MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

Fact Sheet

Permittee:	City of Helena
Permit No.:	MT0028720
Receiving Water:	Ground Water and Unnamed Tributary to Tenmile Creek
Facility Information:	
Name	City of Helena Ten Mile Water Treatment Facility
Location	1115 Rimini Road Helena, MT 59602
Facility Contact:	Jason Fladland, Water Production Supervisor 406-457-8511
Fee Information:	
Number of Outfalls	1
Outfall – Type	002 - Treated Process Wastewater

I. Permit Status

The most recent Montana Pollutant Discharge Elimination System (MPDES) permit MT0028720 for the City of Helena (City) Ten Mile Water Treatment Facility (WTF) became effective on August 1, 2011 and expires on July 31, 2016 (2011-issued permit).

The City submitted the renewal fee on March 31, 2016, and application Forms 1 and 2E on April 1, 2016. After subsequent information was received, the Montana Department of Environmental Quality (DEQ) deemed the application complete and administratively extended the permit on May 25, 2016.

II. Facility Information

A. Facility Description

Helena's Ten Mile WTF is a publicly-owned municipal facility (PWS ID MT0000241) classified under Standard Industrial Classification (SIC) Code 4941, "Water Supply." The WTF treats surface water from Tenmile, Beaver, Minnehaha, Moose, and Walker Creeks; Chessman and Scott Reservoirs; and ground water from two public water supply wells, and distributes the potable water to over 27,000 people. Over the past two years, the average potable water production rate was 4.2 million gallons per day (mgd); the maximum production rate was 7.2 mgd; and full design capacity is 9.0 mgd (Ten Mile WTF Application and Administrative Record).

The WTF is a direct filtration water treatment plant using the following treatment steps (Administrative Record):

- Addition of powdered activated carbon and non-ionic polymer for primary coagulation/ flocculation,
- Clarification - settling in contact absorption clarification (CAC),
- Addition of aluminum products for coagulation and cationic polymer for color control,
- Filtering through a granulated media filtration, and
- Disinfection with chlorine solution prior to storage and distribution.

This permit covers discharge to Tenmile Creek of treated filter and clarifier backwash wastewater generated from the water supply treatment process. The wastewater is treated by settling in three percolation lagoons (also known as sedimentation/ infiltration lagoons). The permit covers discharge from these lagoons that reaches Tenmile Creek both indirectly via ground water after infiltrating the lagoons, as well as surface water leading to the Creek after discharging from the third lagoon through Outfall 002. See **Figure 1** for a schematic of the Ten Mile WTF discharge.

The following describes potential wastewater sources and outfalls in greater detail.

Outfall 001 – Eliminated 2011

The potential overflow of wasted raw water into Tenmile Creek was previously identified as Outfall 001. Helena submitted a letter dated June 9, 2010 asking to eliminate MPDES coverage for Outfall 001 since they discontinued upstream treatment (Administrative Record). DEQ agreed that permitting is not required under these circumstances since discharge from a water conveyance structure, if the water does not contain industrial waste or other wastes, does not require a permit [75-5-401(1)(b), Montana Code Annotated (MCA)].

DEQ confirmed on June 2, 2016 (discussion with Jason Fladland) that Helena has not resumed any treatment of the raw water sources, and does not have plans to do so. If Helena wants to re-institute chemical addition to any state waters, such as Chessman Reservoir, the city must first apply for permit coverage.

Outfall 002 – treated backwash to Tenmile Creek

Wastewater generation from backwash operations at the WTF can represent up to 10% of the raw water taken in for the water supply. The exact amount depends upon operating conditions. The WTF has two sources contributing wastewater: backwash from four clarifiers (contributes ~15% of total); and backwash from four filters (~ 85% of total). The clarifiers are backwashed with raw water, and the filters are backwashed with chlorinated potable water at a maximum of 0.6 mg/L chlorine (Administrative Record).

The City meters the amount of raw water entering the plant and the potable water supplied to the city; the difference provides a calculated "plant loss" of water from the WTF that is assumed to be equivalent to the amount of untreated backwash water entering the lagoon system. This wastewater is treated by three sedimentation/infiltration lagoons operated in series prior to discharge. As stated on page 2, this permit covers discharge from these lagoons that reaches Tenmile Creek both indirectly via ground water, as well as surface water leading to the Creek after the discharge from the third lagoon which, for this permit renewal, are jointly identified as "Outfall 002:"

- ***Surface water*** discharge from the final sedimentation/infiltration lagoon (Lagoon #3) through a weir located at 46°34'20.5" latitude, - 112°12'39.0" longitude. The effluent is discharged into an unnamed tributary that empties into a gravel pit pond area after less than 1/4 mile. From the gravel pit area the wastewater ultimately discharges into Tenmile Creek approximately 0.5 miles from the lagoon discharge.
- ***Ground water*** infiltration currently comprises the majority of the discharge from the three sedimentation/infiltration lagoons to Tenmile Creek. Regionally, ground water flow within the valley is from west to east (Administrative Record). Since there is no better site-specific data available, DEQ has taken the conservative approach and assumed that the discharge flows with the ground water into Tenmile Creek, and that there is no available ground water dilution. The lagoon locations are:

  Lagoon #1: 46°34'19" latitude; -112°12'46" longitude

  Lagoon #2: 46°34'20" latitude; -112°12'44" longitude

  Lagoon #3: 46°34'20" latitude; -112°12'41" longitude

The City records the daily surface water discharge flow rate through the weir following the third lagoon cell (monitoring location Outfall 002). In addition to the recording the quantity of surface water discharge, monitoring from this point will be considered representative of the quality of the discharge through both surface water and ground water infiltration.

The ground water infiltration rate is calculated based on subtracting the lagoon outputs (measured surface water discharge plus 0.009 mgd evaporation) from the calculated amount of backwash entering the lagoon system ("plant loss"). However, the WTF has a six million gallon clear well that serves to equalize the supply of potable water. The capacity to store this amount of water skews the daily water balance since the water supply is temporarily diverted from the supply pipeline prior to the potable water supply meter. Because of this, it is not possible to calculate a *daily* "plant loss" to the lagoons with any accuracy. In addition, the wastewater balance depends on data from two meters (raw water and potable water supply) and a daily reading from the discharge weir – which introduces additional accuracy issues.

Table 1 summarizes the average and maximum monthly discharge flow for 2014 and 2015 from the WTF infiltration/sedimentation treatment lagoons. DEQ proposes to include all discharges from the treatment lagoons to Tenmile Creek -- both surface water and ground water -- as part of Outfall 002. Note that the maximum rates provided in Table 1 represent the highest of the monthly average rates. DEQ believes this is more accurate than using daily maximum numbers, because it avoids the artificially high and low daily plant loss numbers resulting from the six million gallons clear well capacity as described above.

Table 1: Helena's Ten Mile WTF Wastewater Discharge (2014 & 2015)

Wastewater Discharge	Units	"Plant Loss"(1)	Evaporation	***Outfall 002 Discharge***	**Surface Water(2)**	**Ground Water**
Average	mgd	0.62	0.009	*0.62*	0.16	0.46
Maximum(3)	mgd	1.04	0.009	*1.03*	0.33	0.87

Footnote:
(1) The average "plant loss" was calculated by the city from the difference between the measured raw water influent and the measured potable water supply.
(2) Surface water discharge rate from daily weir readings.
(3) The maximum "plant loss" was calculated by DEQ from the city's data, using the *maximum of the monthly averages* in order to mitigate the impact of the six million gallon clear well storage on daily calculations. As a result of the two calculation methods, the sum of the maximum ground water and maximum surface water is greater than the calculated total Outfall 002 discharge.

Early during the 2011-issued permit cycle, the City performed maintenance on the lagoon cells to increase their infiltration capability. As a result, the proportion of treated backwash discharged has changed from ~ 65% surface water/ 35% ground water (based on data provided for the previous renewal) to ~25% surface water / 75% ground water (currently).

In addition, the City performed maintenance on the clear well in June 2015, which reduced the overall plant-wide water loss. The water balance calculations show the average "plant loss" decreased from 0.74 mgd in 2014 to 0.51 mgd in 2015.

B. Effluent Characteristics

Table 2 summarizes the self-monitoring data for surface water discharges, identified in the previous permit as Outfall 002, as provided in the Discharge Monitoring Reports (DMRs) from January 2012 to December 2015.

Table 2: Ten Mile WTF Surface Water DMR Summary (January 2012 – December 2015)

Parameter	Units	2011 Permit Limit(1)	Minimum	Average	Maximum	No. Samples(2)
Flow	mgd	NA	0.02	0.17	0.33(3)	*33*
Duration	days/mo	NA	0	19	31	*48*
Total Suspended Solids (TSS)	mg/L	30 / 45	1	2.8	12	*27*
pH	s.u.	6.0 – 9.0	6.4	--	8.9	*33*
Total Residual Chlorine (TRC)	µg/L	11 / 15(4)	4	23	90	*33*
Dissolved Aluminum	µg/L	87 / 120	7	68	960	*33*
Arsenic, Total Recoverable	µg/L	7 / 10 (5)	1.0	4.9	30	*33*
Cadmium, Total Recoverable	µg/L	0.10 / 0.13(5)	0.08	0.36	1.0	*33(6)*
Zinc, Total Recoverable	µg/L	27 / 37(5)	10	58	160	*33*
Copper, Total Recoverable	µg/L	NA	1.0	4.6	23	*9(6)*
Iron, Total Recoverable	µg/L	NA	40	79	130	*7(6)*
Lead, Total Recoverable	µg/L	NA	< 0.5	0.5	0.5	*1(6)*
Manganese, Total Recoverable	µg/L	NA	12	40	99	*14*
Total Dissolved Solids	mg/L	NA	46	73	92	*7*
Escherichia coli Bacteria	#/100 mL	NA	0	< 1	2	*8*

Footnote: NA= Not Applicable
(1) Average Monthly Limit / Maximum Daily Limit. 'NA' = not applicable; (no effluent limit, monitoring only.)
(2) Number of samples is the number of months with results reported on DMRs; the parameters TSS, pH, TRC, and aluminum have weekly analysis.
(3) Maximum effluent flow rate to surface water based on the maximum of the monthly averages, as determined in Table 1 rather than the flow provided in the DMRs.
(4) An analytical result less than 100 µg/L TRC demonstrates compliance with the TRC effluent limit.
(5) Effluent limits for these parameters became effective January 1, 2016.
(6) Total number of samples analyzed; however, average value for these four metals excludes non-detects, except the detection limit is used in the analysis for non-detects that met the RRV.

C. Compliance History

DEQ conducted one compliance inspection since the 2011-issued permit became effective. There were no violations cited although the inspector noted that the laboratory analyses detection limits for five metals were above the Required Reporting Values (RRVs) in the most recent Department Circular DEQ-7. In the same time frame, DEQ has issued violation notices to the City for the following:

- Seven months with aluminum exceedances, and
- Three missing semi-annual DMR reports for *E.coli* bacteria and Total Dissolved Solids.

III. Rationale for Proposed Technology-Based Effluent Limits

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 MDPES program [40 CFR 125.44(a)]. TBELs may be national standards established by the EPA, or, in some cases, established by the permit writer on a case-by-case basis.

Since EPA has not promulgated a standard for water treatment plants, TBELs were based on best professional judgment (BPJ) of the permit writer [40 CFR 125.3(c)]. The settling ponds used to treat the WTF backwash is comparable to wastewater stabilization ponds used to meet the National Secondary Standards for Total Suspended Solids (TSS) and pH [40 CFR Part 133.102]. DEQ proposes to renew the TBELs in **Table 3** for the Ten Mile WTF:

Table 3: Proposed TBELs for Outfall 002

Effluent Characteristic	Units	30-day Average Limit	Maximum Daily Limit
Total Suspended Solids	mg/L	30	45
pH (1)	s.u.	6.0 – 9.0	

Footnote:
(1) The effluent pH shall not be less than 6.0 or greater than 9.0 in any single sample or analysis.

These effluent limits are consistent with the majority of the WTF permits recently renewed by DEQ. Furthermore, the Ten Mile WTF has demonstrated the ability to comply with these limits at Outfall 002 over the past four years, as the maximum effluent TSS concentration observed over weekly monitoring was 12 mg/L TSS and pH ranged from 6.4 – 8.9 s.u.

B. Mass-Based Limitations

All applicable effluent limits must be expressed in terms of mass [Administrative Rules of Montana (ARM) 17.30.1345(8)]. Because the Ten Mile WTF is not subject to an ELG or other production- or mass-based limitation and does not have an effluent limit subject to this rule, the development of mass-based effluent limits is not required for this permit.

IV. Rationale for Proposed Water Quality-Based Effluent Limits

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 [40 CFR 122.44]. No wastes may be discharged that can reasonably be expected to violate any state water quality standard [ARM 17.30.637(2)]. Montana water quality standards define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses.

The Helena Ten Mile WTF discharge location is in the Upper Missouri Watershed (Hydraulic Unit Code 10030101), as defined by the United States Geological Survey (USGS). The discharge of the treated wastewater is to Tenmile Creek through ground water or surface water via an unnamed tributary (see section II.A of this Fact Sheet). This reach of Tenmile Creek is identified as Montana stream segment **MT41I006_143**, defined as the reach from the Helena Water Treatment plant to the mouth (Prickly Pear Creek).

Tenmile Creek is classified as "B-1" directly at the area of discharge. 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.

On September 27, 2006, the EPA approved the Lake Helena Total Maximum Daily Load (TMDL), including Tenmile Creek at MT41I006_143 for metals (arsenic, cadmium, copper, lead, and zinc), nutrients, and siltation. The TMDL did not include a waste load allocation for the Ten Mile WTF. However, during the 2011 renewal process, DEQ's Water Quality Planning Bureau clarified that the intent was a zero *increase* in Total Nitrogen (TN) and Total Phosphorus (TP) loads (memo from Mark Bostrom to Jenny Chambers, August 26, 2009). The Water Protection Bureau interpreted this decision to mean that a zero increase in the mass of any of the parameters (between influent and effluent) will meet the intent of the TMDL. The Ten Mile WTF does not increase the overall mass, in fact would decrease the overall mass, of siltation and metal pollutant loads in Tenmile Creek through the flocculation and filtration processes.

According to the 2016 Clean Water Act Information Center (CWAIC) database, the stretch of Tenmile Creek is listed as impaired; specifically the drinking water and aquatic life uses are listed as not fully supported. The probable causes were identified as:

- arsenic, cadmium, copper, lead, zinc, sedimentation/siltation, nutrient/eutrophication biological indicators, nitrogen (total), and phosphorus (total) [parameters of concern]; and
- alteration in stream-side or littoral vegetative covers and low flow alterations [not parameters of concern].

DEQ reviewed the information provided in the application and supplemental information, and finds that nutrients (TN, TP, and nutrient/eutrophication biological indicators) meet the intent of the TMDL, for the following reasons:

- **Nitrogen**: The Ten Mile WTF uses two flocculants that contain nitrogen: (1) non-ionic flocculant "Superfloc N-300," a polyacrylamide that, although stable, could potentially decompose into ammonia and oxides of nitrogen; and (2) cationic flocculant "Clarifloc C-339 Polymer," which could produce nitric oxides if burned. Although these materials contain nitrogen compounds, DEQ does not believe that their use would cause an increase in TN since the materials' purpose is to remove particles by flocculation. In addition the materials are both stable and not expected to decompose or dissolve. Lastly, effluent characterization conducted as part of the 2011 permit renewal demonstrated that the mass TN load in the effluent was less than the upstream load in Tenmile Creek. Therefore, DEQ does not consider TN an issue for meeting the TMDL.

- **Phosphorus**: No phosphorus or phosphorus-containing materials are added at the Helena WTF. In addition, effluent characterization conducted as part of the 2011 permit renewal demonstrated that the average TP effluent concentrations are less than the ambient concentration in Tenmile Creek. Therefore, DEQ does not consider TP an issue for meeting the TMDL.

Conformance with the TMDL for the above parameters does not preclude the need for a concentration-based limit to meet water-quality standards (see section IV.E of this Fact Sheet).

Ground water

In addition to surface water, the permittee must maintain the beneficial ground water uses including the requirement to comply with human health standards (HHS) listed in Circular DEQ-7 [ARM 17.30.1006]. Since there is no available site-specific hydrogeologic information to determine an accurate ground water flow direction, DEQ has taken the conservative approach and assumes that the ground water flow is towards Tenmile Creek. By protecting the beneficial uses of Tenmile Creek, the beneficial uses of the ground water impacted by the WTF sedimentation/ infiltration lagoons are also protected.

The receiving ground water is classified as Class I (water with specific conductance equal to or less than 1,000 uS/cm) [ARM 17.30.1006 (1)]. Class I ground water is suitable for the following beneficial uses with little or no treatment: public and private water supplies, culinary and food processing purposes, irrigation, drinking water for livestock and wildlife, and industrial and commercial uses. Class I ground waters are considered high quality waters and are subject to Montana's Nondegradation Policy if there were new or increased discharges.

B. Nondegradation Load Allocations

Since the facility did not increase flow or undergo any modifications after 1993 that could increase the volume or nature of the discharge, DEQ has determined that the Ten Mile WTF discharge is not a new or increased source for the purposes of nondegradation [ARM 17.30 Subchapter 7, *et seq*.]. For existing dischargers, DEQ calculates nondegradation load allocations for conventional pollutants, such as TSS, as a baseline to compare against potential future changes.

During the 2011 permit renewal, DEQ calculated the nondegradation 30-day average load allocation for TSS (based on the TSS effluent concentration limit of 30 mg/L and the facility's average discharge rate to Tenmile Creek (surface plus ground water discharge) of 0.32 mgd as follows:

TSS Nondeg load allocation: 0.32 mgd x 30 mg/L x 8.34 conversion = 80 lb/day

The average discharge rate to Tenmile Creek for the current period of record was 0.62 mgd (surface plus ground water discharge) which results in a calculated TSS load of 155 lb/day. Since this is greater than the average discharge rate evaluated during the 2011 renewal, the nondegradation load allocation will remain unchanged at the more restrictive load of 80 lb/day. A monthly average load limit of 80 lb/day TSS will be added to the permit.

C. Applicable Water Quality Standards

Tenmile Creek at this location is subject to the specific water quality standards for discharges to surface waters classified B-1, including ARM 17.30 Subchapter 6 and Department Circular DEQ-7 and Circulars DEQ-12A and -12B; ARM 17.30 Subchapter 5 (Mixing Zones); Subchapter 7 (Nondegradation); and Subchapter 10 (Ground water).

Metals

The applicable surface water standards for metals presented in **Table 4** are based on Circular DEQ-7 and ambient hardness data provided in the Helena-Lewis & Clark National Forest Draft Report *Rimini Road Water Quality and Channel Stability: 2015 Annual Monitoring Report, Rimini Road Project, MT PFH 98-1(1)*. The applicable hardness value, 62.3 mg/L as $CaCO_3$, is the 25th percentile of 10 samples taken between July 20th and November 24th, 2015 at Water Quality Site #5 (latitude 46.571444N, 112.215826W) located ~ 0.3 miles from Highway 12 near the WTF.

In all cases the surface water metals standards are as stringent, and usually more stringent, than the ground water metals standards. DEQ finds that protection of the surface water quality standards will be protective of the beneficial uses of both surface water and ground water at the Ten Mile WTF.

Table 4. Ten Mile Creek Metals Surface Water Standards (Circular DEQ-7)

Parameter	Units	Aquatic Life Standard		Human Health Standard (HHS)	Required Reporting Value (RRV)
		Acute	Chronic		
Aluminum, Dissolved	µg/L	750	87	--	9
Arsenic, Total Recoverable	µg/L	340	150	10	1
Cadmium, Total Recoverable	µg/L	1.3(1)	0.19(1)	5	0.03
Copper, Total Recoverable	µg/L	9.0(1)	6.2(1)	1,300	2
Iron, Total Recoverable	µg/L	--	1,000	--	20
Lead, Total Recoverable	µg/L	45(1)	1.7(1)	15	0.3
Zinc, Total Recoverable	µg/L	80(1)	80 (1)	2,000	8

Footnotes:
(1) Applicable metals standards calculated using the 25th percentile upstream total hardness value of 62.3 mg/L.

D. Mixing Zone

This MPDES permit covers discharge to Tenmile Creek from both (1) surface water discharge through ephemeral tributaries, and (2) ground water receiving the lagoons' infiltration.

Since the lagoon's surface water discharge flows to an unnamed tributary to Tenmile Creek, the 10-year 7-day low flow (7Q10) of the direct receiving water is assumed to be 0 cubic feet per second (cfs). No surface water mixing zone will be granted [ARM 17.30.515(1) and (2)].

The ground water is considered a conduit to Tenmile Creek, and the permit discharge limits are designed to protect both the ground water and surface water. No ground water mixing zone was previously granted and the City did not supply information in order for DEQ to evaluate whether a ground water mixing zone is appropriate. DEQ will not authorize a ground water mixing zone or ground water dilution until sufficient data is supplied and conforms with ARM 17.30 Subchapter 5 [ARM 17.30.1010(1)].

Therefore, this MPDES permit covers discharge to Tenmile Creek without any dilution allowances. As a result, all effluent limits will need to be met 'end-of-pipe' at the monitoring location for Outfall 002.

E. Basis and Proposed Water Quality-Based Effluent Limits

Pollutants typically present at potable water treatment plants that may cause or contribute to a violation of water quality standards include conventional pollutants such as TSS and pH, and toxics such as total residual chlorine and dissolved aluminum. In addition, DEQ reviewed additional toxic and other pollutants that were included as part of the TMDL for Lake Helena.

Effluent limits are required for all pollutants which demonstrate a reasonable potential (RP) to exceed numeric or narrative standards. DEQ uses a mass balance equation to determine RP based on *EPA Technical Support Document for Water Quality based Toxics Control (TSD) (EPA/505/2-90-001).* Input parameters are based on critical receiving surface water concentration (75th percentile of upstream concentration); maximum projected effluent concentration (maximum observed x TSD multiplier); critical facility effluent flow (maximum monthly average since this is not a POTW); and the applicable receiving surface water flow (7Q10 or 14Q5).

The mass balance equation used to determine RP is presented in *Equation 1*.

$$C_{RP} = \frac{C_d Q_d + C_S Q_S}{Q_d + Q_S} \qquad (\textbf{\textit{Equation 1}})$$

Where:

C_{RP} = receiving water concentration after mixing (µg/L)
C_d = critical discharge concentration (µg/L)
C_s = critical receiving water concentration upstream of discharge (µg/L)
Q_s = critical receiving water flow, 0 cfs (no mixing zone granted)
Q_d = critical discharge rate, 1.59 cfs (= 1.03 mgd) (See **Table 1**)

Since $Q_s = 0$, $C_{RP} = C_d$ = Maximum Observed * RP Multiplier (TSD Table 3-2)

If RP to exceed a standard is found to exist, the mass-balance equation (Eq. 1) can be arranged to calculate the Wasteload Allocation, WLA (C_{WLA}) so that the discharge does not

cause or contribute to an exceedance of the applicable water quality standard under critical conditions (*Equation 2*):

$$C_{WLA} = \frac{C_{stnd}(Q_s + Q_d) - Q_s C_s}{Q_d} \qquad \textbf{(Equation 2)}$$

Where:

C_{WLA} = calculated wasteload allocation (µg/L)
C_{stnd} = applicable standard (µg/L)
Q_s = applicable receiving water flow, cfs
Q_d = facility design flow rate, cfs
C_s = receiving water concentration upstream of discharge (µg/L)

The WLA are then converted to maximum daily and average monthly effluent limitations based on the procedures given in EPA's TSD (pp. 93-114).

1. Conventional Pollutants

The TBELs for TSS and pH are sufficient to protect Tenmile Creek. No additional WQBELs will be required for TSS or pH.

2. Non-conventional Pollutants

Total Dissolved Solids –

DEQ does not have a Total Dissolved Solids (TDS) surface water quality standard. During the 2011-issued permit renewal, DEQ determined that the WTF did not have RP to exceed the previous ground water TDS limit of 500 mg/L. Additional monitoring was required for the duration of the permit; the maximum TDS concentration for seven samples during this POR was 92 mg/L.

C_{RP} = 92 mg/L * 2.0 multiplier = 184 mg/L < 500 mg/L

There is not RP to exceed the previous ground water TDS limit. No limit will be developed and no further monitoring will be required for TDS.

3. Toxic, Carcinogenic, or Harmful Pollutants

Total Residual Chlorine –

The acute water quality standard for Total Residual Chlorine (TRC) is 0.019 mg/L (19 µg/L), the chronic water quality standard is 0.011 mg/L (11 µg/L), and the human health standard is 4.0 mg/L (4,000 µg/L) [Circular DEQ-7, October 2012].

The WTF filters are backwashed with chlorinated potable water at a maximum of 600 µg/L chlorine. The 2011-issued permit included effluent limits of 11 µg/L average monthly and 15 µg/L maximum daily TRC. Analytical results of less than the RRV of 100 µg/L were considered to be in compliance with the limits. During the period of record, the highest TRC effluent concentration was 90 µg/L. Using the TSD method, the RP for TRC is:

C_{RP} = 90 µg/L x 1.4 multiplier = 126 µg/L > acute & chronic standards

The C_{RP} of 126 µg /L exceeds both the acute and chronic aquatic life standards for TRC. DEQ revised the effluent limit calculations based on updated DEQ procedures, and proposes to change the TRC limits to 9.0 µg/L average monthly and 18 µg/L maximum daily (see **Attachment #1**). Analytical results of less than the RRV of 100 µg/L will remain in compliance with the limits.

Metals –

The WTF clarifies and filters raw water collected upstream from the plant. Aluminum is the only metal added by the facility. The remainder of the metals are present in the raw water and a portion are re-introduced to the wastewater from filter and clarifier backwashing.

Dissolved Aluminum –

Dissolved aluminum is a toxic parameter with an acute water quality standard of 750 µg/L and a chronic water quality standard of 87 µg/L [Circular DEQ-7, October 2012].

Aluminum is used as a coagulant in the water treatment process. In October of 2013, the City discontinued the use of aluminum sulfate solution [$Al_2(SO_4)_3$] and replaced it with Aqua Hawk 2987 (a polymerized aluminum-based coagulant blend of 40% aluminum chlorohydrate and polyaluminum chloride). Since then, the City has used Aqua Hawk as the coagulant other than a brief period with a supply chain issue in December 2014.

The 2011-issued permit renewal required that the WTF meet dissolved aluminum effluent limits of 87 µg/L and 120 µg/L, average monthly and maximum daily respectively.

Weekly monitoring was required. The average dissolved aluminum effluent concentration between January 2012 and December 2015 was 68 µg/L and the maximum was 960 µg/L. After the City began using the Aqua Hawk 2987 in October 2013 the dissolved aluminum effluent concentration has declined: the average concentration was 18 µg/L and the maximum was 42 µg/L (excluding the month of December 2014 when Aqua Hawk was not available).

Because the aluminum concentration in the effluent is a result of chemical addition, and historically the dissolved aluminum concentration was greater than both chronic and acute standards, DEQ will continue to include effluent limits for this parameter. For this renewal, DEQ proposes to revise the effluent limits based on updated procedures. The dissolved aluminum effluent limits will be 73 µg/L and 135 µg/L, average monthly and maximum daily, respectively. See **Attachment #2** for the development of the dissolved aluminum effluent limits. Monitoring for dissolved aluminum will be reduced from weekly to twice monthly.

Arsenic, Total Recoverable –

The total recoverable arsenic water quality standards are: 340 µg/L acute, 150 µg/L chronic, and 10 µg/L Human Health Standard (HHS) [Circular DEQ-7, October 2012].

The presence of arsenic is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain arsenic. Upstream total recoverable arsenic concentrations in Tenmile Creek ranges from 18 to 29 µg/L. The 75th

percentile in Tenmile Creek immediately upstream of the plant was 22 µg/L (Forest Service 2015).

The 2011-issued permit renewal included total recoverable arsenic effluent limits of 7 µg/L and 10 µg/L average monthly and maximum daily, respectively, effective January 1, 2016. Monthly monitoring was required.

The concentration for the 33 total recoverable arsenic effluent samples for the period of record ranged from 1.0 to 30 µg/L, with an average of 5 µg/L. The maximum concentration of 30 µg/L occurred in April 2013 (other than this value and the next highest arsenic concentration of 20 µg/L that occurred in January 2014, the maximum arsenic concentration was 6 µg/L). DEQ finds that the Helena Ten Mile WTF discharge has RP for causing or contributing to an exceedence of the total recoverable arsenic HHS:

C_{RP} = 30 µg/L * 1.3 multiplier = 39 µg/L > HHS

The C_{RP} of 39 µg/L exceeds the arsenic HHS and WQBELs are required. See **Attachment #3** for the development of the total recoverable arsenic effluent limits of 10 µg/L average monthly and maximum daily limits; note that the TSD establishes that the average monthly limit is equivalent to the WLA; since Circular DEQ-7 Footnote 16 establishes that concentrations may not exceed the HHS values the maximum daily limit is also equivalent to the WLA.

Cadmium –

The total recoverable cadmium standards are: an acute aquatic life standard of 1.3 µg/L and a chronic aquatic life standard of 0.19 µg/L (based on a 25th percentile ambient hardness of 62.3 mg/L) and a HHS of 5 µg/L [Circular DEQ-7, October 2012].

The presence of cadmium is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain cadmium. Ambient total recoverable cadmium concentrations in Tenmile Creek upstream of the WTF ranges from 0.27 to 0.60 µg/L. The 75th percentile immediately upstream of the plant was 0.49 µg/L (Forest Service 2015), which is above the acute standard. There is no assimilative capacity in Tenmile Creek.

The 2011-issued permit renewal included total recoverable cadmium effluent limits of 0.10 µg/L and 0.13 µg/L average monthly and maximum daily, respectively, effective January 1, 2016. Monthly monitoring was required.

There were 33 months with discharge between January 2012 and December 2015. Of those discharging months, 16 months provided total recoverable cadmium concentrations ranging from 0.08 – 1.0 µg/L, with the average at 0.36 µg/L. The remaining 17 months had non-detects which varied between <0.1 µg/L and <1.0 µg/L. DEQ finds that the WTF discharge has RP for causing or contributing to an exceedence of the total recoverable cadmium standards:

C_{RP} = 1.0 µg/L * 1.8 multiplier = 1.8 µg/L (> acute and chronic standards)

The C_{RP} of 1.8 µg/L exceeds the cadmium acute and chronic standards and WQBELs are required. See **Attachment #4** for the development of the total recoverable cadmium effluent

limits of 0.14 µg/L and 0.35 µg/L average monthly and maximum daily. No compliance schedule will be provided since the City had been provided a four-year compliance schedule in the previous permit.

Copper –

The total recoverable copper standards are: an acute aquatic life standard of 9.0 µg/L and a chronic aquatic life standard of 6.2 µg/L (based on a 25th percentile ambient hardness of 62.3 mg/L) and a HHS of 1,300 µg/L [Circular DEQ-7, October 2012].

The presence of copper is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain copper. Ambient total recoverable copper concentrations in Tenmile Creek upstream of the WTF ranges from 2.0 to 10 µg/L. The 75th percentile immediately upstream of the plant was 2.5 µg/L (Forest Service, 2015).

The 2011-issued permit renewal did not include total recoverable copper effluent limits. Monthly monitoring was required during calendar years 2012 and 2014. There were 14 months with discharge during 2012 and 2014; of those, there were five months with unquantified non-detects, five months with "<1 µg/L" non-detects, and four months with detection. The total recoverable copper effluent concentration ranged from <1.0 µg/L to 23 µg/L. DEQ finds that the WTF discharge has RP for causing or contributing to an exceedence of the total recoverable copper standards:

C_{RP} = 23 µg/L * 3.2 multiplier = 74 µg/L (> acute and chronic standards)

The C_{RP} of 74 µg/L exceeds the copper acute and chronic standards and WQBELs are required. See **Attachment #5** for the development of the total recoverable copper effluent limits of 3.1 µg/L and 8.9 µg/L average monthly and maximum daily. The City cannot currently meet these proposed limits; the average effluent concentration over the period of record was 4.6 µg/L and the 95th percentile was 17 µg/L. A four-year compliance schedule will be included to give time to evaluate and address copper.

Iron –

Total recoverable iron has a chronic aquatic life standard of 1,000 µg/L [Circular DEQ-7, October 2012].

The presence of iron is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain iron. There is no ambient total recoverable iron concentration data for Tenmile Creek upstream of the WTF.

The 2011-issued permit renewal did not include total recoverable iron effluent limits. Monthly monitoring was required during calendar years 2012 and 2014. There were 14 months with discharge during 2012 and 2014; of those, there were seven months with either unquantified non-detects or non-detects that did not meet the RRV, and seven months with detection. The total recoverable iron effluent concentration for the seven months with detects ranged from 40 µg/L to 130 µg/L with the average at 79 µg/L (excluding the non-detects). DEQ finds that the WTF discharge has RP for causing or contributing to an exceedence of the total recoverable iron standards:

C_{RP} = 130 µg/L * 1.6 multiplier = 208 µg/L (< chronic standard)

The C_{RP} of 208 µg/L is below the chronic standard for iron and WQBELs are not required.

Lead–

The total recoverable lead standards are: an acute aquatic life standard of 45 µg/L and a chronic aquatic life standard of 1.7 µg/L (based on a 25th percentile ambient hardness of 62.3 mg/L) and a HHS of 15 µg/L [Circular DEQ-7, October 2012].

The presence of lead is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain lead. Ambient total recoverable lead concentrations in Tenmile Creek upstream of the WTF ranges from nondetect to 3.7 µg/L. The 75th percentile immediately upstream of the plant was 0.4 µg/L (Forest Service 2015).

The 2011-issued permit renewal did not include total recoverable lead effluent limits. Monthly monitoring was required during calendar years 2012 and 2014. There were 14 months with discharge during 2012 and 2014; of those, there were 13 months with non-detects (either a detection limit above the RRV or an unquantified non-detect) and one month with a detection at 0.5 µg/L. DEQ finds that the WTF discharge does not have RP for causing or contributing to an exceedence of the total recoverable lead standards:

C_{RP} = 0.5 µg/L * 1.5 multiplier = 0.75 µg/L (< lead standards)

The C_{RP} of 0.75 µg/L is below all of the standards for lead, and WQBELs are not required.

Zinc

The total recoverable zinc standards are: acute & chronic aquatic life standards of 80 µg/L (based on a 25th percentile ambient hardness of 62.3 mg/L) and a HHS of 2,000 µg/L [Circular DEQ-7, October 2012].

The presence of zinc is attributed to solids removed from the raw water and backwashed. The City does not use any additional raw materials that contain zinc. Ambient total recoverable zinc concentrations in Tenmile Creek upstream of the WTF ranges from 26 to 1,690 µg/L. The 75th percentile immediately upstream of the plant was 99 µg/L (Forest Service 2015). This is above the acute and chronic standards; there is no assimilative capacity for zinc in Tenmile Creek.

The 2011-issued permit renewal included total recoverable zinc effluent limits of 27 µg/L and 37 µg/L average monthly and maximum daily, respectively, effective January 1, 2016. Monthly monitoring was required.

There were 33 months with discharge between January 2012 and December 2015. The total recoverable zinc concentration ranged from 10 - 160 µg/L, with the average at 58 µg/L. DEQ finds that the WTF discharge has RP for causing or contributing to an exceedence of the total recoverable zinc standards:

C_{RP} = 160 µg/L * 1.4 multiplier = 224 µg/L (> acute and chronic standards)

The C_{RP} of 224 µg/L exceeds the zinc acute and chronic standards and WQBELs are required. See **Attachment #6** for the development of the total recoverable zinc effluent limits of 40 µg/L and 80 µg/L average monthly and maximum daily. No compliance schedule will

be provided since the City had been provided a four-year compliance schedule in the previous permit.

Escherichia coli Bacteria

The applicable standards for *Escherichia coli* (*E. coli*) bacteria in B-1 classification waters are [ARM 17.30.623(2)(a)]:

a. April 1 through October 31, the geometric mean number of *E. coli* may 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, 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.

The 2011-issued permit renewal did not include *E. coli* effluent limits. Semi-annual monitoring was required. The City provided the results for eight effluent samples for *E. coli* bacteria, which ranged from 0 to 2 cfu/100 mL, with the median of < 0.4 cfu/100 mL. DEQ finds that the Ten Mile WTF discharge does not have RP for an exceedence of the surface water quality standard:

C_{RP} = 2 cfu/100 mL * 4.3 multiplier = 8.6 cfu/mL (< 126 cfu/100 mL)

In addition to the surface water standards, *E. coli* bacteria is a harmful parameter with a ground water human health standard of < 1 cfu per 100 mL (Circular DEQ-7, October 2012). One sample was over the ground water standard during the period of record: 2 cfu/100 mL, during April 2012. The City has performed maintenance work on the lagoons since this time, and the four results for 2014 & 2015 all showed no *E.coli* present. Furthermore, the nature of the water treatment process is such that no pathogens would be expected to be added (in fact, due to chlorination, pathogens would be reduced).

DEQ finds there is not RP to cause or contribute to an exceedence of water quality standards, and no limit is necessary.

Nutrients

Base numeric nutrient standards for TN and TP are found in Department Circular DEQ-12A. The WTP is located in the Middle Rockies ecoregion, and the applicable standards for Tenmile Creek are 0.30 mg/L TN and 0.03 mg/L TP, from July 1st to September 30th.

