



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

Permit Number:	MT0031801
Permittee:	City of Columbus
Receiving Water:	Yellowstone River
Facility Information:	
Name:	City of Columbus Wastewater Treatment Facility
Location:	45.625218 N, 109.238360 W 208 Lagoon Road Columbus, MT 59019 Stillwater County
Contact:	Scott Caton, Public Works Director PO Box 549 Columbus, MT 59019
Fee Information:	
Type of Facility:	Minor Publicly Owned Treatment Works
Number of Outfalls:	1 (for fee determination only)
Outfall Type:	001 – Process Wastewater
Outfall Location:	45.624944°, -109.225917°
Fact Sheet Date:	July 2023

I. Summary

The Montana Department of Environmental Quality (DEQ) proposes to renew the Montana Pollutant Discharge Elimination System (MPDES) permit issued for the City of Columbus (Columbus) Wastewater Treatment Facility (WWTF), MT0031801. 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 Columbus WWTF.

A. Permit Status

- January 1, 2018 Previous permit became effective.
- June 22, 2022 DEQ received MPDES permit renewal application (Form 2A)
- July 19, 2022 DEQ issued a Notice of Deficiency
- August 16, 2022 DEQ administratively extended the Final Application due date to September 15, 2022.
- September 22, 2022 DEQ issued a Notice of Completeness and administratively extended the 2018 Permit

B. Proposed Changes to Effluent Limits and Monitoring Requirements

- Quarterly ambient monitoring (upstream/instream) for temperature, pH, ammonia, copper, nickel and nitrite and nitrate will be required.
- Carbonaceous Biochemical Oxygen Demand (CBOD₅) limits have been changed from National Secondary standard (25 mg/L monthly average, 40 mg/L weekly average) to Treatment Equivalent to Secondary Standards which has an average monthly limit of 40 mg/L and an average weekly limit of 60 mg/L.
- Percent removal for CBOD₅ and total suspended solids (TSS) will be reduced from 85% to 65%.
- CBOD₅ and TSS percent removal monitoring frequency will increase from quarterly to monthly.
- Oil and grease grab sample monitoring will decrease from quarterly to annually.
- The 7Q10 and 14Q5 calculation changed from 972 and 2,029 cfs to 989 and 2,078.2 cfs, respectively.
- Outfall 001-A will be relocated from the weir location (45.62415° latitude, -109.239278° longitude) to inside the UV treatment building (45.624610° latitude, -109.239625° longitude).
- Outfall 001-B will be relocated from the end of the discharge ditch (45.624125° latitude, -109.232597°) to the center of the discharge ditch (longitude to 45.624167° latitude, -109.234722° longitude).

II. Facility Information

A. Facility Description and Design Criteria

The Columbus WWTF collects wastewater into the lagoon by means of a lift station, which is automated based on a level probe. During normal operation, the wastewater is then diverted through the lagoon cells either in series (treated through Pond 1A to Pond 1B then to Pond 1C) or in parallel operation (first through Pond 1B and/or through Pond 1A). Aeration is used to enhance treatment of the wastewater within all three cells.

Influent flow is measured using a Mag Meter (MAG 3100W) located in a separate manhole after the lift station. Effluent flow rate is measured using a submerged Ultra Mag Model UM-04 electromagnetic flow meter installed in the manhole after Pond Cell 1C where the discharge may be either routed to the Outfall 001 or to the golf course to be land applied. The treated effluent is disinfected by ultraviolet (UV) radiation and

discharges directly from the manhole to the final point of control (a weir at the start of a discharge ditch) and continues in the ditch (Outfall 001-B) and to the point of discharge to the Yellowstone River (Figure 1). Samples are either taken within the UV treatment building (Outfall 001-A) or within the discharge ditch at Outfall 001-B. Discharges from the City of Columbus are the only wastewater discharges to the discharge ditch.

The City of Columbus receives wastewater from two industrial users: Montana Silversmiths and the Stillwater Mining Company.



Figure 1. Columbus Facility Map

Table 1. Columbus WWTF Facility Design Criteria	
Construction Date: 1999	
Average Daily Design Flow: 0.270 mgd	Maximum Daily Design Flow: Unknown
Average Influent Flow Estimate: Unknown	
Design Population: 2,500	Current Population: 1,964
Cell Surface Area: 7.36 Acres	Cell Depth (without sludge): 13 Feet
Aerated Cells: Yes	Design Detention Time: 28.8 Days (Summer)
Disinfection: UV prior to discharge or land application	Type of Discharge: Wastewater
Design BOD₅ Removal: 92%	Design BOD₅ Load: 0.2 lb/day/1,000 sq ft
Design TSS Removal Rate: Unknown	Design TSS Load: Unknown
Collection System: Separate	Estimated I/I: 50,000 gpd
SSO Events: None (2018-2022)	Bypass Events: None (2018-2022)

B. Existing Permit Limits

The effluent limits for Columbus WWTF established in the 2018 Permit are presented in Table 2. The monitoring requirements established in the 2018 Permit are presented in Table 3 for Outfall 001-A and Table 4 for Outfall 001-B.

Table 2. 2018 Permit Effluent Limits				
Parameter	Units	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
5- Day BOD, Carbonaceous (CBOD ₅)	mg/L	25	40	-
	lb/day	52	90	-
	% removal	85	-	-
Total Suspended Solids (TSS)	mg/L	100	135	-
	lb/day	209	304	-
	% removal	85	-	-
<i>Escherichia coli</i> (<i>E. coli</i>) Bacteria, Summer ⁽¹⁾⁽²⁾	Number of organisms / 100mL	126	252	-
<i>Escherichia coli</i> (<i>E. coli</i>) Bacteria, Winter ⁽³⁾⁽⁴⁾	Number of organisms / 100 mL	630	1260	-
pH	s.u.	Within the range of 6.0 to 9.0 ⁽⁵⁾		-
Oil and Grease	mg/L	-		10
<p>(1) This limit applies from April 1 through October 31.</p> <p>(2) The geometric mean of samples taken for the sample period (monthly or weekly) may not exceed these values.</p> <p>(3) This limit applies from November 1 through March 31.</p> <p>(4) For compliance purposes, any single analysis and/or measurement beyond this limit shall be considered a violation of the conditions of this permit.</p> <p>(5) The geometric mean of samples taken for the sample period (monthly or weekly) may not exceed these values.</p>				

Table 3. 2018 Permit Monitoring and Reporting Requirements for Outfall 001-A

Parameter	Monitoring Location	Units	Minimum Sample Frequency
Flow ⁽¹⁾	Effluent	mgd	1/Week
	Effluent	MG	1/Month
5-Day Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	Influent ⁽⁵⁾	mg/L	1/Quarter
	Effluent	mg/L	1/Week
	NA	% Removal	1/Quarter
	Effluent	lb/day	1/Month
Total Suspended Solids	Influent ⁽⁵⁾	mg/L	1/Quarter
	Effluent	mg/L	1/Week
	NA	% Removal	1/Quarter
	Effluent	lb/day	1/Month
pH	Effluent	s.u.	1/Week
Oil and Grease ⁽²⁾	Effluent	Present/Not Present	Daily
	Effluent	mg/L	1/Quarter
<i>E. coli</i> bacteria ⁽³⁾	Effluent	Number of organisms / 100 mL	1/Week

(1) Require Recording device (totalizer or meter)
(2) Oil and grease analysis must be conducted quarterly plus anytime a visual sheen is observed in the effluent.
(3) Report Geometric mean if more than one sample is collected in the reporting period.

Table 4. 2018-Permit Monitoring Requirements for Outfall 001-B

Parameter	Units	Sample/Calculation Frequency
Total Ammonia	mg/L	1/Month
Nitrate + Nitrite	mg/L	1/Month ⁽²⁾
Total Kjeldahl Nitrogen	mg/L	1/Month ⁽²⁾
Total Nitrogen ⁽¹⁾	mg/L	1/Month ⁽²⁾
	lb/day	1/Month ⁽²⁾
Total Phosphorus	mg/L	1/Month ⁽²⁾
	lb/day	1/Month ⁽²⁾
Copper, Total Recoverable	µg/L	Semiannual
Iron, Total Recoverable	µg/L	Semiannual
Nickel, Total Recoverable	µg/L	Semiannual
Whole Effluent Testing ⁽³⁾	% Effluent	1/Quarter

(1) Calculated as the sum of nitrate + nitrite and total Kjeldahl nitrogen concentrations.
(2) Nutrient sample collection required only during the months of July, August and September.
(3) WET testing map be done at either Outfall 001-A or Outfall 001-B Sampling Points.

C. Effluent Quality

The period of record (POR) selected was January 2018 – June 2022. Effluent data for the POR are considered representative of the facility's effluent quality because the Columbus WWTF has not undergone any major changes since the 2018 Permit was issued. Table 5 summarizes monthly effluent data

at Outfall 001-A and Table 6 summarizes effluent data at Outfall 001-B for the POR as reported on discharge monitoring reports (DMRs), Form 2A, and the laboratory data sheets.

Table 5. Effluent Characteristics for the POR – Outfall 001-A

Parameter	Units	Minimum Value	Maximum Value	Average Value ⁽¹⁾	Sample Size
TSS	mg/L	2.8	142	45.6	53
	lb/day	4.2	311	75.1	53
	% removal	62	96	82.9	16
CBOD ₅	mg/L	2.5	82	12.2	53
	lb/day	4	160	19.3	53
	% removal	82	98	92.6	16
pH	s.u.	7.13	8.72	7.96 ⁽²⁾	103
Flow	mgd	0.13	0.32	0.19	54
<i>E. coli</i> ⁽³⁾	number of organisms/100 mL	2.1	2432	194	30
<i>E. coli</i> ⁽⁴⁾	number of organisms/100 mL	18.8	50552	3314	23
Oil and Grease	mg/L	All below detection limit			17
Whole Effluent Toxicity	% Effluent	One fathead minnow WET failure ⁽⁵⁾			11
⁽¹⁾ For values reported below the detection limit (i.e. non detect), the detection limit was used in calculations. ⁽²⁾ Average of maximum and minimum reported values ⁽³⁾ Values observed during April 1 through October 31 ⁽⁴⁾ Values observed during November 1 through March 31 ⁽⁵⁾ See Section VI part D for WET test failure specifics.					

Table 6. Effluent Characteristics for the POR – Outfall 001-B

Parameter	Units	Minimum Value	Maximum Value	Average Value ⁽¹⁾	Sample Size
Ammonia	mg/l	0.1	21.9	5.9	51
Nitrate + Nitrite, Total	mg/L	0.1	9.5	2.3	12
Nitrogen, Total	mg/L	<1	12.3	6.4	12
	lb/day	0.38	26	11.1	12
Nitrogen, Kjeldahl, Total	mg/L	1.9	9	4.5	12
Copper, Total Recoverable	µg/L	6	11	8.42	7
Iron, Total Recoverable	µg/L	80	160	124	7
Nickel, Total Recoverable	µg/L	32	56	42.57	7
Phosphorus, Total	mg/l	1.72	5.23	4.03	12
	lb/day	3.1	11.7	7.2	12
⁽¹⁾ For values reported below the detection limit (ie non detect), the detection limit was used in calculations.					

D. Compliance History

DEQ performed one compliance inspection between 2018 and 2022 on February 20, 2020, with the following findings:

- Exceeded the effluent limit of CBOD₅ during monitoring periods ending on June 30, 2019, April 30, 2020, May 31, 2020, and May 31, 2021.
- Exceeded *E. coli* limit 30 times since 2018.
- The facility was cited for incorrect reporting of oil and grease results, flow rate data, WET test results, CBOD₅, TSS, loading values, pH and *E. Coli*.
- The city did not properly calculate loading values.
- The city did not conduct monitoring for monitoring period ending March 21, 2018. These parameters were said to be inadvertently missed due to new permit requirements becoming effective.
- The city failed a fat minnow WET test on May 16, 2023. The city past the retest taken on May 30, 2023

III. Receiving Water: Yellowstone River

The Columbus WWTF discharges wastewater to the Yellowstone River. Wastewater from Columbus WWTF first discharges from Outfall 001-A to an unnamed dedicated ditch. The discharge then travels to Outfall 001-B where it discharges into the Yellowstone River.

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/Location: | Yellowstone River, Bridger Creek to City of Laurel PWS |
| ▪ Montana Stream Segment: | MT43F001_012 |
| ▪ Basin: | Yellowstone |
| ▪ USGS Hydrologic Unit Code (HUC 12): | 10070004 |
| ▪ HUC 12 Name: | Upper Yellowstone-Lake Basin |
| ▪ 7Q10: | 638 mgd (989 cfs) |
| ▪ Seasonal 14Q5: | 1343.1 mgd (2,078.2 cfs) |
| ▪ Ecoregion: | Northwestern Great Plains |
| ▪ Beneficial Use Status: | Fully supporting agriculture, aquatic life, drinking water and recreation. |
| ▪ Impairment Listing: | None. (2020 Montana Water Quality Integrated Report) |
| ▪ Total Maximum Daily Load (TMDL): | None. Yellowstone River Planning Area |

B. Water Use Classification

ARM 17.30 Subchapter 6 defines water use classifications for state waters and the numeric and narrative standards that protect those uses. The Yellowstone River is classified as B-1 according to the 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 2020 *Water Quality Integrated Report* does not list any impairments for the segment of Yellowstone River that the City of Columbus discharges to. The segment of Yellowstone approximately 20 miles downstream is impaired for aquatic life as a result of alteration in stream side and physical substrate habitat alterations. Loss of riparian habitat, site clearance and streambank modification is listed as the probable source.

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

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 Columbus WWTF was previously not required to monitor upstream. Table 7 provides ambient water quality data from the following monitoring locations for the period of record spanning from December 2003 to December 2018

- USGS-453959109212101: Yellowstone River at Holmgren FAS MT
- MDEQ_WQ_WQX-Y06YELSR04: Yellowstone River downstream Highway 78 Bridge at Ich-Kep Pe Park
- MDEQ_WQ_WQX-Y06YELSR08: Yellowstone River at Reed Point
- MDEQ_WQ_WQX-Y06YELSR60: Yellowstone River off Joliet Road, just downstream Itch-Kep-Pe-Park

Table 7. Yellowstone Ambient Water Quality

Parameter	Units	Minimum Value	Maximum Value	75 th Percentile	Sample Size
Temperature	°C	-8.5	20.3	18.0	14
pH	s.u.	7.84	8.45	8.27	14
Hardness, total [as CaCO ₃]	mg/L	37	203	69.5 ⁽¹⁾	14
Nitrate + nitrite	mg/L	0.01	0.11	0.08	14
Ammonia	mg/L	0.05	0.05	0.05	14
Copper	µg/L	0.44	24	4.15	9

⁽¹⁾ 25th percentile.
⁽²⁾ For values reported below the detection limit (ie non detect), the detection limit was used in calculations.

F. Low Flow

In the 2018-permit, low flow was calculated by combining low flow statistics from six upstream USGS gages because there are no nearby gages on the Yellowstone River. This method tends to underestimate the low flow values of the facility and therefore a new method was used for this renewal. Low flow estimates were calculated using a site-specific method which accounts for the underprediction. See Appendix A for

low flow calculation. The final recommended 7Q10 for Columbus facility is 989 cfs (638 mgd). The same method was also used to estimate the 14Q5 for the Yellowstone River at the Columbus facility. The final recommended 14Q5 for Columbus facility is 2,078.2 cfs (1343.1 mgd).

IV. Technology-Based Effluent Limits

A. Applicable Effluent Limit Guidelines

Technology-based effluent limits (TBELs) represent the minimum level of control that must be implemented in MPDES permits. Section 402(a)(1) of the federal Clean Water Act (CWA) and 40 CFR 125.3(a) require that permits issued under Section 402, including those issued by state programs, contain TBELs that implement the technology-based treatment requirements specified in the CWA. These limits are developed based on currently available treatment technologies and must be met prior to dilution.

The Montana Board of Environmental Review has adopted by reference 40 CFR 133, which defines the minimum levels of secondary treatment for publicly owned treatment works (POTWs) that use a trickling filter or a waste stabilization pond (lagoon) for the biological treatment of municipal wastewater.

1. Secondary Treatment Standards

Secondary treatment is defined in terms of effluent quality as measured by BOD₅, TSS, pH, and percent removal of BOD₅ and TSS. The parameter carbonaceous biochemical oxygen demand (CBOD₅) can be replaced for BOD₅. The most stringent secondary treatment requirements are National Secondary Standards (NSS). Facilities may be eligible for less stringent limits for CBOD₅ and TSS, called Treatment Equivalent to Secondary Standards (TES), if:

- Through proper operation and maintenance, the 95th percentile of the facility's monthly average data for a period of at least the last two years exceeds NSS limits for TSS and/or CBOD₅;
- A waste stabilization pond (lagoon) is the principal treatment process; and
- The facility uses biological treatment that achieves monthly averages of at least 65% removal.

Facilities eligible for TES that cannot meet TES limits may be eligible for a less stringent standard for TSS known as Alternative State Requirements (ASR) if:

- Through proper operation and maintenance, the 95th percentile of monthly average data over the last two years exceeds TES limits for TSS.

The period of record (POR) that was chosen as representative of Columbus WWTF discharge is January 2018- June 2022, as discussed in *Section II(C)*.

CBOD₅ Effluent History and Proposed Limits

- In an authorization letter dated June 20, 2016, DEQ allowed the City of Columbus to replace BOD₅ with CBOD₅.
- In the 2018 Permit, effluent limits were set to NSS for CBOD₅ (25 mg/L monthly average, 40 mg/L weekly average).
- The 95th percentile of monthly average data for CBOD₅ during the POR was 27.6 mg/L, which exceeds the NSS limit of 25 mg/L
- The 5th percentile of CBOD₅ removal during the POR was 86.2%, well above the 65% minimum required.
- The city has achieved proper operation and maintenance during inspections and site visits in April 7 2022, September 3, 2020 and September 5th, 2019, and is a lagoon with biological treatment.
- City of Columbus WWTF demonstrated it cannot meet NSS and meets the eligibility requirements for TES. Therefore, CBOD₅ limits will change to TES standards of 40 mg/L monthly average and 60 mg/L weekly average.

TSS Effluent History and Proposed Limits

- In the 2018 Permit, DEQ set effluent limits to ASR for TSS (100 mg/L monthly average, 135 mg/L weekly average).
- While maintaining proper operation and maintenance, the 95th percentile of monthly average data for TSS during the POR was 74.8 mg/L, which is greater than the TES standard of 45 mg/L.
- Columbus WWTF cannot meet TES for TSS, therefore TSS limits will remain at ASR.

B. Load Limits

Determining load limits for pollutants with TBELS is a three-step process. First, load limits are calculated from the proposed concentration limit. Next, nondegradation load limits are compared to actual pollutant loading. Next, final load limits are determined by comparing calculated limits to previous limits.

1. Nondegradation Load Allocations

Montana’s nondegradation policy protects state waters from degradation due to new or increased pollution sources. A facility is considered a new or increased source if it exceeds the load limits established in its current permit or the limits from a permit issued by DEQ prior to April 29, 1993.

Typically, nondegradation monthly average load limits are compared to a facility’s monthly average loading for the POR. Table 8 shows a comparison between the 2018 Permit load limits (i.e. nondegradation limits) and actual loading based on data obtained from DMRs, unless otherwise noted. The Columbus 2018 nondegradation average monthly load limits are based on the lowest average daily design flow rate since 1993 (0.25 million gallons per day (mgd)). Columbus WWTF did not exceed its nondegradation load allocations for CBOD₅ or TSS and will not be considered a new or increased source.

Nondegradation Load Allocation		Average Monthly Load (lb/day)			
Parameter	Load (lb/day)	2018	2019	2020	2021
CBOD ₅	52	29.9	35.4	28.2	24.0
TSS	209	55.0	73.5	152.8	67.6

2. Calculated Load Limits

Pollutants’ limits must be expressed in terms of mass and identified as load (lb/day) when appropriate and feasible. The mass loading limits for CBOD₅ and TSS are calculated based on the current average daily design flow (0.27 mgd) and the proposed concentration limits as shown below.

$$\text{Load Limit} = \text{Average Daily Design Flow} \cdot \text{Concentration Limit} \cdot \text{Conversion Factor}$$

CBOD₅: 30-Day Load Limit = 0.27 mgd • 40 $\frac{\text{mg}}{\text{L}}$ • 8.34 $\frac{\text{lb}\cdot\text{L}}{\text{Mgal}\cdot\text{mg}}$ = **90 $\frac{\text{lb}}{\text{day}}$**
 7-Day Load Limit = 0.27 mgd • 60 $\frac{\text{mg}}{\text{L}}$ • 8.34 $\frac{\text{lb}\cdot\text{L}}{\text{Mgal}\cdot\text{mg}}$ = **135 $\frac{\text{lb}}{\text{day}}$**
 TSS: 30-Day Load Limit = 0.27 mgd • 100 $\frac{\text{mg}}{\text{L}}$ • 8.34 $\frac{\text{lb}\cdot\text{L}}{\text{Mgal}\cdot\text{mg}}$ = **225 $\frac{\text{lb}}{\text{day}}$**
 7-Day Load Limit = 0.27 mgd • 135 $\frac{\text{mg}}{\text{L}}$ • 8.34 $\frac{\text{lb}\cdot\text{L}}{\text{Mgal}\cdot\text{mg}}$ = **304 $\frac{\text{lb}}{\text{day}}$**

3. Comparing Load Limits

The average monthly TBELs will be maintained at the more stringent of the average monthly nondegradation allocation or the average monthly mass-based load limits calculated above. Since nondegradation reflects longer averaging time, the average weekly limit will reflect the current mass-based load limit, as developed above. Nondegradation load allocation used the design flow of 0.25 mgd

not 0.27 mgd indicated in engineering documents. Therefore, the nondegradation load allocations are the most stringent and will be used.

Columbus WWTF will be held to TBELs based on ASR for TSS and TES for CBOD₅, as summarized in Table 9.

Parameter	Units	Average Monthly Limit	Average Weekly Limit
CBOD ₅	mg/L	40	60
	lb/day	52	135
	% removal	65%	--
TSS	mg/L	100	135
	lb/day	209	304
	% removal	65%	--
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, or contribute to, 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 Columbus WWTF must comply with the general prohibitions set forth in ARM 17.30.637. The general prohibitions 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 waste load allocation (WLA) in a TMDL

Table 10 summarizes the POCs identified for the Columbus WWTF. Identification of a POC is not an indication that a WQBEL is necessary, but an indication that further evaluation is required.

Table 10. Parameters of Concern for QBELs	
Parameter	Basis for Identification
<i>Conventional Pollutants</i>	
TSS, pH, CBOD ₅ or BOD ₅	TBEL
Oil and Grease	Previous permit limit
<i>E. coli</i> bacteria	Previous permit limit
<i>Nonconventional Pollutants</i>	
Nickel, Iron and Copper	Known Present or Previous monitoring
Nitrate plus Nitrite (N+N), Ammonia	Known Present or Previous monitoring
Total Nitrogen (TN), Total Phosphorus	Known Present

C. Mixing Zones

A mixing zone is an area established in a permit where the effluent mixes with the receiving water and certain water quality standards may be exceeded. 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 granted on a parameter-by-parameter basis and are not granted for TBELs. Chronic aquatic life standards and standards based on human health must not be exceeded beyond the boundaries of a surface water mixing zone. 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.

The Columbus WWTF does have a mixing zone authorized for nitrate + nitrite, copper and ammonia.

Standard Mixing Zone

A standard mixing zone is granted for necessary parameters, based on the criterion that the mean annual effluent flow is less than 1 mgd (0.19 mgd) and there is ample dilution. The mean average discharge from the Columbus WWTF is less than one mgd and the dilution ratio with the Yellowstone River is more than 100:1 (639 mgd 7Q10 stream flow/ 0.19 mgd average discharge). Therefore, a standard mixing zone is granted, and discharge limits are based on the eligibility for a dilution ratio of up to 100% for nitrate + nitrite (human health standard) and copper (chronic aquatic life standard). DEQ finds that granting minimal initial dilution for the acute aquatic life standard for copper will not impair beneficial uses. Minimal initial dilution is considered to be no more than 10% of the dilution granted for the chronic aquatic life standard. There is no reasonable potential to exceed water quality standards when granted 1% dilution for nitrate + nitrite and therefore there is no limit. In addition, there is no reasonable potential to exceed water quality standards when granted 1% dilution for acute copper and 10% for chronic copper standard. Therefore, there are no limits for copper.

In accordance with standard mixing zone procedures, the length of a standard mixing zone must not extend downstream more than one-half the mixing width distance or ten times the stream width, whichever is more restrictive. A standard mixing zone is defined by the more restrictive of these two values. Stream width at low flow was approximated as 264 feet at the outfall location; therefore, the length of the chronic and human health mixing zones will be set at 2,640 feet, equivalent to 10 times the stream width. The dimensions of the acute mixing zone will be 10% of that, or 264 feet long and 26.4 feet wide.

Alternative Mixing Zone

The Columbus WWTF will be allowed an alternative mixing zone for ammonia for acute and chronic aquatic life standards. The flow used to calculate RP and develop limits for total ammonia will be

established as 1% of the 7Q10 (6.39 mgd) for acute conditions and 10% of the 7Q10 (63.9 mgd) for chronic conditions. Table 11 summarizes the mixing zone characteristics.

Parameter	Mixing Zone Type	Standard	Allowed Dilution	Mixing Zone Length
Nitrate + nitrite	Standard	Human health	100	2,640 ft
Copper	Standard	Acute	100	264 ft
		Chronic	1	2,640 ft
Ammonia	Alternative	Acute	1%	10 ft
		Chronic	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.

$$C_r = \frac{C_s \cdot Q_s + C_d \cdot Q_d}{Q_r} \quad (\text{Equation 1})$$

Where:

- C_r = in-stream pollutant concentration after mixing (calculated)
- C_s = receiving water ambient pollutant concentration (75th percentile of ambient water quality data)
- Q_s = receiving water critical flow (allowed dilution • 7Q10)
- C_d = critical effluent pollutant concentration (C_{max} • TSD 3-2 multiplier)
- Q_d = critical effluent flow (POTWs: average daily design 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 12.

- 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 default CV of 0.6 is used if there are less than 10 samples.

- $CV = \frac{\text{standard deviation of monthly data}}{\text{average of monthly data}}$

2. Calculation of C_r and Reasonable Potential Determination

The in-stream pollutant concentration after mixing (C_r) is calculated using *Equation 1*. If $C_r >$ water quality standard (WQS) there is reasonable potential to exceed water quality standards (RP), and a WQBEL is needed. The WQS for total recoverable copper, iron and nickel were determined based on the 25th percentile of the receiving water’s hardness.

See *Section VI: Final Pollutant Evaluation* for pollutant specific RP analysis.

E. WQBELs for Pollutants with Reasonable Potential

When there is RP, DEQ develops WQBELs. 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.

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

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)

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

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

Q_d = effluent flow (POTWs: average daily design 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. 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*.

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.

- The WLA multiplier from TSD Table 5-1 is determined using the CV and the 99th percentile occurrence probability. This multiplier is then multiplied by the WLA to get the Long-Term Average (LTA). The LTA is calculated for both WLAs established from acute and chronic aquatic life criterion.
- 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.

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.

- 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.

VI. Final Pollutant Evaluation

A. Conventional Pollutants

5-Day Carbonaceous Biochemical Oxygen Demand (BOD₅): This permit will retain CBOD₅ in place of BOD₅. CBOD₅ is a typical effluent quality indicator for POTWs and is regulated through TBELs. TBELs provide adequate protection of water quality, and no WBELs will be required. The Columbus WWTF will be required to comply with the average monthly nondegradation load of 52 lb/day (discussed in *Section IV(D)*). The facility will be required to meet the below limits at the last point of control (Outfall 001-A).

- Concentration: AML= 40 mg/L, AWL= 60 mg/L
- Load: AML=52 lb/day, AWL=90 lb/day
- Percent removal: AML=65%
- Weekly effluent monitoring and monthly influent monitoring requirements will be continued.

Total Suspended Solids (TSS): TSS is a typical effluent quality indicator for POTWs and is regulated through TBELs. The Columbus WWTF will be required to comply with the average monthly nondegradation load of 209 lb/day (discussed in *Section IV(B)*). The nondegradation load is more protective than the waste load allocation (WLA) of 225 tons sediment/year. TBELs provide adequate protection of water quality, and no WBELs will be required.

- Concentration: AML= 100 mg/L, AWL= 135 mg/L
- Load: AML=209 lb/day, AWL=304 lb/day
- Percent removal: AML=65%
- Weekly effluent monitoring and monthly influent monitoring requirements will be continued.

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

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

Escherichia coli (E. coli): *E. coli* is a known pathogen in municipal wastewater systems. *E. coli* standards are set forth in the Montana Water Use Classifications set forth in ARM 17.30 Subsection 6. To protect human health and beneficial uses of the receiving water, no dilution is allowed. Columbus WWTF must meet the following standards applicable to all B-1 waterbodies:

- Summer (April 1 through October 31):
 - The geometric mean number of *E. coli* must not exceed 126 organisms per 100 milliliters (org/mL).
 - 10% of the total samples (expressed as average weekly limits) may not exceed 252 organisms per 100 mL during any 30-day period.
- Winter (November 1 through March 31):
 - The geometric mean number of *E. coli* must not exceed 630 organisms per 100 mL.
 - 10% of the total samples (expressed as average weekly limits) may not exceed 1,260 organisms per 100 mL during any 30-day period.
- The facility may report *E. coli* data as “number of organisms/100 mL,” which will incorporate either most probable number (MPN) or colony forming units (cfu) per 100 mL.
- Weekly effluent monitoring requirement will be continued.

Oil and Grease: The general prohibitions set forth in ARM 17.30.637 require that state waters be free from substances from municipal discharges that will result in visible oil film or be present in concentrations in excess of 10 mg/L. Columbus WWTF will be required to monitor for oil and grease and will be held to the standard established in the general prohibitions.

- Concentration: MDL=10 mg/L
- Weekly visual monitoring for oil and grease will be required.
- Annual grab sample will be required.

If visual monitoring indicates the presence of oil and grease, a grab sample must be collected. The facility must also collect one grab sample per year.

B. Nonconventional Pollutants

Total Ammonia: Ammonia is a toxic pollutant typically found in domestic wastewater. As shown in Table 12, Columbus WWTF has RP to exceed water quality standards prior to dilution in the receiving water. Columbus WWTF will be granted an alternative mixing zone with 10% dilution and a length of 100 ft for chronic standards and 1% and a length of 10 ft for acute standards.

Table 12 shows that the Columbus WWTF exceeds the ammonia water quality standards at the point of discharge and shows there is no reasonable potential for the discharge to cause or contribute to an exceedance of the water quality standards with the allowed alternative mixing zone. *Section V.D.* details the process for determining reasonable potential. As reasonable potential does not exist, this permit renewal will not include ammonia limits.

Table 12. Reasonable Potential Analysis for Total Ammonia									
Projected Critical Effluent Concentration (C _d)					Water Quality Standard				
CV	Sample Size	→ TSD Mult.	• C _{max}	= C _d	Acute	Chronic	HH		
-	-	-	mg/L	mg/L	mg/L	mg/L			
1.15	51	1.06	21.9	23.25	3.34	1.28		-	
Dilution	Projected Receiving Water Conc. (C _r) in mg/L					Reasonable Potential			
	C _s	• Q _s	+ C _d	• Q _d	/ Q _r	C _r	< or >	WQS	RP?
	mg/L	mgd	mg/L	mgd	mgd	mg/L		mg/L	-
1% chronic	0.050	6.390	23.3	0.27	6.660	0.991	<	3.34	no
10% chronic	0.050	63.900	23.3	0.27	64.170	0.15	<	1.28	no

Columbus WWTF will be required to monitor ammonia in the discharge ditch (longitude to 45.624167° latitude, -109.234722° longitude). This sampling point is identified on Figure 1 as “Outfall 001-B: Sampling Point”. Ambient monitoring of pH and temperature will be required upstream of the Yellowstone River to provide a dataset for ammonia standards calculations in the next permit cycle.

- Quarterly ambient monitoring will be required.
- The monthly monitoring requirement will be continued in this permit. Although there is no RP for total ammonia, monitoring is required because dilution with the receiving water is needed to achieve water quality standards.

Nitrate + Nitrite, as N: Nitrate + nitrite (N+N) are toxic components of total nitrogen and are commonly found in domestic wastewater. DEQ adopted a numeric human health standard of 10 mg/L for nitrate + nitrite, as N. Columbus WWTF will be granted a standard mixing zone with 100% dilution for nitrate + nitrite.

The previous permit had no effluent limits for nitrate + nitrite, as there was no RP. Table 13 demonstrates the calculations determining the reasonable potential for nitrate + nitrite to exceed aquatic water quality standards exists based on effluent quality during the POR. There is no reasonable potential for the discharge to cause or contribute to an exceedance of the water quality standards when given 1% dilution. *Section V.D.* details the

process for determining reasonable potential. As reasonable potential does not exist, this permit renewal will not include nitrate + nitrite limits.

Table 13. Reasonable Potential Analysis for Total Nitrate + nitrite									
Projected Critical Effluent Concentration (C _d)					Water Quality Standard				
CV	Sample Size	→ TSD Mult.	• C _{max}	= C _d	Acute	Chronic		HH	
-	-	-	mg/L	mg/L	mg/L	mg/L			
1.21	12	2.30	9.5	21.7	-	-		10	
Dilution	Projected Receiving Water Conc. (C _r) in mg/L					Reasonable Potential			
	C _s	• Q _s	+ C _d	• Q _d	/ Q _r	C _r	<	WQS	RP?
	mg/L	mgd	mg/L	mgd	mgd	mg/L	or >	mg/L	-
1% human	0.080	6.39	21.7	0.27	6.60	0.956	<	10	no

Effluent monitoring will be required. Columbus WWTF will be required to monitor N+N within the discharge ditch (longitude to 45.624167° latitude, -109.234722° longitude). This sampling point is identified on Figure 1 as “Outfall 001-B: Sampling Point”.

- Monthly effluent monitoring requirements will be required during summer months of July, August and September. Although there is no RP for nitrate + nitrite, monitoring is required because dilution with the receiving water is needed to achieve water quality standards.

Nutrients – Total Nitrogen, as N and Total Phosphorus, as P: Total nitrogen (TN) and total phosphorus (TP) are nutrients which can lead to excessive algal and aquatic vegetation growth and are common constituents of municipal waste. DEQ protects waterbodies from undesirable aquatic life, such as excessive algae, that are stimulated by nutrients. DEQ has not developed a TN or TP water quality standard for the Upper Yellowstone River, so a numeric RP assessment is not required. The Yellowstone dilution ratio is greater than 100:1 and therefore this point source has little impact on aquatic life. Furthermore, the segment to which the facility discharges is not listed as impaired for nutrients. Based on these considerations, TN nor TP limits are needed at this time.

- Monthly effluent monitoring of total Kjeldahl nitrogen, total nitrogen, and total phosphorus will be continued during the summer months of July, August and September.

C. Total Recoverable Metals

Total Recoverable Metals: copper, iron, nickel: Concentrations of toxic parameters which would remain in the water after treatment must not exceed the applicable standards specified in DEQ-7. Table 14 demonstrates iron does not have reasonable potential to exceed water quality standards. Copper received the standard mixing zone for chronic and acute conditions.

Ambient data was not available for nickel. Ambient data is needed to calculate the RP and therefore quarterly ambient monitoring will be required to collect data for nickel. Nickel reasonable potential will be reassessed next permitting cycle.

Table 14. Reasonable Potential Analysis for Recoverable Metals									
Parameters	Projected Critical Effluent Concentration (C_d)					Water Quality Standard			
	CV	Sample Size	→TSD Mult.	• C _{max}	= C _d	Acute	Chronic	HH	RP?
	-	-	-	μg/L	μg/L	μg/L	μg/L	-	-
Copper	0.6	7	2.01	11	22.05	9.94	6.84	1300	yes
Iron	0.6	7	2.01	160	320.8		1000		no
Nickel	0.6	7	2.01	56	112.3	344.87	38.34	100	yes
Parameters (1)	Projected Receiving Water Conc. (C_r) in mg/L					Reasonable Potential			
	C _s	• Q _s	+ C _d	• Q _d	/ Q _R	C _r	< or >	WQS	RP?
	μg/L	mgd	μg/L	mgd	μg/L	μg/L		μg/L	-
Copper, Acute	4	6.39	22.05	0.27	6.660	4.732	<	9.94	no
Copper, Chronic	4	63.9	22.05	0.27	64.170	4.076	<	6.84	no

(1) Acute parameters receive a mixing zone with 1% dilution and chronic parameters receive a mixing zone with 10% dilution, see Section V.C.

- Semi-annual effluent monitoring for copper, iron and nickel will be continued to ensure it does not exceed water quality standards.
- Quarterly effluent monitoring of nickel and copper will be required during the last year of the permit.
- Quarterly ambient (upstream) monitoring only during the last three years of the permit will be required for copper and nickel.

D. Whole Effluent Toxicity Limitations

The general prohibitions set forth in ARM 17.30.637 state that state surface waters must be free from substances that will create concentrations or combinations of materials which are toxic or harmful to human, animal, plant, or aquatic life. DEQ uses whole effluent toxicity (WET) testing to ensure compliance with this narrative requirement. DEQ’s procedures for determining the type of WET testing required (acute or chronic) are based on the EPA’s recommendations in the *Technical Support Document for Water Quality-based Toxics Control, 1991*.

The following endpoints define acute and chronic toxicity as measured in a WET test:

- During an acute WET test, acute toxicity occurs when 50 percent mortality is observed for any tested species at any effluent concentration (i.e., LC₅₀ < 100% effluent)
- During a chronic WET test, chronic toxicity occurs when the 25% inhibition concentration (IC₂₅) for any tested species is less than or equal to the percent effluent represented by the effluent concentration in the receiving water after accounting for any allowable dilution.

Acute WET Testing Required: The previous permit required quarterly acute WET testing on two species. However, Columbus WWTF had one fathead minnow WET failure (5/16/2023). Columbus retested on May 30, 2023, and passed. Therefore, Columbus WWTF will now have an acute Whole Effluent Toxicity (WET) limit of ‘no acute toxicity.’ Wet Testing is required because Columbus WWTF receives discharge

from Montana Silversmiths Company and Stillwater Mining Company. Quarterly acute WET testing using two species will be required of the facility starting the first full quarter after the permit effective date.

Confirmation of acute toxicity in the effluent will trigger the standard toxicity identification/toxicity reduction (TIE/TRE) requirements of the permit. Standard WET language will be included in the permit and will describe the test methods, test conditions, endpoints, test acceptability criteria, reporting requirements, and accelerated testing-TIE/TRE requirements.

If the results for four consecutive quarters of testing indicate no acute toxicity, Columbus WWTF may request DEQ to reduce acute WET monitoring to semi-annual for two species. DEQ may approve or deny the request based on the results and other available information without an additional public notice. If the request is approved, DEQ will process this request as a minor modification.

VII. Final Effluent Limits

A. Anti-Backsliding Analysis

DEQ considered the proposed limits to ensure this permit does not violate anti-backsliding policies.

B. Final Limits

The final effluent limits are a combination of TBELs developed in *Section IV*. Effluent limitations and conditions of reissued permits must be at least as stringent as those in the existing permit, with certain exceptions. Discharge from Columbus WWTF must not violate the general prohibitions set forth in ARM 13.30.637. Outfall 001-A is located at the point that the effluent from pond 1C is discharged through the cement weir at the beginning of the discharge ditch. This point is identified on the facility map in Figure 1 as “Outfall 001-A”. All sampling of the effluent discharged at Outfall 001-A shall be conducted at the weir located at the beginning of the man-made ditch before comingling with any residing ditch water. The final effluent limits in Table 15 will be applied to the discharge at Outfall 001-A beginning on the permit effective date and lasting through the term of the permit.

- There shall be no discharge of floating solids or visible foam other than in trace amounts.
- There shall be no discharge which causes visible oil sheen in the receiving stream.
- There shall be no discharge that settles to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines.

Table 15. Final Effluent Limits – Outfall 001-A				
Parameter	Units	Average Monthly Limit⁽¹⁾	Average Weekly Limit⁽¹⁾	Maximum Daily Limit⁽¹⁾
CBOD ₅	mg/L	40	60	--
	lb/day	52	135	--
	% removal	65%	--	--
TSS	mg/L	100	135	--
	lb/day	209	304	--
	% removal	65%	--	--
pH	s.u.	6.0 – 9.0 ⁽²⁾		
<i>E. coli</i> , Summer ^(3,4)	org/100mL	126	252	--
<i>E. coli</i> , Winter ^(4,5)	org/100mL	630	1,260	--
Oil and Grease	mg/L	--	--	10.0
Whole Effluent Toxicity, Acute, LC ₅₀	% Effluent	No Acute Toxicity		
<p>⁽¹⁾ See definitions in Part V of the permit for explanation of terms.</p> <p>⁽²⁾ Instantaneous minima and maxima. Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of the permit.</p> <p>⁽³⁾ Limit applied from April 1 through October 31.</p> <p>⁽⁴⁾ Geometric mean shall be reported if more than one sample is collected during the reporting period.</p> <p>⁽⁵⁾ Limit applied from November 1 through March 31.</p>				

VIII. Monitoring and Reporting Requirements

Monitoring requirements are based on the type of treatment facility and the method of discharge. Columbus WWTF 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 Columbus WWTF 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 Columbus WWTF are presented in Table 17 and 18.

- The facility must monitor their effluent at the last point of control prior to discharge at Outfall 001-A, unless the parameter is specified for Outfall 001-B.
- 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 weekly and 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).

Columbus WWTF must monitor effluent at the last point of control prior to discharge at Outfall 001-A. Outfall 001-A was located at discharge ditch at 45.62415°, -109.239278°. For easier access, Outfall 001-A will now be located inside the UV building at location 45.624610°, -109.239625°. Monitoring and reporting requirements for Outfall 001-A are shown in Table 17.

Outfall 001-B was located at the point that the discharge ditch meets the Yellowstone River (45.624125° latitude, - 109.232597° longitude). Due to inaccessibility during winter Outfall 001-B will now be located upstream of the discharge ditch at 45.624167° latitude, -109.234722° longitude. This point is identified on the facility map in Figure 1 as “Outfall 001-B: Sampling Point”. Monitoring and reporting requirements for Outfall 001-B are shown in Table 17.

Table 17. Monitoring Requirements for Outfall 001-A

Parameter ⁽¹⁾	Units	Sample Type ⁽²⁾	Sample/Calculation Frequency	Reporting Requirement	RRV ⁽³⁾
Flow	mgd	Instantaneous	1/Week	Monthly average Daily Maximum	--
5-Day Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	mg/L	Composite	1/Week	Weekly Average Monthly Average	2
	% removal	Calculated	1/Month	Monthly Average	--
	lb/day	Calculated	1/Month	Weekly Average Monthly Average	--
Total Suspended Solids (TSS)	mg/L	Composite	1/Week	Weekly Average Monthly Average	10
	% removal	Calculated	1/Month	Monthly Average	--
	lb/day	Calculated	1/Month	Weekly Average Monthly Average	--
pH	s.u.	Instantaneous	1/Week	Daily Minimum Daily Maximum	0.1
<i>E. coli</i>	Number of organisms/100 mL ⁽⁴⁾	Grab	1/Week	Weekly Geometric Mean Monthly Geometric Mean	1/100m L
Oil and Grease	Presence	Observation	1/Week	Presence/Absence	--
	mg/L	Grab	1/Discharge	Daily Maximum	1.0
⁽¹⁾ All parameters are effluent unless otherwise noted. ⁽²⁾ See definitions in Part V of the permit for an explanation of terms. ⁽³⁾ Required reporting value. If reporting non-detects, analysis must achieve these or lower RRVs. ⁽⁴⁾ May be reported as MPN/100 mL or number of organisms/100 mL. ⁽⁵⁾ A sample must also be taken any time the visual presence of oil is observed.					

Table 18. Monitoring Requirements for Outfall 001-B					
Parameter⁽¹⁾	Units	Sample Type ⁽¹⁾	Sample/Calculation Frequency	Reporting Requirement	RRV⁽²⁾
Total Ammonia, as N	mg/L	Composite	1/Month	Monthly Average	0.07
Nitrate + Nitrite, as N	mg/L	Composite	1/Month ⁽⁴⁾	Monthly Average	0.02
Total Kjeldahl Nitrogen, as N	mg/L	Composite	1/Month ⁽⁴⁾	Monthly Average	0.225
Total Nitrogen, as N	mg/L	Calculated ⁽³⁾	1/Month ⁽⁴⁾	Monthly Average	0.245
Total Phosphorus, as P	mg/L	Composite	1/Month ⁽⁴⁾	Monthly Average	0.003
Copper, Total Recoverable ⁽⁵⁾	µg/L	Grab	1/Semiannual	Value	2
Iron, Total Recoverable	µg/L	Grab	1/Semiannual	Value	20
Nickel, Total Recoverable ⁽⁵⁾	µg/L	Grab	1/Semiannual	Value	2
Whole Effluent Testing ⁽⁶⁾	% Effluent	Pass/Fail	1/Quarter	Pass/Fail	NA
⁽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⁾ Calculated as the sum of nitrate + nitrite and total Kjeldahl nitrogen concentrations. ⁽⁴⁾ Monitoring for nutrients is conducted during the summer months of July, August and September ⁽⁵⁾ Effluent monitoring will increase to quarterly during the last year of the permit. ⁽⁶⁾ Wet Testing may be done at either Outfall 001-A or 001-B Sampling Points. Failure of any acute WET test requires that the permittee comply with the Permit’s Special Conditions					

B. Influent Monitoring

Columbus WWTF must monitor influent CBOD₅ and TSS monthly to calculate a monthly average percent removal. The sampling and monitoring location for influent shall be established at the influent manhole.

C. Ambient Monitoring

Columbus WWTF will be required to start ambient monitoring for temperature, pH, ammonia, nitrate + nitrite, copper, and nickel during the last three years of the permit as specified in Table 18.

- Monitoring must take place in Yellowstone River at a consistent location upstream and outside the influence of Outfall 001-A and B with sample type, frequency, and RRVs as identified in Table 18.

Table 19. Ambient Monitoring Requirements				
Parameter	Units	Sample Frequency	Sample Type ⁽¹⁾	RRV⁽²⁾
Temperature	°C	1/Quarter	Instantaneous	0.1
pH	s.u.	1/Quarter	Instantaneous	0.1
Total Ammonia	mg/L	1/Quarter	Grab	0.07

Table 19. Ambient Monitoring Requirements				
Parameter	Units	Sample Frequency	Sample Type ⁽¹⁾	RRV⁽²⁾
Nitrate + nitrite	mg/L	1/Quarter	Grab	0.02
Copper ⁽³⁾	µg/L	1/Quarter	Grab	2
Nickel ⁽³⁾	µg/L	1/Quarter	Grab	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⁾ Quarterly monitoring will be required only during the last three years of the permit.				

IX. Public Participation

A. Public Notice

DEQ issued Public Notice No. MT-20-05 dated July 17, 2023. 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 August 18, 2023. 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.

Columbus Water Treatment Facility 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.

X. 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)*.

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Appendix A – Columbus Wastewater Treatment Facility Low Flow Stats Calculations

DEQ – Columbus Wastewater Treatment Plant Low Flow Stats Calculations

DEQ used the following methodology to determine the annual 7Q10 and seasonal 14Q5 low flow statistic at the Columbus Wastewater Treatment Facility (“facility”) for its MPDES permit (MT0031801).

The previous permit combined the low flow statistics from 6 upstream USGS gages (06192500-Yellowstone River near Livingston; 06195600-Shields River near Livingston; 06197000-Big Timber Creek near Big Timber; 06200000-Boulder River at Big Timber; 06201000-Sweet Grass Creek below Melville; 06205000-Stillwater River near Absarokee) to determine the low flow statistics at this facility because there are no nearby USGS gages on the Yellowstone River with adequate streamflow data to estimate low flow values. Since that time, the Department has developed protocols for determining low flow statistics for MPDES permits. While the method used in the previous permit is a valid estimation method it has inherent errors as each stream used may have different flow regimes and thus the timing of low flows can be different between gages. By combining low flow statistics that may not occur at the same time, the method would tend to underestimate the low flow values at the facility. Therefore, other methods as described below were evaluated to determine more accurate low flow statistics.

The facility discharges to the Yellowstone River at 45.6249 latitude, -109.2259 longitude. There is a long-term USGS gage located on the Yellowstone River approximately 43 miles downstream of the facility – USGS gage 06214500 (Yellowstone River at Billings, MT). The choice of using a particular gage depends on proximity to the facility (in terms of drainage area), the period of record, and how recent the data collection is. The drainage area, period of record, and most recent climate year for the USGS gage, and the drainage area of the Yellowstone River at the facility, are listed in Table 1. The drainage area at the facility was determined using the USGS Streamstats program.

Table 1. Data Summary for USGS Gage Locations and Facility

Location	Drainage Area (square miles)	Period of Record	Most Recent Climate Year
USGS 06214500 (Yellowstone River at Billings, MT)	11,414	1929-current	2020
USGS 06192500 (Yellowstone River near Livingston, MT)	3,551	1897-current	2020
Yellowstone River near the Columbus WWTF	7,930	-	-

The department’s guidance states that if there is a long-term gaging station on the stream with a drainage area greater than 5% different than the drainage area of the facility (but not outside the 0.5-1.5 ratio), and the facility is not bracketed by two gages, to use the drainage area ratio method to calculate the low flow stats. The drainage area at the facility is 0.69 of the USGS gage drainage area (see Table 1) and thus is within the 0.5-1.5 area criteria. This methodology uses equation 10 from Chapter G of Montana StreamStats (USGS 2015) as shown below. As shown in Table 1 the nearest upstream gage on the Yellowstone River is at Livingston, the drainage area at the facility is 2.23 larger than the Livingston gage and is outside the 0.5-1.5 criteria, therefore the bracket method was not used.

$$Q_u = Q_g \left(\frac{A_u}{A_g} \right)^{exp_{Q,R}} \quad (10)$$

where

- Q_u is the streamflow characteristic for the ungaged site,
- Q_g is the streamflow characteristic for the gaging station (table 1-1),
- A_u is the contributing drainage area for the ungaged site,
- A_g is the contributing drainage area for the gaging station (table 1-2), and
- exp is the coefficient for drainage area adjustment for the streamflow characteristic (Q) and region (R) of the gaging station (table 1-3).

To determine low flow stats at the gaged site, the Yellowstone at Billings gage (period of record 1929-2022) was reviewed. The 7Q10 values for the gage site were calculated using March 1 as the start of the climatic year. The calculated USGS gage low flow statistics are found in Table 2. Those values were then used in equation 10 of chapter G of Montana StreamStats (see above) to calculate the low flow statistic value of the Yellowstone River at the Columbus facility discharge location. The 7Q10 and 14Q5 “exp” values for the Upper Yellowstone-Central Mountain hydrologic region in the above equation are 0.749 and 0.636, respectively, per Chapter G, Table 1-3 (USGS, 2015). Using the Billings gage and the drainage area ratio method the low flow values at the facility are summarized in Table 2.

Table 2. Preliminary 7Q10 and 14Q5 Low Flow Statistic Calculations

Site	Climatic Years Used	Drainage Area (square miles)	Annual 7Q10 Value (cfs)	Seasonal 14Q5 Value (cfs)
USGS 06214500 (Yellowstone River at Billings, MT)	1929-2020	11,414	1147.3	2,342.5
Columbus Wastewater Treatment Facility	-	7,930	873.4	1,858.2

The 7Q10 in Table 2 is lower than the 7Q10 used in the previous permit, which as described previously is likely underestimated. Because the 7Q10 (and 14Q5) in Table 1 may be underestimated additional analysis was conducted.

There is one major tributary to the Yellowstone between the facility and the Yellowstone at Billings gage, Clarks Fork of the Yellowstone (CFY). To determine if the typical drainage area ratio method described above from the USGS Streamstats equation 10 of Chapter G is applicable, the 7Q10 to drainage area ratio was calculated for the Yellowstone at Billings gage and compared to the ratio for the CFY at Edgar gage (USGS 06208500). The ratio for the Yellowstone at Billings gage (0.097 cfs/square mile) is nearly double of the CFY at Edgar gage (0.051 cfs/square mile). The difference in the ratio indicates that the CFY is contributing less flow to the Yellowstone at Billings gage than predicted by the Streamstats drainage area ratio equation. Overpredicting the flow from the CFY would result in an

underestimation of the 7Q10 on the Yellowstone River upstream of the CFY confluence, and thus underestimation at the Columbus facility.

This potential underestimation of 7Q10 using Streamstats was previously recognized for the low flow statistics calculation for the Laurel Water Treatment Plant (WTP) (MT0030261). The low flow statistics for the Laurel WTP were estimated using a site-specific method to account for the Streamstats underprediction described above. That same method will be used for the 7Q10 and 14Q5 at the Columbus facility as described below. Although this method is not part of the typical protocols DEQ uses for estimating low flow statistics, it was chosen for the Laurel WTP as a more accurate estimate. Because there are no major tributaries to the Yellowstone River in the approximately 29 river miles between Columbus and Laurel this method will also be used for the Columbus facility.

7Q10

The 7Q10 for the Yellowstone River immediately above the confluence with the CFY will be estimated by subtracting the calculated 7Q10 at the mouth of the CFY from the calculated 7Q10 at the Yellowstone Billings gage (1147.3 cfs). To calculate the 7Q10 at the mouth of the CFY the 7Q10 at the CFY Edgar gage (102 cfs) has to be adjusted for the larger watershed area at the mouth using the drainage area ratio equation shown above (USGS, 2015). Based on Streamstats the watershed area at the CFY mouth is 2,793 square miles. Using the drainage area ratio method, the 7Q10 at the CFY mouth is 129.3 cfs. By subtracting the 7Q10 at the CFY mouth (129.3 cfs) from the 7Q10 at the Yellowstone at Billings gage (1,147.3) the 7Q10 above the CFY confluence is 1,018 cfs. Combining low-flow statistical values for multiple gages can lead to some timing errors as was described previously for the estimated 7Q10 in the current permit, but combining low-flow values for two gages (Yellowstone at Billings and CFY at Edgar) that are closer to the Columbus facility than the 6 gages used in the current permit provides less chance for error and a more accurate low-flow estimation.

Using the calculated 7Q10 for the Yellowstone River immediately upstream of the CFY confluence (1,018 cfs) the drainage area ratio method is used to account for the difference in drainage areas and calculate the low flow statistic value of the Yellowstone River at the Columbus facility. The Columbus facility drainage area is 0.96 of the drainage area for Yellowstone River above the CFY confluence. The final recommended 7Q10 for Columbus facility is **989 cfs** (Table 3).

14Q5

The same method used above for the 7Q10 was also used to estimate the 14Q5 at the Columbus facility. The final recommended 14Q5 for Columbus facility is **2,078.2 cfs** (Table 3).

Table 3. Final 7Q10 and 14Q5 Statistic Calculations

Site	Drainage Area (square miles)	Climatic Years Used	7Q10/14Q5 “exp” Value	Annual 7Q10 Value (cfs)	Seasonal 14Q5 Value (cfs)
USGS 06214500 (Yellowstone River at Billings, MT)	11,414	1929-2020	0.749/0.636	1147.3 ⁽¹⁾	2,342.5 ⁽¹⁾

USGS 06208500 (Clark Fork Yellowstone River at Edgar, MT)	2,034	1931-2020	0.749/0.636	102 ⁽¹⁾	160.4 ⁽¹⁾
Mouth of Clark Fork Yellowstone River	2,793	-	0.749/0.636	129.3 ⁽²⁾	203.4 ⁽²⁾
Yellowstone River above confluence with Clark Fork Yellowstone	8,242	-	0.749/0.636	1,018 ⁽²⁾	2,139.1 ⁽²⁾
Columbus Wastewater Treatment Facility	7,930	-	0.749/0.636	989 ⁽²⁾	2,078.2 ⁽²⁾

NOTES:

(1) Value calculated using daily measured streamflows for the period of record listed.

(2) Value calculated as described in the text.

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