

## **Appendix B: Montana Water Quality Standards**



## B.0 WATER QUALITY STANDARDS

### B.1 Classification and Beneficial Uses

Classification is the assignment (designation) of a single or group of uses to a water body based on the potential of the water body to support those uses. Designated uses or beneficial uses are simple narrative descriptions of water quality expectations or water quality goals. There are a variety of “uses” of state waters, including: growth and propagation of fish and associated aquatic life; drinking water; agriculture; industrial supply; and recreation and wildlife. The Montana Water Quality Act (WQA) directs the Board of Environmental Review (BER, i.e., the state) to establish a classification system for all waters of the state that includes their present (when the Act was originally written) and future most beneficial uses (Administrative Rules of Montana (ARM) 17.30.607-616) and to adopt standards to protect those uses (ARM 17.30.620-670).

Montana, unlike many other states, uses a watershed based classification system with some specific exceptions. As a result, *all* waters of the state are classified and have designated uses and supporting standards. All classifications have multiple uses and in only one case (A-Closed) is a specific use (drinking water) given preference over the other designated uses. Some waters may not actually be used for a specific designated use, for example as a public drinking water supply. However, the quality of that water body must be maintained as suitable for that designated use. When natural conditions limit or preclude a designated use, permitted point source discharges or non-point source discharges may not make the natural conditions worse.

Descriptions of Montana’s surface water classifications and designated beneficial uses are presented in Table B-1. All water bodies within the Lake Helena watershed are classified as B-1, with two exceptions. Tenmile Creek from its headwaters to the Helena public water supply intake above Rimini is classified A-1, and Prickly Pear Creek from the Highway 433 crossing to Lake Helena is classified I. The geographic distribution of stream classifications within the Lake Helena watershed is shown in Figure B-1.

### B.2 Standards

In addition to the Use Classifications described above, Montana’s water quality standards include numeric and narrative criteria as well as a nondegradation policy that currently applies to the numeric criteria.

Numeric surface water quality standards have been developed for many parameters to protect human health and aquatic life. These standards are in the Department Circular WQB-7 (MDEQ, 2002). The numeric human health standards have been developed for parameters determined to be toxic, carcinogenic, or harmful and have been established at levels to be protective of long-term (i.e., life-long) exposures as well as through direct contact such as swimming.

The numeric aquatic life standards include chronic and acute values that are based on extensive laboratory studies including a wide variety of potentially affected species, a variety of life stages and durations of exposure. Chronic aquatic life standards are protective of long-term exposure to a parameter. The protection afforded by the chronic standards includes reproduction, early life stage survival and growth rates. In most cases the chronic standard is more stringent than the corresponding acute standard. Acute aquatic life standards are protective of short-term exposures to a parameter and are not to be exceeded.

High quality waters are afforded an additional level of protection by the nondegradation rules (ARM 17.30.701 et. seq.) and in statute (75-5-303 MCA). Changes in water quality must be “non-significant” or an authorization to degrade must be granted by the Department. However under no circumstance may standards be exceeded. It is important to note that waters that meet or are of better quality than a standard

are considered “high quality” for that parameter, and nondegradation policies apply to new or increased discharges to that the water body.

Narrative standards have been developed for substances or conditions for which sufficient information does not exist to develop specific numeric standards. The term “Narrative Standards” commonly refers to the General Prohibitions in ARM 17.30.637 and other descriptive portions of the surface water quality standards. The General Prohibitions are also called the “free from” standards; that is, the surface waters of the state must be free from substances attributable to discharges, including thermal pollution, that impair the beneficial uses of a water body. Uses may be impaired by toxic or harmful conditions (from one or a combination of parameters) or conditions that produce undesirable aquatic life. Undesirable aquatic life includes bacteria, fungi and algae.

The standards applicable to the list of pollutants addressed in the Lake Helena watershed TPA are summarized, one-by-one, in the sections that follow.

**Table B-1. Montana surface water classifications and designated beneficial uses.**

<b>Classification</b>	<b>Designated Uses</b>
<b>A-CLOSED CLASSIFICATION:</b>	Waters classified A-Closed are to be maintained suitable for drinking, culinary and food processing purposes after simple disinfection.
<b>A-1 CLASSIFICATION:</b>	Waters classified A-1 are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities.
<b>B-1 CLASSIFICATION:</b>	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.
<b>B-2 CLASSIFICATION:</b>	Waters classified B-2 are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
<b>B-3 CLASSIFICATION:</b>	Waters classified B-3 are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
<b>C-1 CLASSIFICATION:</b>	Waters classified C-1 are to be maintained suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
<b>C-2 CLASSIFICATION:</b>	Waters classified C-2 are to be maintained suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
<b>C-3 CLASSIFICATION:</b>	Waters classified C-3 are to be maintained suitable for bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers. The quality of these waters is naturally marginal for drinking, culinary and food processing purposes, agriculture and industrial water supply.
<b>I CLASSIFICATION:</b>	The goal of the State of Montana is to have these waters fully support the following uses: drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

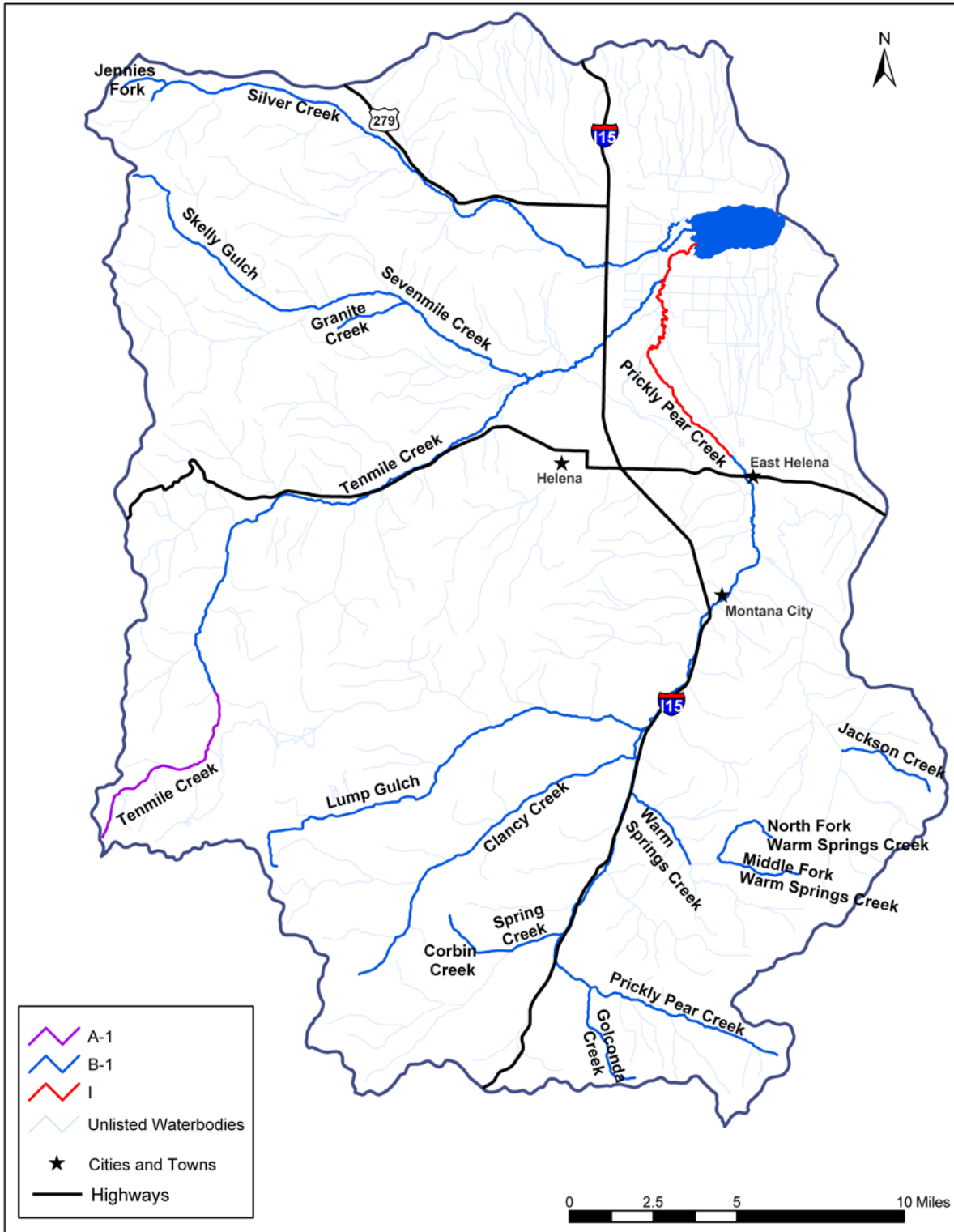


Figure B-1. Beneficial water use classifications in the Lake Helena watershed.

