

U.S. Environmental Protection Agency

Final ARARs Review Technical Memorandum

Third 5-Year Review Report for Silver Bow Creek/Butte Area Superfund Site

Appendix B to Volume 1: Site-Wide Summary Report

June 2011

REMEDIAL ACTION CONTRACT
FOR REMEDIAL, ENFORCEMENT OVERSIGHT, AND NON-TIME-
CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES
IN EPA REGION 8

U. S. EPA CONTRACT NO. EP-W-05-049

FINAL

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

REVIEW TECHNICAL MEMORANDUM

FOR THE FIVE-YEAR REVIEW

Silver Bow Creek/Butte Area NPL Site
Butte, Montana

Work Assignment No.: 337-FRFE-0822

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Acronyms

ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
BPSOU	Butte Priority Soils Operable Unit
BRES	Butte Reclamation Evaluation System
BSBC	Butte-Silver Bow County
CD	consent decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cfs	cubic feet per second
CWL	critical water level
cy	cubic yard
DEQ	Montana Department of Environmental Quality
EPA	United States Environmental Protection Agency
ESD	explanation of significant differences
IC	institutional control
LAO	Lower Area One
MCE	maximum credible earthquake
mg/kg	milligrams per kilogram
MSD	Metro Storm Drain
NCP	National Contingency Plan
NPL	National Priorities List
NTU	nephelometric turbidity units
OU	operable unit
PMF	probable maximum flood
ppm	parts per million
PRP	potentially responsible party
ROD	record of decision
Site	Butte/Silver Bow Creek National Priorities List site
SST OU	Streamside Tailings Operable Unit
TBC	to be considered
TI	technical impracticability (zone)

Section 1

Introduction

This technical memorandum summarizes the evaluation of the applicable or relevant and appropriate requirements (ARARs) conducted as part of the 5-year review for the Butte/Silver Bow Creek National Priorities List (NPL) site (Site). This work is being done for Work Assignment No. 337-FRFE-0822 under U.S. Environmental Protection Agency (EPA) Contract No. EP-W-05-49. The five-year review for the Site includes the following operable units (OUs):

- Warm Springs Ponds Active (OU 4) and Inactive (OU 12) operable units
- Rocker (OU 7)
- Butte Mine Flooding (OU 3)
- Streamside Tailings (OU 1)
- Butte Priority Soils (OU 8)

1.1 ARARs Review Overview and Background

The purpose of the ARARs review is to determine whether regulations, laws, or criteria identified in the decision documents for the various OUs at the Site have been updated or changed, and whether these changes alter the protectiveness of the selected remedy for the Site. The ARARs reviewed during this process were established in the record of decision (ROD) for each OU. Changes to the Warm Springs Pond Active OU 4 ARARs were also identified in an explanation of significant differences (ESD).

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that onsite remedial actions attain or waive federal environmental ARARs, or more stringent state environmental ARARs, upon completion of the remedial action. The preamble to the National Contingency Plan (NCP) states that remedy selection, including ARAR identification, will not be re-evaluated unless new or modified requirements call into question the protectiveness of the selected remedy.

Response actions under CERCLA are exempted by law from the need to obtain federal, state, or local permits for any activities conducted completely on site. However, response actions must still meet the substantive requirements of regulations that are specified in the Site ARARs unless waived.

1.2 ARARs Review Guidance (EPA 2001)

The purpose of the ARARs review is to evaluate whether changes or updates to the laws, regulations, and criteria identified in the RODs will affect the protectiveness of

the selected remedy. Cleanup levels or actions may be based on ARARs as opposed to site-specific risk-based values.

In the NCP, the regulations require ARARs to be kept the same as of the date of the ROD and not reopen remedy selection decisions contained in RODs (i.e., ARARs are normally frozen at the time of ROD signature) unless a new or modified requirement calls into question the protectiveness of the selected remedy. 55 FR 8757 (March 8, 1990). The NCP preamble states that “a policy of freezing ARARs at the time of ROD signing will not sacrifice protection of human health and the environment because the remedy will be reviewed for protectiveness every 5 years, considering new or modified requirements at that point, or more frequently, if there is reason to believe that the remedy is no longer protective of health and environment.” 55 FR 8758 (March 8, 1990). The preamble also states that a remedy would not necessarily need to be modified solely to attain a newly promulgated or modified requirement, but that “newly promulgated or modified requirements contribute to [the] evaluation of protectiveness.” 55 FR 8758 (March 8, 1990).

Generally, the ARARs review will consider changes in standards that were identified as ARARs in the ROD, newly promulgated standards for chemicals of potential concern, and to be considered documents (TBCs) identified in the ROD that bear on the protectiveness of the remedy.

The purpose of this memorandum is to summarize the ARARs for the OUs included in the 5-year review, and any changes to the ARARs since the time of the last five-year review. Evaluation of the effects of these changes on the protectiveness of the remedy for each OU will be included in the full 5-year review report.

Section 2

Selected Remedy Summaries

2.1 Location and Setting

The Site begins around the City of Butte, Montana. The urban center of “Uptown” Butte, Montana, is located on the Butte Hill, which is widely referred to as the “Richest Hill on Earth”. The Butte Hill lies just west of the Continental Divide at the head of Silver Bow Creek and the Clark Fork River watershed. Historically, metal mines and ore processing facilities on the Butte Hill produced globally significant quantities of copper, lead, zinc, molybdenum, gold, and silver. Throughout much of the 20th century, the Butte Mining District was the largest producer of copper in North America. Large scale mining in Butte as well as the operation of silver mills and copper and zinc concentrators/smelters has resulted in the generation of tremendous volumes of mining-related waste including waste rock, mill tailings, slag, and aerial smelter emissions. Historically, Silver Bow Creek was used to impound smelter tailings and to convey wastes out of Butte. Mining wastes carried from Butte have impacted water quality throughout the entire length of Silver Bow Creek and the upper Clark Fork River between Butte and Missoula, Montana. The Silver Bow Creek/Butte Area Superfund Site includes the urban uptown part of the City of Butte (the Butte Hill), the underground mines beneath the Butte Hill, the Berkeley Pit, the mining area associated with the historic Berkeley Pit operation and the active Continental Pit operation, the entire reach of Silver Bow Creek between Butte and Warm Springs, Montana, and the Warm Springs treatment ponds. The Site encompasses approximately 85 square miles.

Summaries of the ROD and/or consent decree (CD) requirements are provided in the following sections for each OU. Table 1 accompanies this text and presents a summary of the ARARs for the OUs.

2.2 Warm Springs Ponds Active and Inactive OUs

Table 1 presents the summary of ARARs for each of the OUs, as presented in the Active Unit ROD (EPA 1990) and ESD (EPA 1991), and the Inactive Area ROD (EPA 1992). A summary of the selected remedy from the RODs for these OUs is presented below:

2.2.1 Active Area OU

- Allow the ponds to remain in place; Ponds 3 and 2 will continue to function as treatment ponds until upstream sources of contamination are cleaned up and standards can be met without treatment.

- Raise and strengthen all pond berms according to specified criteria, which will protect against dam failure in the event of major earthquakes or floods, and increase the storage capacity of Pond 3 to receive and treat flows up to the 100-year flood.

- Construct new inlet and hydraulic structures to prevent debris from plugging the Pond 3 inlet and to safely route flows in excess of the 100-year flood around the ponds.
- Comprehensively upgrade the treatment capability of Ponds 2 and 3 to fully treat all flows up to 3,300 cubic feet per second (cfs) (100-year peak discharge) and construct spillways for routing excess flood water into the bypass channel.
- Remove remaining tailings and contaminated soils from the Mill-Willow Bypass, consolidate them over existing dry tailings and contaminated soils within the Pond 1 and Pond 3 berms, and provide adequate cover material which will be revegetated.
- Reconstruct the Mill-Willow Bypass channel and armor the north-south berms of all ponds to safely route flows up to 70,000 cfs (one half of the estimated probable maximum flood[PMF]).
- