MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

Fact Sheet

Permittee:	City of Dillon
Permit No.:	MT0021458
Receiving Water:	Beaverhead River
Facility Information:	
Name	City of Dillon Wastewater Treatment Plant
Location	84 Lagoon Lane Dillon, MT Township 7 S, Range 8 W, Section 18 Beaverhead County
Facility Contact:	Michael L Klakken, Mayor 125 N. Idaho Street Dillon, MT 59725
Fee Information:	
Number of Outfalls	1 (for fee determination purposes)
Outfall – Type	001 – Minor Publicly Owned Treatment Works (POTW)

I. Permit Status

This fact sheet has been drafted for renewal of Montana Pollutant Discharge Elimination System (MPDES) permit no. MT0021458. The existing permit was issued January 19, 2010 (reissued with modifications on August 31, 2010, April 9, 2014 and April 21, 2014), became effective on March 1, 2010, and expired at midnight, February 28, 2015.

The Montana Department of Environmental Quality (DEQ) received an application from the City of Dillon WWTP for renewal of MT0021458 on March 6, 2014. DEQ deemed the application complete and the 2010-issued permit to be administratively continued in a letter dated September 8, 2014.

II. Facility Information

A. Facility Description

The permittee operates a one cell Biological Nutrient Removal (BNR) mechanical plant, upgraded from a 5-cell aerated lagoon system, which was installed in pre-existing cell no. 4 in 2014. The BNR mechanical plant incorporates both denitrification and phosphorus removal processes. The

current activated sludge facility design flow is 0.75 million gallons per day (mgd) for a design population of 5,200 people. Current population served is 4,200 (application, 2014). A new headworks, consisting of a pair of two foot wide channels; one with a bar rack and the other a mechanical rotary screen, and Parshall flume have been installed for more efficient removal of debris and more accurate flow measurement. In this treatment system influent will pass through aeration basins, clarifiers and the effluent will be directed to the UV disinfection and discharged into the Beaverhead River through a diffuser. Waste Activated Sludge (WAS) will flow from the clarifiers to the sludge storage located in the eastern portion of cell no. 4. Return Activated Sludge (RAS) will gravity flow back to the head of the aeration basin. The WAS is then pumped to drying beds for future removal. Effluent flow data indicate that the I/I contribution to influent flow is approximately 0.040 mgd (Application, 2014).

The system has ultra-violet (UV) disinfection which operates year round. Influent flow is measured with a Parshall flume and an ISCO mechanical flow meter. Effluent flow is measured using an in-pipe, mechanical flow meter that is calibrated annually by the manufacturer. Discharge is continuous to the Beaverhead River via a single port diffuser that discharges approximately 15 feet from the river bank into the main flow of the receiving water. **Table 1** summarizes the WWTP design details.

Table 1: Current Design Criteria Summary (Manion Engineering, 2012)

Facility Description: Two-celled, Biolac system; continuous discharge; UV disinfection.	
Construction Date: unknown	Modification Date: 2014
Design Population: 5,200	Current Population: 4,200 (application)
Design Flow, Average Day (mgd): 0.750	Design Flow, Maximum Day, Summer (mgd): 1.0 Maximum Day, Winter (mgd): 0.700
Primary Cells: 1	Secondary Cells: 1
Number Aerated Cells: 1	Minimum Detention Time Total System (days): Winter - 26 Summer -20
Design BOD_5 Removal (%): unknown	Design BOD_5 Load (lb/day): 510
Design TSS Removal (%): unknown	Design TSS Load (lb/day): 510
Influent Flow (mgd): 1.025 (max daily)	Source: NA
Collection System Combined [ ] Separate [X]	Estimated I/I: 90,000 gallons per day (gpd) during wet weather/irrigation season
SSO Events (Y/N): unknown	Bypass Events (Y/N): none
Disinfection (Y/N): Y	Type: UV light

B. Effluent Characteristics

A summary of effluent quality from facility Discharge Monitoring Reports (DMR) is given in **Table 2**. The Period of Record (POR) is July 2014 through October 2016. The upgraded mechanical plant went online in June of 2014.

Table 2: DMR Effluent Characteristics* for POR June 2010 through October 2016.

Parameter	Location	Units	2010 Permit Limitation	Minimum Value	Maximum Value	Average Value	Number of Records
Flow, 30-Day Average	Effluent	mgd	(1)	0.29	0.40	0.35	28
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Influent	mg/L	(1)	150.0	480.0	222.5	28
	Effluent	mg/L	25/40(2)	0	11.1	3.31	25
	Effluent	% removal	85	94	100	98.2	28
	Effluent	lb/day	156/250(2)	0	28.8	9.3	28
Total Suspended Solids (TSS)	Influent	mg/L	ND	118	483	191.4	28
	Effluent	mg/L	100/135(2)	10.0	13.5	10.3	26
	Effluent	% removal	ND	88.6	100.0	94.5	28
	Effluent	lb/day	624/844(2)	23	36	30	26
Escherichia coli Bacteria(3)	Effluent	cfu per 100 mL	126/252(2)	1.0	259.5	28.2	18
Escherichia coli Bacteria(4)	Effluent	cfu per 100 mL	630/1,260(2)	1.0	772.4	109.9	10
pH (median value)	Effluent	s.u.	6.0-9.0	7.1	7.7	7.3	28
Temperature	Effluent	ºC	(1)	3.4	21.6	14.0	28
Total Ammonia as N (5)	Effluent	mg/L	8.5/11.4(2)	0.09	2.05	0.39	19
Total Kjeldahl Nitrogen (TKN)	Effluent	mg/L	(1)	0.50	36.4	3.2	28
Nitrate + Nitrite as N	Effluent	mg/L	(1)	0.07	28.40	14.05	28
Total Nitrogen(6)	Effluent	mg/L	(1)	8.3	25.4	13.8	9
		lb/day	(1)	12.8	77.3	43.9	9
Total Phosphorus as P	Effluent	mg/L	(1)	2.9	8.6	4.3	9
		lb/day	(1)	3.6	27.5	12.9	9
Dissolved Oxygen	Effluent	mg/L	(1)	1.2	7.2	2.3	28
Oil and Grease	Effluent	mg/L	10	1.0	3.0	1.1	26

Footnotes:
ND – No data available.
* Conventional and Non-conventional Pollutants only, table does not include information on toxic pollutants with the exception of total residual chlorine and total ammonia as N.
(1) No effluent limitation in previous permit, monitoring requirement only.
(2) Limit shown as 30-day average/7-day average.
(3) This limit applies during the period April 1 through October 31.
(4) This limit applies during the period November 1 through March 31.
(5) Ammonia as N data was analyzed from April 2015 through October 2016. The ammonia as N limit became effective February 1, 2015.
(6) Calculated as the sum of Nitrite and Nitrate as N and TKN concentrations

C. **Compliance History**
No MPDES compliance evaluation inspections have been conducted since March 1, 2010.

Several numeric limit exceedances were documented for the POR.

- Two numeric limit exceedances for *Escherichia coli* (*E.coli*) for monitoring periods ending 2013, July 31, 2014, and February 28, 2015, and
- One numeric limit exceedance for Ammonia as N for the monitoring period ending March 31, 2015.

III. Technology-based Effluent Limitations

A. Scope and Authority
Technology-based Effluent Limits (TBELs) represent the minimum level of control that must be imposed by a permit issued under the MPDES program. DEQ must consider technology available to treat wastewater, and effluent limits that can be consistently achieved by that technology. TBELs are based on currently available treatment technologies and allow the permittee discretion to choose applicable controls to meet those standards.

The Montana Board of Environmental Review (BER) has adopted by reference Title 40 of the Code of Federal Regulations Part 133 (40 CFR 133) which defines minimum treatment requirements for secondary treatment for publically owned treatment works (POTWs) [ARM 17.30.1203(14)(a)]. Secondary treatment is defined in terms of effluent quality as measured by Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), percent removal of BOD_5 and TSS, and pH. The parameter carbonaceous BOD_5 ($cBOD_5$) can be substituted for BOD_5 (40 CFR 133.102(4)).

National secondary standards (NSS) specify the minimum of effluent quality in terms of the parameters $cBOD_5$ and TSS. For $cBOD_5$ and TSS the 30-day average shall not exceed 25 mg/L and 30 mg/L respectively and the 7-day average shall not exceed 40 mg/L and 45 mg/L respectively. The 30-day average percent removal for $cBOD_5$ and TSS shall not be less than 85 percent. The effluent limits for pH must be maintained within the range of 6.0 to 9.0.

The 2010-issued permit TBELs were based on NSS for pH, $cBOD_5$ and Alternative State Requirements (ASR) for TSS (**Table 2**) with 85 percent removal required for $cBOD_5$ only. DMR data show that the WWTP routinely met NSS effluent limitations for pH and $cBOD_5$ and ASR effluent limitations for TSS.

Since June 2014, the City of Dillon has operated a mechanical wastewater plant therefore NSS standards for $cBOD_5$ and TSS will be implemented with this permit renewal.

A. Mass-based Expression of Limitations
Effluent limits must be expressed in terms of mass (mass/time), except for certain conditions, such as pH or temperature. For municipal treatment plants, mass-based limitations are developed using the average daily design flow (discussed in Part II) for the facility. The City of Dillon WWTP has an average design flow of 0.75 mgd.

The mass-based limits for the City of Dillon WWTP are calculated as follows:
Load (lb/day) = Design Flow (mgd) x Concentration Limitation (mg/L) x 8.34 (lb·L)/(mg·gal)

$cBOD_5$ mass-based limitations:

7-day load: 0.750 mgd x 40 mg/L x 8.34 = 250 lb/day
30-day load: 0.750 mgd x 25 mg/L x 8.34 = 156 lb/day

TSS mass-based limitations:

7-day load: 0.750 mgd x 45 mg/L x 8.34 = 281 lb/day
30-day load: 0.750 mgd x 30 mg/L x 8.34 = 188 lb/day

B. Nondegradation

The provisions of ARM 17.30.701 - 718 (Nondegradation of Water Quality) apply to new or increased sources of pollution [ARM 17.30.702(18)]. Sources that are in compliance with the conditions of their permit and do not exceed the limits established in the permit or determined from a permit previously issued by DEQ are not considered new or increased sources.

Nondegradation threshold values for the City of Dillon WWTP are calculated for $cBOD_5$ and TSS with a design flow of 0.75 mgd. The nondegradation load allocations and the actual average loads discharged from the facility for the POR are presented below in **Table 3**. These data indicate that the facility did not exceed the nondegradation load values calculated for $cBOD_5$ and TSS.

Actual discharge loads from self-monitoring data were calculated by DEQ and are compared to the nondegradation loads in **Table 3**. The permit does not authorize a new or increased discharge.

Table 3: Calculated Nondegradation Allocated and Actual Annual Loads

Parameter	Allocated Load (lb/day)	Actual 30-Day Average Loads (lb/day)		
		2014 (July 2014 to December 2014)	2015	2016 (January 1 to October 31)
$cBOD_5$	156	11.87	9.99	7.17
TSS	188	30.43	29.75	30.15

Load limits for technology-based parameters of concern ($cBOD_5$ and TSS) will apply to the effluent and will be maintained at the more stringent of the nondegradation allocations or mass-based loading limits calculated in this fact sheet.

C. Proposed TBELs for Outfall 001

Table 4. Proposed TBELs for Outfall 001[(1)]

Parameter	Concentration (mg/L)		Load (lb/day)	
	Average Monthly Limitation	Average Weekly Limitation	Average Monthly Limitation	Average Weekly Limitation
$cBOD_5$	25	40	156	250
TSS	30	45	188	281
pH, s.u	Within the range of 6.0 to 9.0 (instantaneous)			
$cBOD_5$ and TSS Percent Removal	85 %			

Footnotes:
(1) See Definition section at end of permit for explanation of terms

IV. Water Quality-based Effluent Limitations

A. Scope and Authority

Permits are required to include Water Quality-based Effluent Limits (WQBELs) when TBELs are not adequate to protect state water quality standards. Montana water quality standards require that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards also define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses.

B. Receiving Water

The City of Dillon WWTP discharges from Outfall 001 to the Beaverhead River from a single port diffuser extended approximately 15 feet off shore into the main channel of the river. The segment of the Beaverhead River the facility discharges to is located in the Missouri Headwaters watershed as identified by the U.S. Geological Survey (USGS) Hydrologic Unit Code (HUC) 10020002 and assessment unit MT41B001_020, Grasshopper Creek to Jefferson River (mouth).

The Beaverhead River is classified as B-1 according to Montana Water Use Classifications**.** 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 propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply [ARM 17.30.623(1)].

The stream segment to which the facility discharges is listed as impaired in DEQ's Final 2016 303(d) lists (Clean Water Act Information, CWAIC). This segment is fully supporting drinking water and agriculture but is not fully supporting aquatic life. The probable causes of impairments are: alteration in stream-side or littoral vegetative covers, low flow alterations, physical substrate habitat alterations, sedimentation-siltation, and water temperature. TMDL documents have been completed for sedimentation-siltation and temperature, Beaverhead Sediment Total Maximum Daily Loads and Framework Water Quality Protection Plan and Final – Lower Beaverhead River and Upper Jefferson River Temperature TMDLs. The sediment wasteload allocation for the City of Dillon considered in the TMDL was based on the 2010-issued permit total suspended solids (TSS) effluent limit of 100mg/L. The City of Dillon recently upgraded to a mechanical plant and is now held to a TBEL based on national secondary standards of 30 mg/L for a 30-day average and 45 mg/L for a 7-day average. The effluent limits included in this permit renewal for TSS are more stringent

than the WLA found in the Beaverhead Sediment TMDL and are considered sufficient for protecting the water quality of the Beaverhead River. The TSS limit can be found below in Section V. Regarding temperature, the Dillon WWTP discharges a small amount of effluent relative to the discharge of the Beaverhead River; it has a negligible effect on stream temperatures below the effluent discharge. Maintaining operation of this facility at current levels would appear to cause no significant increase in Beaverhead River temperatures (Finals – Lower Beaverhead River and Upper Jefferson River Temperature TMDLs). Effluent temperature monitoring will be continued with this permit renewal.

Except for total nitrogen (TN) and total phosphorus (TP), the critical upstream flow value is the 7-day average expected to occur every 10 years (7Q10) of 41.40 cubic feet per second (cfs), which is equivalent to 26.76 mgd. This value was determined using the most current data published by the U.S. Geological Survey (USGS). The USGS maintains flow measuring capabilities on the Beaverhead River at gauging station number 06018000 near Dillon, MT (USGS 2015), seven miles downstream of Outfall 001. The flow recorded at gauging station 06018000 includes the contribution of the Dillon WWTP. Therefore, the downstream 7Q10 value of 26.76 mgd will be corrected to 26.41 mgd by removing the average flow contribution from Dillon WWTP of 0.35 mgd. This results in a dilution ratio of 35:1 (26.41 mgd receiving water flow/0.75 mgd WWTP design flow).

DEQ uses the seasonal 14-day average expected to occur every five years (14Q5) for parameters such as TN and TP. The seasonal 14Q5 for this gauging station is 70.50 cfs, which is equivalent to 45.56 mgd. The corrected 14Q5 flow is 45.21 mgd (July-October) (USGS 2015).

The Montana Department of Fish, Wildlife, and Parks MFISH database describes this segment of the Beaverhead River as an area with a high fisheries resource value for both habitat and sports classifications (September 2009). In the area of discharge, the brown trout, longnose dace, mottled sculpin, mountain whitefish, and white sucker are abundant year-round residents. The brook and Rainbow trout, the longnose and mountain suckers, burbot, and common carp are rare year-round residents.

Ambient water quality data for the Beaverhead River above the outfall location are limited. What data are available have been obtained from permittee stream monitoring and DEQ samples collected in August 2008 and June 2009 to support stream impairment listings. A summary of these data is presented in **Table 5**.

Table 5. Beaverhead River Ambient Water Quality Data				
Parameter	**Units**	**Number of Samples**	**75th Percentile**	**Monitoring Data Source**
pH, median value	s.u.	4	8.49	MTWTRSHD_WQX-BVD-BVHR-4 & City of Dillon WWTP
Temperature	°C	5	16.41	
Total Ammonia as N	mg/L	7	0.008	
Total Nitrogen	mg/L	4	0.528	
Total Phosphorus	mg/L	4	0.0098	
Footnote: (1) Only data collected from July 1 to September 30 was analyzed and included in this table.				

1. Applicable Water Quality Standards

Discharges to surface water classified B-1 are subject to the specific water quality standards of Administrative Rules of Montana (ARM) 17.30.623, Department Circulars DEQ-7 (Numeric Water Quality Standards) and 12A (Base Numeric Standards), and the general provisions of ARM 1.30.635 through 637. In addition to these standards, discharges are subject to ARM 17.30 Subchapter 5 (Mixing Zones) and Subchapter 7 (Nondegradation).

No wastes may be discharged that can reasonably be expected to violate any standard. Pollutants typically present in domestic POTW effluent that may exceed water quality standards include TSS, Oil and Grease (O&G), *Escherichia coli* (*E. coli*) bacteria, total residual chlorine (TRC) when used to control pathogens, total ammonia as nitrogen (N), low levels of dissolved oxygen (DO), temperature, and nutrients (TN and TP).

C. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded. Mixing zones must have the smallest practicable size, a minimum practicable effect on water uses, and definable boundaries. DEQ will determine the appropriateness of a mixing zone when applied for and will grant a mixing zone, deny the mixing zone, or grant an alternative or modified mixing zone. Requirements governing the granting of mixing zones are found in Montana Code Annotated (MCA) 75-5-301 and in ARM 17.30.501.

Although certain standards may be exceeded in the mixing zone, an effluent in its mixing zone may not block passage of aquatic organisms nor may it cause acutely toxic conditions [ARM 17.30.602(16)]. No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Aquatic life-chronic, aquatic life-acute and human health standards may not be exceeded outside of the mixing zone [ARM 17.30.507(1)(a)]. Acute standards may not be exceeded in any part of the mixing zone [ARM 17.30.507(1)(b)].

A standard mixing zone must not extend downstream more than one-half the mixing width distance (A½) or extend downstream more than 10 times the stream width. ARM 17.30.516(4) requires a standard mixing zone to be defined by the more restrictive of these two values. In order to be the smallest practicable size and lacking the physical data to determine A½, DEQ will set the mixing zone at 10 times the stream width at 7Q10 flow. The stream width is estimated to be 80 feet at the point of discharge; therefore, the chronic mixing zone length will be set at 800 feet and the acute

mixing zone length will be set at 10% of the chronic mixing zone or 80 feet. These are the same chronic and acute mixing zone length s that were calculated in the 2010-issued permit.

A standard mixing zone may be granted for facilities that discharge a mean annual flow of less than 1 mgd to a stream segment with a dilution ratio less than 100:1[ARM 17.30.516(3)(b)] or when the mixing is nearly instantaneous. Nearly instantaneous mixing is assumed when the discharge is through an effluent diffuser, when the mean daily flow exceeds the 7Q10 (dilution ratio <1) or the permittee demonstrates through a DEQ approved study plan that the discharge is nearly instantaneous. The amount of the 7Q10 allowed for dilution as part of the standard mixing zone is dependent on the size of the discharge relative to the receiving water flow. Because the dilution ratio is 36:1 and discharge flow is less than 1 mgd, the discharge would qualify for a standard mixing zone and DEQ will grant dilution for the chronic condition using 25% of the 7Q10 flow, 6.60 mgd and the acute condition using 2.5% of the 7Q10 flow, 0.66 mgd.

DEQ will also grant the full seasonal 14Q5 dilution flow of 45.21 mgd to assess Reasonable Potential (RP) and develop nutrient limits.

D. Basis for Proposed Water Quality-based Effluent Limitations

Permits are required to include WQBELs when TBELs are not adequate to protect water quality standards, and no waste may be discharged that can reasonably be expected to violate any standard. Pollutants typically present in effluent from facilities treating domestic sewage include conventional pollutants such as BOD_5, TSS, pH, oil and grease, and *E. coli* bacteria; and non-conventional pollutants such as low dissolved oxygen (DO), nitrate + nitrite, nutrients, and total ammonia.

The need for WQBELs is determined based on Reasonable Potential (RP) analysis for certain pollutants to determine if numeric or narrative water quality standards may be exceeded. RP calculations utilize the receiving water concentration; the maximum projected effluent concentration, the design flow of the wastewater treatment facility, and the applicable receiving water flow.

DEQ uses a mass balance equation to determine RP (Equation 1). Equation 1 is used to determine the concentration of a pollutant of concern after accounting for other sources of pollution in the receiving water and any dilution by a mixing zone.

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

Where:

Q_s = receiving water, low flow rate before discharge available for dilution (mgd)
C_s = upstream receiving water pollutant concentration (mg/L), 75th percentile
Q_d = effluent flow rate (mgd), average daily design flow
C_d = critical effluent pollutant concentration (mg/L)
C_r = receiving water pollutant concentration (after dilution; mg/L)

If C_r > standard, then RP exists and a WQBEL must be developed.

The critical effluent concentration is obtained following the method recommended by the EPA *Technical Support Document for Water Quality-based Toxics Control* (TSD, 1991A multiplier is determined using the TSD methods, based on dataset statistics (based on the data set, coefficient of variation, and sample size at the 95% confidence interval),

When no mixing or dilution in the receiving water is available and the critical effluent concentration exceeds the water quality standard, RP exists and limits are developed based on achieving the water quality standard at the point of discharge.

DEQ is proposing effluent limits for pollutants with RP for which adequate data exist, as discussed in the following section. A complete RP analysis is included in **Attachment A**.

1. **Conventional Pollutants**

   TSS, $cBOD_5$ and pH: These parameters are typical effluent quality indicators for domestic wastewater treatment facilities and are regulated as TBELs. The facility provides a significant reduction in biological material, solids and pH through secondary treatment meeting national secondary standards, since the upgraded facility was brought on line in June 2014, and no additional WQBELs will be required for these parameters.

   Oil and Grease (O&G): The 2010-issued permit included an O&G instantaneous maximum limit of <10 mg/L and required monthly effluent monitoring. Montana regulations require state waters be free from substances attributable to municipal discharges that will result in concentrations of oil and grease at or in excess of 10 mg/L. The limit and monitoring will be retained in the proposed permit.

   ***Escherichia coli* (*E. coli*) Bacteria:** Pathogens are known municipal wastewater contaminants. The state has promulgated *E. coli* standards to protect the beneficial uses of receiving waters from pathogens. The standards for B-1 classified waters are:

   a. April 1 through October 31, of each year, the geometric mean number of the microbial species *E. coli* must not exceed 126 colony forming units (cfu) per 100 milliliters (mL), nor are 10% of the total samples during any 30-day period to exceed 252 cfu per 100 mL; and

   b. November 1 through March 31, of each year, the geometric mean number of *E. coli* shall not exceed 630 cfu per 100 mL and 10% of the samples during any 30-day period may not exceed 1,260 cfu per 100 mL.

   These criteria will be included in the proposed permit as average monthly and average weekly limits along with weekly monitoring.

2. **Non-conventional Pollutants**

   Total Ammonia as N: Determination of RP for the total ammonia as N (ammonia) and development of applicable limits are based on water quality standards that account for a combination of pH and temperature of the receiving stream during critical conditions, the presence or absence of salmonid species, and the presence or absence of fish in early life stages. The instream critical condition for both pH and temperature is the 75^{th} percentile of the data. Salmonid fishes and their early life stages are presumed present year-round in Beaverhead River based on “Spawning Times of Montana Fishes” (MFISH). Ammonia

reduction was achieved in 2015 when the City of Dillon WWTP moved to a full-mixed aerated basin.