### B.2.1 Nutrients

Most waters of Montana are protected from excessive nutrient concentrations by narrative standards. The exception is the Clark Fork River above the confluence with the Flathead River, where numeric water quality standards have been adopted. These standards are 300 µg/l for total nitrogen and 20 µg/l (upstream of the confluence with the Blackfoot River) and 39 µg/l (downstream of the confluence) for total phosphorus. A related standard has been established for algal biomass measured as chlorophyll *a*, which is 100 mg/m<sup>2</sup> as a summer mean concentration and 150 mg/m<sup>2</sup> as a maximum value.

The narrative standards applicable to nutrients elsewhere in Montana are contained in the General Prohibitions of the surface water quality standards (ARM 17.30.637 et seq.) Seq.). The prohibition against the creation of “*conditions which produce undesirable aquatic life*” is generally the most relevant to nutrients.

### B.2.2 Ammonia

The 30-day average (chronic) and 1-hour average (acute) criteria for total ammonia-nitrogen (expressed in mg/L as N) are calculated using equations in Circular WQB-7 (MDEQ, 2002). In addition, the highest four-day average concentration within any 30-day time period should not exceed 2.5 times the chronic criterion. The acute criterion in Circular WQB-7 is calculated on the basis of the instream pH value, while the chronic criterion is determined on the basis of pH and the presence or absence of early life stages of fish (MDEQ, 2002). The pH dependent acute and chronic criteria values are shown in Table B-2 and Table B-3 below.

**Table B-2. pH dependent values of the CMC (acute criterion) ammonia standard (mg/L).**

pH	CMC total Ammonia nitrogen (mg/L NH <sub>3</sub> plus NH <sub>4</sub> -N)	
	Salmonids Present	Salmonids Absent
6.5	32.6	48.8
6.6	31.3	46.8
6.7	29.8	44.6
6.8	28.1	42.0
6.9	26.2	39.1
7.0	24.1	36.1
7.1	22.0	32.8
7.2	19.7	29.5
7.3	17.5	26.2
7.4	15.4	23.0
7.5	13.3	19.9
7.6	11.4	17.0
7.7	9.65	14.4
7.8	8.11	12.1
7.9	6.77	10.1

pH	CMC total Ammonia nitrogen (mg/L NH3 plus NH4-N)	
	Salmonids Present	Salmonids Absent
8.0	5.62	8.40
8.1	4.64	6.95
8.2	3.83	5.72
8.3	3.15	4.71
8.4	2.59	3.88
8.5	2.14	3.20
8.6	1.77	2.65
8.7	1.47	2.20
8.8	1.23	1.84
8.9	1.04	1.56
9.0	0.885	1.32

**Table B-3. Temperature and pH dependent values of the CCC (chronic criterion) ammonia standard for early life stages present**

Temperature, C																				
CCC for Fish Life Stages Present, total ammonia nitrogen (mg/l NH3-N plus NH4-N)											CCC for Fish Life Stages Absent, total ammonia nitrogen (mg/l NH3-N plus NH4-N)									
pH	0	14	16	18	20	22	24	26	28	30	0-7	8	9	10	11	12	13	14	15*	16*
6.5	6.7	6.7	6.1	5.3	4.7	4.1	3.6	3.2	2.8	2.5	10.8	10.1	9.51	8.9	8.4	7.8	7.4	6.9	6.5	6.1
6.6	6.6	6.6	6.1	5.3	4.6	4.1	3.6	3.1	2.8	2.4	10.7	10.0	9.4	8.8	8.2	7.7	7.2	6.8	6.4	6.0
6.7	6.4	6.4	6.0	5.2	4.5	4.0	3.5	3.1	2.7	2.4	10.5	9.81	9.2	8.6	8.1	7.6	7.1	6.7	6.3	5.9
6.8	6.3	6.3	5.9	5.0	4.4	3.9	3.4	3.0	2.6	2.3	10.2	9.58	8.98	8.4	7.9	7.4	6.9	6.5	6.1	5.7
6.9	6.1	6.1	5.7	4.9	4.3	3.8	3.3	2.9	2.6	2.3	9.93	9.31	8.73	8.2	7.7	7.2	6.8	6.3	5.9	5.6
7.0	5.9	5.9	5.6	4.7	4.2	3.7	3.2	2.8	2.5	2.2	9.6	9.0	8.43	7.9	7.4	6.9	6.5	6.1	5.7	5.4
7.1	5.7	6.7	5.4	4.5	4.0	3.5	3.1	2.7	2.4	2.1	9.2	8.6	8.1	7.6	7.1	6.7	6.3	5.9	5.5	5.2

Temperature, C																					
CCC for Fish Life Stages Present, total ammonia nitrogen (mg/l NH3-N plus NH4-N)											CCC for Fish Life Stages Absent, total ammonia nitrogen (mg/l NH3-N plus NH4-N)										
7.2	5.4	5.4	5.2	4.3	3.8	3.3	2.9	2.6	2.3	2.0	8.8	8.2	7.7	7.2	6.8	6.3	5.9	5.6	5.2	4.9	
7.3	5.1	5.1	5.0	4.1	3.6	3.1	2.8	2.4	2.1	1.9	8.24	7.73	7.25	6.8	6.4	6.0	5.6	5.3	4.9	4.6	
7.4	4.8	4.7	4.6	3.8	3.3	2.9	2.6	2.3	2.0	1.7	7.7	7.21	6.76	6.3	5.9	5.6	5.2	4.9	4.6	4.3	
7.5	4.4	4.4	4.3	3.5	3.1	2.7	2.4	2.1	1.8	1.6	7.1	6.64	6.23	5.8	5.5	5.1	4.8	4.5	4.23	3.97	
7.6	4.0	4.0	4.0	3.2	2.8	2.5	2.2	1.9	1.7	1.5	6.5	6.05	5.67	5.3	5.0	4.7	4.4	4.1	3.85	3.61	
7.7	3.6	3.6	3.6	2.9	2.5	2.2	1.9	1.7	1.5	1.3	5.81	5.45	5.11	4.8	4.5	4.2	4.0	3.7	3.47	3.25	
7.8	3.2	3.2	3.3	2.5	2.2	2.0	1.7	1.5	1.3	1.2	5.17	4.84	4.54	4.3	4.0	3.7	3.5	3.3	3.1	2.9	
7.9	2.8	2.8	2.9	2.2	2.0	1.7	1.5	1.3	1.2	1.0	4.54	4.26	3.99	3.7	3.5	3.3	3.1	2.9	2.7	2.54	
8.0	2.4	2.4	2.2	2.0	1.7	1.5	1.3	1.2	1.0	0.9	3.95	3.70	3.47	3.3	3.1	2.9	2.7	2.5	2.4	2.21	
8.1	2.1	2.1	2.0	1.7	1.5	1.3	1.1	1.0	0.9	0.8	3.41	3.19	2.99	2.8	2.6	2.5	2.3	2.2	2.03	1.91	
8.2	1.8	1.8	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.7	2.91	2.73	2.56	2.4	2.3	2.1	2.0	1.9	1.74	1.63	
8.3	1.5	1.5	1.4	1.2	1.1	1.0	0.8	0.7	0.6	0.6	2.47	2.32	2.18	2.0	1.9	1.8	1.7	1.6	1.5	1.4	
8.4	1.3	1.3	1.2	1.0	1.0	0.8	0.7	0.6	0.5	0.5	2.09	1.96	1.84	1.7	1.6	1.5	1.4	1.3	1.3	1.2	
8.5	1.1	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	1.77	1.66	1.55	1.5	1.4	1.3	1.2	1.1	1.1	0.99	
8.6	0.9	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	1.49	1.4	1.31	1.2	1.2	1.1	1.0	1.0	0.89	0.84	
8.7	0.8	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	1.26	1.18	1.11	1.0	1.0	0.9	0.9	0.8	0.75	0.71	



Temperature, C																					
CCC for Fish Life Stages Present, total ammonia nitrogen (mg/l NH3-N plus NH4-N)											CCC for Fish Life Stages Absent, total ammonia nitrogen (mg/l NH3-N plus NH4-N)										
8.8	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	1.07	1.01	0.94	0.9	0.8	0.8	0.7	0.7	0.6	0.6	
8.9	0.6	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.92	0.86	0.81	0.8	0.7	0.7	0.6	0.6	0.5	0.5	
9.0	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.79	0.74	0.69	0.7	0.6	0.6	0.5	0.5	0.5	0.4	

\*At 15 C and above, the criterion for fish ELS absent is the same as the criterion for fish ELS present

### B.2.3 Dissolved Oxygen

The freshwater aquatic life standards for dissolved oxygen are presented in Table B-4. A table of fish spawning times and schedule for the presence of early life stages of fish are likely may be found at <http://www.deq.state.mt.us/wqinfo/Standards/SpawningTimesFWP.pdf>.

**Table B-4. Aquatic life standards for dissolved oxygen (mg/L).**

Time Period	Use Classes A-1 and B-1		Use Class I	
	Early Life Stages <sup>a</sup>	Other Life Stages	Early Life Stages	Other Life Stages
30-day average	NA	6.5	NA	5.5
7-day average	9.5 (6.5)	NA	6.0	NA
7-day average minimum	NA	5.0	NA	4.0
1-day minimum	8.0 (5.0)	4.0	5.0	3.0

<sup>a</sup>These are water column concentrations recommended to achieve the required intergravel DO concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the figures in parentheses apply.

### B.2.4 Sediment

Sediment (i.e., coarse and fine bed sediment) and suspended sediment are addressed via the narrative criteria identified in Table B-5. The relevant narrative criteria do not allow for harmful or other undesirable conditions related to increases above naturally occurring levels or from discharges to state surface waters. This is interpreted to mean that water quality goals should strive toward a reference condition that reflects a water body's greatest potential for water quality given current and historic land use activities, where all reasonable land, soil, and water conservation practices have been applied (see definitions in Table B-5).

**Table B-5. Applicable rules for sediment related pollutants.**

Rule(s)	Standard
17.30.623(2)	No person may violate the following specific water quality standards for waters classified B-1.
17.30.623(2)(f)	No increases are allowed above naturally occurring concentrations of sediment or suspended sediment (except a permitted in 75-5-318, MCA), settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.
17.30.637(1)	State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will.
17.30.637(1)(a)	Settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines.
17.30.637(1)(d)	Create concentrations or combinations of materials that are toxic or harmful to human, animal, plant, or aquatic life.
	The maximum allowable increase above naturally occurring turbidity is: 0 NTU for A-closed; 5 NTU for A-1, B-1, and C-1; 10 NTU for B-2, C-2, and C-3)
17.30.602(17)	"Naturally occurring" means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied.
17.30.602(21)	"Reasonable land, soil, and water conservation practices" means methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include but are not limited to structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.

### B.2.5 Metals

Numeric criteria for metals in Montana include specific standards for the protection of both aquatic life and human health. As described earlier, both acute and chronic criteria have been established for the protection of aquatic life. The criteria for some metals vary according to the hardness of the water. The standards for cadmium, copper, chromium (III), lead, nickel, silver and zinc vary according to the hardness of the water. These standards have an inverse relationship to toxicity (decreasing hardness causes increased toxicity). The applicable numeric criteria for the metals of concern in the Lake Helena watershed TPA are presented in Table B-6.

It should be noted that recent studies have indicated some metals concentrations vary through out the day because of diel pH and alkalinity changes. In some cases the variation can cross the standard threshold (both ways) for a metal. Montana water quality standards are not time of day dependent.