There is not sufficient data to conduct an RP analysis for TN. Monitoring for TN was not required in the 2011-issued permit. The City reported a concentration of <0.65 mg/L TN (sum of TKN plus N+N) from one 2008 effluent sample on Form 2E Section J. Upstream TN data from USGS Gaging Station 06062750 between 1997 and 2004 provided results for seven TN samples with six nondetects ranging from <0.11 to <0.34 mg/L, and one estimated value of 0.18 mg/L. Assuming the TN concentration was equivalent to the detection limit, the 75th percentile is 0.28 mg/L year-round (and the 75th percentile of two summer season results was 0.12 mg./L). This is below the TN standard. Effluent TN monitoring will be required

monthly for July, August, and September in order to provide data for an RP analysis during the next permit renewal.

There is not RP to cause or contribute to an exceedance of the TP standard. Monitoring for TP was not required in the 2011-issued permit. The City reported a concentration of 0.02 mg/L TP from one effluent sample taken in 2008 on Form 2E Section J; this is below the water quality standard. Furthermore, the WTP does not add any chemicals that contain phosphorus.

V. Proposed Effluent Limits – Outfall 002

A. Outfall 002- Effluent Limits

Except for total recoverable copper, the quality of effluent discharged by the facility shall, at a minimum, meet the limits as set forth below in **Table 5** upon the effective date of this permit and lasting through the term of the permit. The proposed limit for total recoverable copper will become effective <*four years from the effective date of this permit*> and continue through the end of the permit term.

Table 5: Proposed Outfall 002 Effluent Limits

Parameter	Units	Average Monthly Limit(1)	Maximum Daily Limit(1)
Total Suspended Solids (TSS)	mg/L	30	45
	lb/day	80	NA
pH (2)	s.u.	6.0 – 9.0	
Total Residual Chlorine (TRC)(3)	µg/L	9	18
Aluminum, Dissolved	µg/L	73	135
Arsenic, Total Recoverable	µg/L	10	10
Cadmium, Total Recoverable	µg/L	0.14	0.35
Copper, Total Recoverable(4)	µg/L	3.1	8.9
Zinc, Total Recoverable	µg/L	40	80

Footnotes: NA=Not Applicable
(1) See Definition section at end of permit for explanation of terms.
(2) The effluent pH shall not be less than 6.0 or greater than 9.0 in any single sample or analysis.
(3) On-site analysis per 40 CFR 136 required. Analytical results less than 100 µg/L TRC will be considered to be in compliance with the limits.
(4) Total recoverable copper limits become effective <*four years from the effective date of the permit.*> See Special Conditions.

VI. Monitoring Requirements

A. Outfall 002- Monitoring

At a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. Samples shall be collected, preserved, and analyzed in accordance with approved procedures listed in 40 CFR Part 136, unless another test procedure has been specified in this permit. All analytical procedures must meet any Required Reporting Values (RRVs) listed in Department Circular DEQ-7 (DEQ-7) as specified below. If no discharge occurs during the entire monitoring period, it shall be stated on DMRs that no discharge occurred. Self-monitoring of effluent discharged at Outfall 002 shall be conducted after treatment (after Lagoon #3). Samples will reflect the volume and nature of the discharge.

Table 6: Outfall 002 – Effluent Monitoring Requirements

Parameter	Unit	Frequency of Analyses	Sample Type (1)	Reporting Requirements	RRV or RL
Ground Water Discharge Flow	mgd	Daily	Calculated	Average Monthly	+/- 10% actual flow
Surface Water Discharge Flow	mgd	5/Week	Instantaneous	Average Monthly	+/- 10% actual flow
Discharge Duration	days	NA	Reported	Number of Days	--
pH	s.u.	1/Week	Instantaneous	Minimum and Maximum	0.1
Total Suspended Solids	mg/L	2/Month(2)	Grab	Maximum Daily and Average Monthly	10
	lb/day	1/Month	Calculated	Average Monthly	--
Total Residual Chlorine (3)	µg/L	1/Week	Grab	Maximum Daily and Average Monthly	100
Aluminum, Dissolved	µg/L	2/Month(2)	Grab	Maximum Daily and Average Monthly	9
Arsenic, Total Recoverable	µg/L	1/Month	Grab	Maximum Daily and Average Monthly	1
Cadmium, Total Recoverable	µg/L	1/Month	Grab	Maximum Daily and Average Monthly	0.03
Copper, Total Recoverable	µg/L	1/Month	Grab	Maximum Daily and Average Monthly	2
Zinc, Total Recoverable	µg/L	1/Month	Grab	Maximum Daily and Average Monthly	8
Total Nitrogen	mg/L	1/Month(4)	Grab(4) or Calculated	Value	0.225

Footnotes: NA=Not Applicable
(1) See Definition section at end of permit for explanation of terms.
(2) Samples must be at taken at least 7 days apart.
(3) Analytical methods in 40 CFR 136 requires TRC samples to be analyzed immediately. On-site analysis must use an approved method and achieve a minimum detection level of 100 µg/L. An effluent sample with an analytical result less than 100 µg/L is considered in compliance with the TRC limit.
(4) Monitoring for TN required only during the summer months of July, August, and September. TN may be analyzed by either the persulfate digestion method or the sum of total Kjeldahl nitrogen and N+N.

VII. Special Conditions/Compliance Schedule

The City of Helena is required to complete the following:

(1) Historically, partially dewatered sludge was pumped from the lagoons to adjacent "sludge drying beds." However, the sludge drying beds are two unlined depressions dug in the alluvial gravels next to the sedimentation/infiltration lagoons. The sludge drying beds could be sources of pollutants and potentially unpermitted discharges to ground water.

The 2011-issued permit required the City address this potential pollutant source. As a result, the City reported that in 2015 they decommissioned the drying beds and now dispose of newly generated sludge offsite. Furthermore, the City has started removing the existing sludge and has removed more than 10% of the total. As of June 2016, one cell has been cleaned and the City has general plans to continue to remove the remainder of the dried sludge as time and resources allow. With this permit renewal, the City will be required to remove all of the remaining sludge and properly dispose off-site <*within four year of the effective date of this permit*>, or have otherwise satisfied permitting requirements for placement of this waste on-site.

(2) The City will need investigate and comply with the total recoverable copper effluent limits <*within four year of the effective date of this permit*>.

The actions listed in the table below must be completed on or before the respective scheduled completion dates. Completion of all actions or deliverables must be reported to DEQ and in accordance with the signatory requirements of the permit.

Table 7: Compliance Schedule

Action	Frequency	Scheduled Completion Date of Action(1)	Report Due Date(2)
Provide annual summary of the amount of dried sludge removed during the previous year, and the amount remaining.	Annual	Beginning December 31, 2017 and continuing each year until < *4 years after effective date* >.	By January 28, 2018 and January 28th of each year until < *4 years after effective date* >.
Complete removal of dried sludge that had historically been placed in on-site unlined sludge-drying beds.	One time	By < *4 years after effective date* >	Due 28th of the month following scheduled completion date.
Provide annual summary of total recoverable copper compliance option evaluation and implementation	Annual	Beginning December 31, 2017 and continuing each year until < *4 years after effective date* >.	By January 28, 2018 and January 28th of each year until < *4 years after effective date* >.
Comply with total recoverable copper limits	One time	By < *4 years after effective date* >	Due 28th of the month following scheduled completion date.

Footnotes:
(1) The actions must be completed on or before the scheduled completion dates.
(2) This notification must be postmarked or electronically submitted to DEQ on or before the scheduled due date.

VIII. Nonsignificance Determination

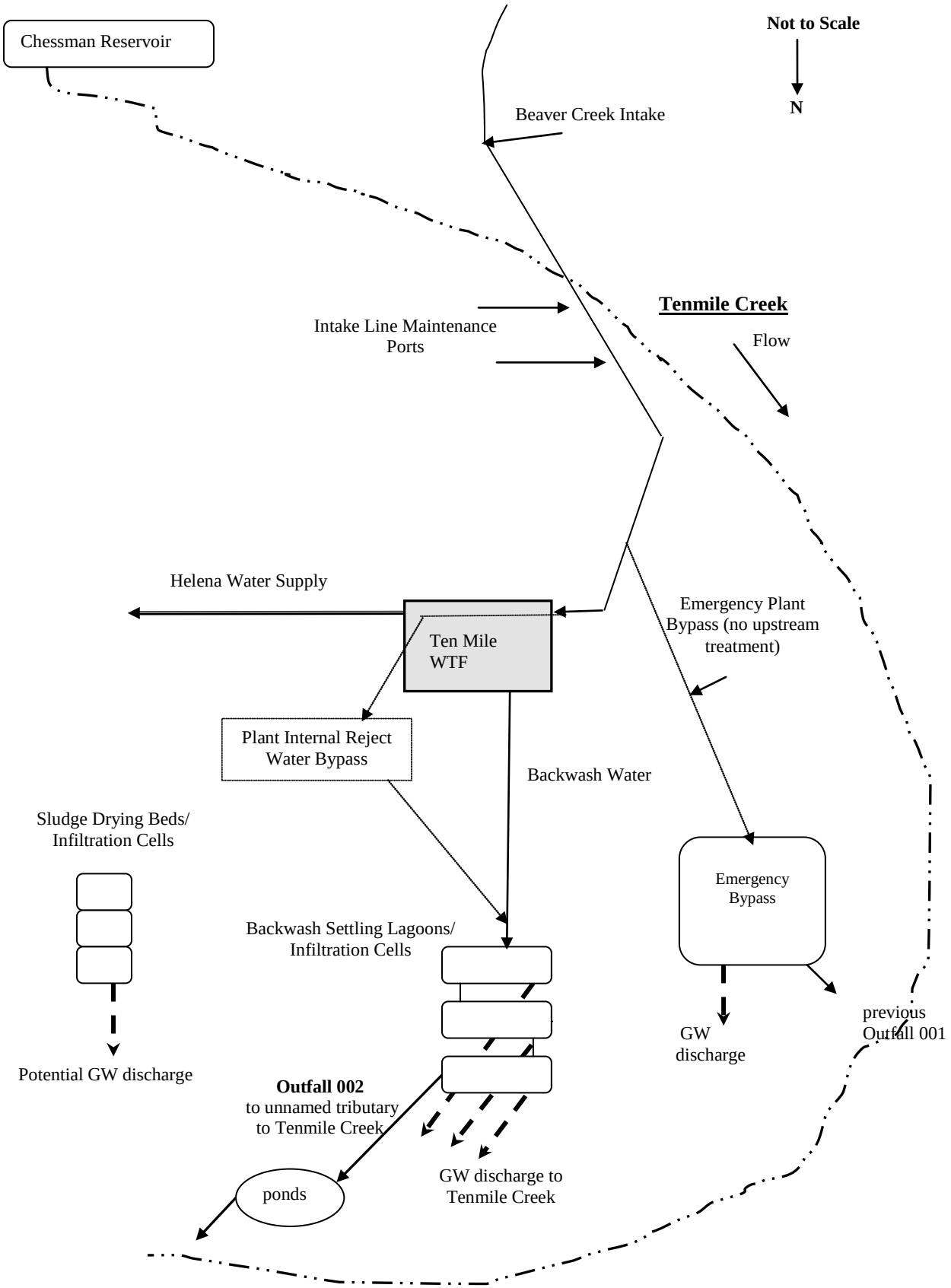
The discharge from the Helena Ten Mile WTF does not constitute a new or increased source of pollutants.

IX. Information Sources

1. Title 75 -5-101 *et seq*., Montana Code Annotated (MCA)
2. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
   a. Subchapter 5 - Mixing Zones in Surface and Ground Water.
   b. Subchapter 6 - Montana Surface Water Quality Standards and Procedures.
   c. Subchapter 7- Nondegradation of Water Quality
   d. Subchapter 10 - Montana Ground Water Pollution Control System
   e. Subchapter 12 - Montana Pollutant Discharge Elimination System (MPDES) Standards
   f. Subchapter 13 - Montana Pollutant Discharge Elimination System (MPDES) Permits
3. Montana Circular DEQ-7, Montana Numeric Water Quality Standards, August 2012.
4. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387.
5. Clean Water Act § 303(d), 33 USC 1313(d) Montana List of Waterbodies in Need of Total Maximum Daily Load Development, draft 2016.
6. US Code of Federal Regulations, 40 CFR Parts 122, 125, 130, 133, 136, and 143.
7. Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0028720:
   a. Administrative Records for MT0028720.
   b. Renewal Application EPA Forms 1, 2C, and GW-2, April 2016.
8. US EPA Technical Support Document for Water Quality-Based Toxics Control, EPA/505/2-30-001, March 1991.
9. US EPA NPDES Permit Writers' Manual, EPA 833-B-96-003, September 2010.
10. *Rimini Road Water Quality and Channel Stability: 2015 Annual Monitoring Report, Rimini Road Project, MT PFH 98-1(1)*, Helena-Lewis & Clark National Forest Draft Report.

Completed by Christine Weaver, July 2016

Figure 1. -Flow Schematic for Discharge from the Helena Ten Mile WTF



Attachment #1 – Attachment #6