NODI Code B). If individual samples are below the detection limit, the detection limit (not zero) should be used to calculate average values.
- The facility should calculate average monthly TSS loading as follows:
  - Daily TSS loading should be calculated using the TSS concentration and the effluent flow for the date of sample collection
  - Daily TSS loading values should then be averaged to determine monthly loading.
  - If TSS concentration for a single sample is below the detection limit, then loading should be calculated using the detection limit (not zero).

Table 15. Effluent Monitoring Requirements – Outfall 001

Parameter	Units	Sample Type (1)	Sample Frequency	Reporting Requirement	RRV(2)
Flow	mgd	Instantaneous	Continuous	Daily Maximum Monthly Average	--
Total Suspended Solids (TSS)	mg/L	Grab	1/Week	Daily Maximum Monthly Average	1
	lb/day	Calculated	1/Month	Monthly Average	--
pH	s.u.	Instantaneous	1/Week	Daily Minimum Daily Maximum	0.1
Total Residual Chlorine (TRC)	mg/L	Grab	1/Day(3)	Daily Maximum Monthly Average	0.10
Aluminum, dissolved	mg/L	Grab	1/Week	Daily Maximum Monthly Average	0.009
Fluoride	mg/L	Grab	1/Quarter(4)	Single Value	0.2

(1) See definitions in Part V of the permit for an explanation of terms.
(2) Required reporting value. If reporting non-detects, analysis must achieve these or lower RRVs
(3) Facility is only required to sample for TRC on days that the lagoon is discharging to Outfall 001.
(4) Sampling must be conducted when the lagoon is discharging to Outfall 001.

B. Upstream/Ambient Monitoring

The Bozeman WTP will be required to conduct ambient monitoring for aluminum and fluoride to provide adequate data to asses RP during the next permit cycle.

- Monitoring must take place at a consistent location upstream and outside the influence of Outfall 001 with sample type, frequency, and RRVs as identified in *Table 16*.

Table 16. Ambient Monitoring Requirements					
Parameter	**Units**	**Sample Frequency**	**Sample Type [1]**	**Reporting Requirement**	**RRV[2]**
Aluminum, dissolved	mg/L	1/Quarter	Grab	Single Value	0.009
Fluoride	mg/L	1/Quarter	Grab	Single Value	0.2

[1] See definitions in Part V of the permit for an explanation of terms.
[2] Required reporting value. If reporting non-detects, analysis must achieve these or lower RRVs.

IX. Special Conditions

The permitee must notify DEQ in writing prior to changing any of the chemicals used in the treatment process including if the facility elects to use any of the optional chemicals listed in this fact sheet.

X. Public Participation

A. Public Notice

DEQ issued Public Notice No. MT-20-05 dated March 09, 2020. The public notice states that a tentative decision has been made to issue an MPDES permit to the Permittee and that a draft permit, fact sheet and environmental assessment (EA) have been prepared. Public comments are invited any time prior to the close of the business on April 8, 2020. Comments may be directed to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620
or
DEQWPBPublicComments@mt.gov

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments and issue a final decision within sixty days of the close of the public comment period or as soon as possible thereafter.

All persons, including the applicant, who believe any condition of a draft permit is inappropriate or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing).

B. Notification of Interested Parties

Copies of the public notice were mailed to the discharger, state and federal agencies and interested persons who have expressed an interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this permit. In addition to mailing the public notice, a copy of the notice and applicable draft permit, fact sheet and EA were posted on DEQ’s website for 30 days.

Any person interested in being placed on the mailing list for information regarding this MPDES permit should contact DEQ, reference this facility, and provide a name, address, and email address.

C. Public Hearing

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

D. Permit Appeal

After the close of the public comment period, DEQ will issue a final permit decision. A final permit decision means a final decision to issue, deny, modify, revoke and reissue, or, terminate a permit. A permit decision is effective 30 days after the date of issuance unless a later date is specified in the decision, a stay is granted, or the applicant files an appeal pursuant to 75-5-403, MCA.

The Bozeman Water Treatment Plant may file an appeal within 30 days of DEQ's action to the following address:

Secretary, Board of Environmental Review
Department of Environmental Quality
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901

E. Additional Information

Requests for additional information or questions regarding this permit should be directed to the Water Protection Bureau at 406-444-5546.

XI. Information Sources

Administrative Rules of Montana Title 17 Chapter 30 – Water Quality
Subchapter 2 – *Water Quality Permit and Application Fees*
Subchapter 5 – *Mixing Zones in Surface and Ground Water*
Subchapter 6 – *Montana Surface Water Quality Standards and Procedures*
Subchapter 7 – *Nondegradation of Water Quality*
Subchapter 12 – *Montana Pollutant Discharge Elimination (MPDES) Standards*
Subchapter 13 – *Montana Pollutant Discharge Elimination (MPDES) Permits*

Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

Montana Code Annotated (MCA), Title 75-5-101, *et seq*., "Montana Water Quality Act,".

Montana Department of Environmental Quality. *Clean Water Act Information Center (CWAIC)*. http://deq.mt.gov/Water/Resources/cwaic/. Accessed October 2019.dkdk

Montana Department of Environmental Quality. *Department Circular DEQ-7, Montana Numeric Water Quality Standards*, June 2019.

Montana Department of Environmental Quality. *Department Circular DEQ-12A, Montana Base Numeric Nutrient Standards*, July 2014.

Montana Department of Environmental Quality. *Lower Gallatin Planning Area TMDLs & Framework Water Quality Improvement Plan*, March 2013.

Montana Department of Environmental Quality. *2018 Water Quality Integrated Report, Appendix A-Impaired Waters*, January 2019

Montana Department of Environmental Quality. MPDES Permit Number MT0030155

- Administrative Record
- Renewal Application Forms DEQ Form 1 and EPA Form 2A, Received May 2019

Morrison-Maierle, Inc. & HDR. *Hyalite/Sourdough Water Treatment Plant Operation and Maintenance Manual,* December, 2014.

Ronald D. McCutcheon, U.S. Environmental Protection Agency, Region VII. *BPT Water Treatment Plants, Region VII Policy,* February 24, 1977.

Science Applications International Corporation (SAIC). Prepared for U.S. Environmental Protection Agency, Office of Water Enforcement and Permits. *Draft Model Permit Package: Water Supply Industry,* January 1987.

U.S. Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, 136 and 442.

U.S. Environmental Protection Agency. *NPDES Permit Writers' Manual*, EPA 833-B-96-003, September 2010.

U.S. Environmental Protection Agency. *EPA Region VIII Mixing Zones and Dilution Policy*, December 1994 (Updated September 1995).

U.S. Environmental Protection Agency. *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001, March 1991.

U.S. Geological Survey. *National Watershed Boundary Dataset,* https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=4c08f2e2b13741da96ad4a8f6aa5e36a. Accessed November 2019.

U.S. Geological Survey. *StreamStats: Streamflow Statistics and Spatial Analysis Tools for Water-Resources Applications.* http://streamstats.usgs.gov/. Accessed November 2019.

Prepared by: Maya Rao
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