**Table B-6. Montana numeric surface water quality standards for metals.**

Parameter	Aquatic Life (acute) ( $\mu\text{L}$ ) <sup>a</sup>	Aquatic Life (chronic) ( $\mu\text{L}$ ) <sup>b</sup>	Human Health ( $\mu\text{L}$ ) <sup>a</sup>
Arsenic (TR)	340	150	18 <sup>d</sup>
Cadmium (TR)	1.05 @ 50 mg/L hardness <sup>c</sup>	0.16 @ 50 mg/L hardness <sup>c</sup>	5
Copper (TR)	7.3 @ 50 mg/L hardness <sup>c</sup>	5.2 @ 50 mg/L hardness <sup>c</sup>	1,300
Lead (TR)	82 @ 100 mg/L hardness <sup>c</sup>	3.2 @ 100 mg/L hardness <sup>c</sup>	15
Zinc (TR)	67 @ 50 mg/L hardness <sup>c</sup>	67 @ 50 mg/L hardness <sup>c</sup>	2,000

<sup>a</sup>Maximum allowable concentration.

<sup>b</sup>No 4-day (96-hour) or longer period average concentration may exceed these values.

<sup>c</sup>Standard is dependent on the hardness of the water, measured as the concentration of  $\text{CaCO}_3$  (mg/L) (see Appendix F for the coefficients to calculate the standard).

<sup>d</sup> Human health standard for arsenic is currently 18  $\mu\text{g/L}$ , but will change to 10  $\mu\text{g/L}$  in 2006.

Note: TR – total recoverable.

### B.2.6 pH

Montana's standards set restrictions on induced variations in hydrogen ion concentration, or pH, in order to protect fish and aquatic life as well as other beneficial uses.

For waters classified as A-1 or B-1, the maximum allowable change in pH within the range of 6.5 to 8.5 must be less than 0.5 pH units. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0 (ARM 17.30.622(c), ARM 17.30.623(c)).

For waters classified as I, pH must be maintained within the range of 6.5 to 9.5 (ARM 17.30.628(c)).

### B.2.7 Water Temperature

Montana's temperature standards were originally developed to address situations associated with point source discharges, making them somewhat awkward to apply when dealing with primarily nonpoint source issues. In practical terms, the temperature standards address a maximum allowable increase above "naturally occurring" temperatures to protect the existing temperature regime for fish and aquatic life. Additionally, Montana's temperature standards address the maximum allowable rate at which temperature increases or decreases can occur in order to avoid fish and aquatic life temperature shock.

For waters classified as A-1 or B-1, the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67° Fahrenheit) is 1° (F) and the rate of change cannot exceed 2°F per hour. If the natural occurring temperature is greater than 67° F, the maximum allowable increase is 0.5° F (ARM 17.30.622(e), ARM 17.30.623(e)).

For waters classified I, no increase in naturally occurring temperature is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife (ARM 17.30.628(e)).

### B.2.8 Salinity/TDS/Chlorides

Montana currently does not have numeric standards for chlorides. USEPA recommends chloride standards for streams and rivers based on the aquatic toxicity of plant, fish, and invertebrate species (USEPA, 1999). USEPA recommends an acute standard of 860 mg/L and a chronic standard of 230 mg/L. These standards are proposed here as target values for Lake Helena watershed streams (Table B-7).

**Table B-7. Proposed chloride target values for the Lake Helena watershed.**

Targets	Threshold
Chloride Concentration (max)	< 860 mg/L
Chloride Concentration (avg)	< 230 mg/L

### B.2.9 Priority Organics

Silver Creek was listed as impaired because of priority organics on the Montana 303(d) list. Additional information from Montana DEQ identified dichlorodiphenyl-dichloroethylene (DDE) as the priority organic pollutant of concern (MDEQ, XXXX).

DDE is a breakdown product of DDT (dichlorodiphenyltrichloroethane), which was once widely used as a pesticide throughout the United States. Although banned, DDT and DDE still exist in the atmosphere and soils. Both bond strongly to soils and breakdown over a period of 2 to 15 years (ATSDR, 2002). DDE is listed by USEPA as a “probable human carcinogen”, and has been shown to cause reproductive and liver damage in avian species (USEPA, 1980). The Montana water quality standard for DDE is a maximum of 0.0059 ug/L to protect human health, and this standard is also protective of aquatic life.