Table 6 presents the total ammonia water quality standards for the Beaverhead River using the ambient water quality data in **Table 5**.

Table 6. Total Ammonia as N Water Quality Standards for the Beaverhead River.

Condition	Period	Salmonids Present	Early Life Stages Present	Ambient Condition		Water Quality Standard (1) (mg/L)
				pH (s.u.)	Temperature (°C)	
Acute	Annual	Yes	Yes	8.49 (2)	N/A	2.18
Chronic	Annual	Yes	Yes	8.49 (2)	16.41 (2)	0.98

Footnotes: N/A – Not Applicable
(1) Acute - maximum daily standard; Chronic - 30-day average concentration, based on Circular DEQ-7 (October 2012)
(2) Based on 75th percentile of data set.

RP to exceed the acute water quality standard for ammonia was assed using Equation 1, where:

C_r = receiving water concentration (RWC) after mixing, mg/L
C_d = maximum projected effluent concentration, 3.45 mg/L
C_s = RWC upstream of discharge, 0.008 mg/L
Q_s = applicable receiving water flow, 2.5% of the 7Q10, 0.66 mgd
Q_d = facility design flow rate, 0.75 mgd

The projected maximum concentration for total ammonia (C_d) was found following the TSD Method. A multiplier of 1.68 was determined using the TSD methodology, given a CV of 1.08, a sample size of 19. The maximum reported effluent for total ammonia was 2.05 mg/L. The multiplier times the maximum concentration is 3.45 mg/L (1.68 * 2.05 mg/L).

$$C_r = \frac{(0.75 * 4.52) + (0.66 * 0.008)}{(0.75 + 0.66)} = 1.84 \text{ mg/L}$$

C_r (1.84 mg/L) is less than the acute ammonia standard for the Beaverhead River therefore a limit will not be necessary for this permit renewal. Extended calculations are included in **Attachment A**.

RP to exceed the chronic water quality standard for ammonia was assessed using Equation 1, and 25 % of the applicable receiving water flow. The calculated receiving water concentration (C_r) after mixing was 0.36 mg/L which is less than the chronic ammonia standard for the Beaverhead River; therefore a chronic limit is not necessary for this permit renewal. Weekly ammonia monitoring will be required with this permit renewal.

Upstream monitoring of pH and temperature will be included in this permit renewal.

Nitrate plus Nitrite (N+N): Nitrate and nitrite are toxic components of total nitrogen, which is a common constituent of domestic wastewater. The human health standard for N+N is 10 mg/L.

RP to exceed the human health standard for N + N was assed using Equation 1, where:

C_r = receiving water concentration (RWC) after mixing, mg/L
C_d = maximum projected effluent concentration, 34.17 mg/L
C_s = RWC upstream of discharge, 0.138 mg/L
Q_s = applicable receiving water flow, 25% of the 7Q10, 6.60 mgd
Q_d = facility design flow rate, 0.75 mgd

The projected maximum concentration for N + N (C_d) was found following the TSD Method. A multiplier of 1.2 was determined using the TSD methodology, given a CV of 0.53, a sample size of 28. The maximum reported effluent concentration of N + N was 28.4 mg/L. The multiplier times the maximum concentration is 34.17 mg/L (1.2 * 28.4 mg/L).

$$C_r = \frac{(0.75 * 34.17) + (6.60 * 0.138)}{(0.75 + 6.60)} = 3.61 \text{ mg/L}$$

C_r (3.61 mg/L) is less than the N + N human health standard for the Beaverhead River, therefore, RP does not exist for this parameter and a limit is not necessary for this permit renewal. N + N monitoring will be continued in this permit renewal. Extended calculations are included in **Attachment A**.

Dissolved Oxygen (DO) – DO standards are characterized by receiving water use classification, the type of fishery (cold- or warm-water) and by the presence or absence of fish in early life stages (Circular DEQ7, 2012). Standards are further defined on a specific period of time and required in-stream DO levels. B-1 waterbody classification states the receiving waters are cold-water fisheries. DO standards for B-1 waters are given in **Table 7**. Salmonid fishes and their early life stages are presumed present year-round in Beaverhead River based on "Spawning Times of Montana Fishes" (MFISH).

Table 7: B-1 Water Classification Dissolved Oxygen Standards.

Dissolved Oxygen	30-Day Mean (mg/L)	7-Day Mean (mg/L)	7-Day Mean Minimum [1] (mg/L)	1-Day Minimum [1] (mg/L)
Early Life Stages [2, 3]	N/A	9.5(6.5)	N/A	8.0(5.0)
Other Life Stages	6.5	N/A	5.0	4.0

Footnotes: N/A - Not Applicable
(1) All minima should be considered as instantaneous concentrations to be achieved at all times.
(2) These are water column concentrations recommended to achieve the required inter-gravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the figures in parentheses apply.
(3) Includes all embryonic and larval stages and all juvenile forms of fish to 30 days following hatching.

The 2010-issued permit introduced DO monitoring for the purpose of assessing RP. DO is a dynamic parameter that is influenced by the physical and biochemical condition of the effluent, and therefore should be measured as close to discharge into the receiving water as possible. In this case, DO is measured after the velocity of effluent stream has been reduced to create more contact for disinfection in the UV chamber nearly 100 yards before the point of effluent discharge into the Beaverhead River after passing through the underground effluent discharge pipe. At the point of discharge the effluent will experience nearly instantaneous mixing and become more aerated and diluted. Low effluent $cBOD_5$ concentrations limit further impact of effluent on DO in the Beaverhead River. Therefore, the probability for DO concentrations below the standard is minimal. The DO effluent monitoring will be removed with this permit renewal (see Part H of this fact sheet).

Total Nitrogen and Total Phosphorus – In July 2014, Montana adopted base numeric nutrient standards. For wadeable streams in the Middle Rockies ecoregion, where the Beaverhead River is located, the numeric nutrient standards for total nitrogen (TN) and total phosphorus (TP) are 0.30 mg/L and 0.03 mg/L, respectively (which apply from July 1 to September 31).

The seasonal receiving water concentration for total nitrogen was calculated using *Equation 1*, where:

C_r = receiving water concentration (RWC) after mixing, mg/L
C_d = maximum projected effluent concentration, 46.01 mg/L
C_s = RWC upstream of discharge, 0.5275 mg/L
Q_s = applicable receiving water flow, 100% of the 14Q5, 45.21 mgd
Q_d = facility design flow rate, 0.75mgd

The projected maximum concentration for TN was found following the TSD method. A multiplier of 1.81 was determined using the TSD methodology, using a CV of 0.60 and a sample size of 9 at the 95% confidence interval. The maximum reported effluent for total nitrogen was 25.40 mg/L. The multiplier times the maximum concentration is 46.01 mg/L (1.81* 25.40 mg/L).

$$C_r = \frac{(0.75 * 46.01) + (45.21 * 0.5275)}{(0.75 + 45.21)} = 1.26 \text{ mg/L}$$

The TN concentration in the receiving water after mixing exceeds the numeric nutrient standard of 0.3 mg/L. Since the Beaverhead River has no assimilative capacity to receive TN, the Dillon WWTP total nitrogen limit will be based on the water quality standard of 0.3 mg/L and will have to be met at end of pipe, at the point of discharge. Monthly effluent monitoring will be continued with this permit renewal.

Using Section 2.2 of Circular DEQ-12A and the TSD method, the following limits were calculated:

Total Nitrogen AML = 0.3 mg/L (1.9 lb/day)

The receiving water concentration for TP was calculated using *Equation 1*, where:

C_r = receiving water concentration (RWC) after mixing, mg/L
C_d = maximum projected effluent concentration, 15.58 mg/L
C_s = RWC upstream of discharge, 0.0098 mg/L
Q_s = applicable receiving water flow, 100% of the 14Q5, 45.21 mgd
Q_d = facility design flow rate, 0.75 mgd

The projected maximum concentration for TP was found following the TSD method. A multiplier of 1.81 was determined using the TSD methodology, given a CV of 0.6 and a sample size of 9 at the 95% confidence interval. The maximum reported effluent for TP was 8.60 mg/L. The multiplier times the maximum concentration is 15.58 mg/L (1.81 * 8.6 mg/L).

$$C_R = \frac{(0.75 * 15.58) + (45.21 * 0.0098)}{(0.75 + 45.21)} = 0.26 \text{ mg/L}$$

TP receiving water concentrations after mixing exceed the numeric nutrient standard of 0.03 mg/L; therefore, there will be a TP limit with this permit renewal. The Beaverhead River does have assimilative capacity for the discharge of TP from the Dillon WWTP. *Equation 2* (below) will be used to determine a waste load allocation (WLA) for TP.

$$C_d = WLA = \frac{Q_r C_r - Q_s C_s}{Q_d} \quad (Equation2)$$

Q_s = applicable receiving water flow, 100% of the 14Q5, 45.21 mgd
C_s = Upstream concentration of TP in the Beaverhead River, 0.0098 mg/L
Q_d = facility design flow rate, 0.75 mgd
C_d = Effluent pollutant concentration = WLA (mg/L)
Q_r = resultant in-stream flow, after discharge (equal to $Q_d + Q_s$), 45.96 mgd
C_r = Water quality standard for TP, 0.03 mg/L

Using *Equation 2* and the TSD method the following limits were calculated:

Total Phosphorus AML = 1.25 mg/L (7.81 lb/day)

In 2014 DEQ adopted a general variance for nutrients that permittees may request if required to comply with the base numeric nutrient standards. The variances are effective for up to 20 years from the date of adoption, at which time the effluent limits based on the water quality standard are final and effective.

As can be seen from the WWTP's TN and TP effluent concentrations shown in **Table 2**, the Dillon WWTP is currently unable to comply with the WQBELs calculated above. As allowed by MCA 75-5-313(5)(a), on February 3, 2015, the city requested a general nutrients standard variance for both nitrogen and phosphorus. The appropriate general variances that apply to a facility are determined by the facility discharge flow rate and are described in Department Circular DEQ-12B. The Dillon WWTP design flow is less than 1.0 mgd and is therefore eligible for the 15.0 mg/L TN and 2.0 mg/L TP variances.

When developing permit limits based on the variances, DEQ treats the variance concentration as the long term average (LTA) the facility must achieve. An appropriate average monthly limit (AML) is calculated from this LTA based on the coefficient of variation of the facility's effluent data following the method described in the TSD. For this permit, DEQ used a CV of 0.6 to calculate the TN and TP. The resulting AMLs are 23.25 mg/L for TN and 3.10 mg/L for TP. These values multiplied by the facility design flow, as specified in Circular DEQ-12B, result in effluent limits of 145.4 lb/day for TN and 19.4 lb/day for TP, also applied as AMLs.

The mass-based limits for the City of Dillon WWTP are calculated as follows:
Load (lb/day) = Design Flow (mgd) x Concentration Limitation (mg/L) x 8.34 (lb·L)/(mg·gal)

Total Nitrogen	0.75 mgd x 23.25 mg/L x 8.34 = 145.4 lb/day
Total Phosphorus	0.75 mgd x 3.10 mg/L x 8.34 = 19.4 lb/day

The nutrient limits imposed in this permit renewal are interim, general variance limits for the protection of the Beaverhead River. These limits are effective upon permit issuance, as follows:

In granting a variance, DEQ-12B requires the permittee to conduct a Wastewater Facility Optimization Study. This requirement is included in the permit as a Special Condition.

The general variances in Circular DEQ-12B are subject to revision every three years. Future permit renewals will incorporate these revisions and may result in more stringent effluent limits than those shown above.

V. Final Effluent Limitations

Final Effluent Limitations – starting **TBD**, the following final effluent limitations will apply to discharges at Outfall 001 for the duration of the permit cycle.

Table 9. Outfall 001 Final Effluent Limitations (Effective TBD Through the Term of the Permit).

Parameter	Units	Average Monthly Limitation[1]	Average Weekly Limitation[1]	Maximum Daily Limitation
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	25	40	--
	lb/day	156	250	--
	% Removal	85	N/A	--
Total Suspended Solids (TSS)	mg/L	30	45	--
	lb/day	188	281	--
	% Removal	85	N/A	--
Escherichia coli Bacteria, summer[2]	cfu/100 mL	126[3]	252[3]	--
Escherichia coli Bacteria, winter[4]	cfu/100 mL	630[3]	1,260[3]	--
Oil and Grease	mg/L	--	--	10
Total Nitrogen as N	lb/day	145.4[6]	--	--
Total Phosphorus as P	lb/day	19.4[6]	--	--
pH	s.u.	6.0 - 9.0 (instantaneous)[5]		

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) Summer period is April 1 through October 31.
(3) Geometric mean value.
(4) Winter period is November 1 through March 31.
(5) For compliance purposes, any single analysis and/or measurement beyond his limit shall be considered a violation of the conditions of this permit.
(6) Effective July 1 through September 30.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

VI. Monitoring Requirements

Influent and Effluent Monitoring

The sampling and monitoring location for influent shall be established at the influent Parshall flume. Effluent shall be sampled and monitored after UV disinfection at the last point of control prior to discharge to the Beaverhead River.

Table 10: Outfall 001 Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type (1)	Reporting Requirements	ML (2)
Flow	mgd	Effluent	Daily	Instantaneous	Monthly Average	0.01
5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	Influent	1/Month	Composite	Monthly Average	5
	mg/L	Effluent	1/Week	Composite	Weekly Average	5
	lb/day	Effluent	1/Month	Calculated	Monthly Average	0.1
	% Removal(3)	Effluent	1/Month	Calculated	Monthly Minimum	0.1
Total Suspended Solids (TSS)	mg/L	Influent	1/Month	Composite	Monthly Average	10
	mg/L	Effluent	1/Week	Composite	Weekly Average	10
	lb/day	Effluent	1/Month	Calculated	Monthly Average	0.1
	% Removal(3)	Effluent	1/Month	Calculated	Monthly Minimum	0.1
pH	s.u.	Effluent	1/Week	Instantaneous	Daily Maximum Daily Minimum	0.1
Temperature	°C	Effluent	1/Week	Instantaneous	Weekly Maximum Monthly Average	0.1
Escherichia coli Bacteria (4)	cfu/100 mL	Effluent	1/Week	Grab	Weekly Average	1/100 mL
Oil and Grease	mg/L(5)	Effluent	2/Year	Grab	Daily Maximum	1
	Visual(6)		1/Week	No Visual Sheen		
Total Ammonia as N	mg/L	Effluent	1/Week	Composite	Daily Maximum Monthly Average	0.07
Nitrate + Nitrite as N	mg/L	Effluent	1/Month	Composite	Monthly Average	0.05
Total Kjeldahl Nitrogen	mg/L	Effluent	1/Month	Composite	Monthly Average	0.225
Total Nitrogen as N (7)(8)	mg/L	Effluent	1/Month	Composite	Monthly Average	0.1
	lb/day	Effluent	1/Month	Calculated		
Total Phosphorus as P(8)	mg/L	Effluent	1/Month	Composite	Monthly Average	0.01
	lb/day	Effluent	1/Month	Calculated		0.1

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) ML is the minimum detection level.
(3) Percent (%) Removal shall be calculated using he monthly average values.
(4) Report Geometric Mean if more than one sample is collected during the reporting period.
(5) Collect a sample and analyze using EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM) or equivalent.
(6) In the event an oil sheen or floating oil is observed, a grab sample shall be collected, analyzed, and reported on the DMR.
(7) Calculated as the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.
(8) TN and TP monitoring is only required during the time the limit applies (July 1 through September 30)..

Upstream Ambient Monitoring
Upstream sampling shall be monitoring upstream of the City of Dillon WWTP discharge in the Beaverhead River.

Table 11: Upstream Ambient Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type (1)	Reporting Requirements	ML (2)
pH	s.u.	Upstream	1/Month	Instantaneous	Daily Maximum Daily Minimum	0.1
Temperature	°C	Upstream	1/Month	Instantaneous	Monthly Average	0.1
Total Ammonia as N	mg/L	Upstream	1/Quarter	Composite	Daily Maximum	0.07

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) ML is the minimum detection level.

VII. Special Conditions

1. Facility Optimization Study

Facilities that receive a nutrient variance must evaluate current facility operations to optimize nutrient reduction with existing infrastructure and analyze other cost-effective methods of nutrient load reductions. DEQ-12B allows for flexibility regarding the scope and content of the study but requires that the optimization study includes, but is not limited to, an assessment of nutrient trading feasibility within the watershed without substantial investment in new infrastructure. DEQ may request the permittee provide the results of the optimization study/nutrient reduction analysis within two years of receiving the variance.

This permit requires the completion of an optimization study/nutrient reduction analysis including an assessment of trading with a two years, as summarized in **Table 12** below.

Table 12: Special Condition Schedule

Action	Frequency	Scheduled Completion Date of Action(1)	Report Due Date(2)
Complete a Facility Optimization Study	Single Event	No Later than Two Years from the Effective Date of the Permit	NA
Submit Notification that the Facility Optimization Study is Complete	Single Event	No Later than Two Years from the Effective Date of the Permit	No Later than the 28th of the Month Two Years from the Effective Date of the Permit

Footnotes:
NA = Not Applicable
(1) The actions must be completed on or before the scheduled completion dates.
(2) This notification must be received by the DEQ on or before the scheduled due date.

DEQ-12B encourages optimization studies to include, but not be limited to, facility operations and maintenance, reuse, recharge, and land application. However, DEQ-12B clarifies that the changes to facility operations resulting from the analysis carried out are only intended to be refinements to the wastewater treatment system already in place,

addressing changes to facility operation and maintenance. Optimizations are not intended to include changes to the facility resulting in structural modification, user rate increases, or substantial capital investment.

2. Upstream pH and Temperature Monitoring

The City of Dillon will collect additional pH and temperature data for the duration of the permit cycle to address the impacts of the Dillon WWTP on the Beaverhead River and to calculate the Total Ammonia as N standard. Monthly upstream pH and temperature sampling will be required with this permit renewal. Upstream semi-annual ammonia monitoring will also be required with this permit renewal. The upstream monitoring frequency for temperature and pH can be found in **Table 11.**

VIII. Information Sources

A. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
   1. Sub-Chapter 2 - *Water Quality Permit and Application Fees*.
   2. Sub-Chapter 5 - *Mixing Zones in Surface and Ground Water*.
   3. Sub-Chapter 6 - *Montana Surface Water Quality Standards and Procedures*.
   4. Sub-Chapter 7- *Nondegradation of Water Quality*.
   5. Sub-Chapter 10 - *Montana Ground Water Pollution Control System*.
   6. Sub-Chapter 12 - *Montana Pollutant Discharge Elimination System (MPDES) Standards*.
   7. Sub-Chapter 13 - *Montana Pollutant Discharge Elimination System (MPDES) Permits*.

B. Clean Water Act § 303(d), 33 USC 1313(d) *Montana List of Waterbodies in Need of Total Maximum Daily Load Development*, 1996 and 2006.

C. 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.

D. Montana Code Annotated Title 75 - Environmental Protection Chapter 5 - Water Quality, 2011.

E. Montana Department of Environmental Quality Circular DEQ-2, *Design Standards for Wastewater Facilities,* June 2016.

F. Montana Department of Environmental Quality Circular DEQ-7, *Montana Numeric Water Quality Standards,* October 2012.

G. Montana Department of Fish Wildlife and Parks, *Spawning Times of Montana Fishes,* March 2001.

H. Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0021458
   1. Administrative Record.
   2. Renewal Application Forms DEQ-1 and EPA Form 2A, March 2010.

I. Damschen & Associates, Wastewater Treatment Facility Operation and Maintenance Manual, City of Dillon, Montana, 1996.

J. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

K. US Code of Federal Regulations, 40 CFR Part 403 – *General Pretreatment Regulations for Existing and New Sources of Pollution.*

L. US Code of Federal Regulations, 40 CFR Part 503 – *Standards for the Use or Disposal of Sewage Sludge.*

M. US Department of the Interior US Geological Survey, *Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2009,* Scientific Investigations Report, 2015.

N. US EPA *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001, March 1991.

O. US EPA NPDES *Permit Writers' Manual*, EPA 833-B-96-003, September 2010.

P. US EPA Region VIII NPDES *Whole Effluent Toxics Control Program*, August 1997.

Q. US EPA *NPDES Permit Writers' Course Manual*, EPA-833-B-91-001, March 2009.

R. Montana Fisheries Information System (MFISH)

S. MontanaDEQ. 2014. *Final – Lower Beaverhead River and Upper Jefferson River Temperature TMDLs*. Helena, MT: Montana Dept. of Environmental Quality.

T. MontanaDEQ. 2012. *Beaverhead Sediment Total Maximum Daily Loads and Framework Water Quality Protection Plan*. Helena, MT: Montana Dept. of Environmental Quality.

Prepared by: Kaela Murphy March, 2017

Attachment A: City of Dillon WWTP Reasonable Potential Analysis (March 2017)

			Ammonia (Acute)	Ammonia (Chronic)	N+N (HHS)	Nitrogen, total (TN) Seasonal	Phosphorus, total (TP) Seasonal
Flow							
critical stream flow	7Q10 or seasonal 14Q5	mgd	26.41	26.41	26.41	45.21	45.21
% of critical stream flow for dilution	as decimal	%	0.025	0.25	0.25	1.00	1.00
Q_s	resulting critical stream flow Q_s = (critical stream flow for dilution)*(% of critical stream flow provided)	**mgd**	**0.66**	**6.60**	**6.60**	**45.21**	**45.21**
Q_d	critical effluent flow (avg. daily design flow)	**mgd**	**0.75**	**0.75**	**0.75**	**0.75**	**0.75**
Q_r	downstream flow (Q_s + Q_d)	mgd	1.41	7.35	7.35	45.96	45.96
Concentrations							
C_{max}	maximum effluent concentration for POR (from application or DMR data)	mg/L	**2.05**	**2.05**	**28.4**	**25.4**	**8.60**
n	number of samples in effluent data set		19	19	28	9	9
CV	0.6 if n < 10 calculated as $\sigma_{effluent}/\mu_{effluent}$ if n ≥ 10		1.08	1.08	0.53	0.6	0.6
P_n	%tile for n samples at 95% confidence level		0.85	0.85	0.90	0.72	0.72
Z_{Pn}	Z-score for P_n		1.05	1.05	1.27	0.574	0.574
TSD	calculated TSD multiplier (should be close to Table 3-2 value)		1.68	1.68	1.20	1.8	1.8
C_d	critical effluent concentration - 95%tile (=max. effluent concentration * TSD multiplier)	**mg/L**	**3.45**	**3.45**	**34.17**	**46.01**	**15.58**
C_s	critical instream concentration (75%tile if n<=30, 95% UCL if n>30)	**mg/L**	**0.008**	**0.008**	**0.138**	**0.528**	**0.0098**
C_r	**resulting or downstream pollutant concentration** $C_r = (C_dQ_d + C_sQ_s)/(Q_d+Q_s)$	**mg/L**	**1.84**	**0.36**	**3.61**	**1.27**	**0.26**
WQS	**water quality standard**	**mg/L**	**2.181**	**0.981**	**10**	**0.300**	**0.030**
Reasonable Potential			**no**	**no**	**no**	**yes**	**yes**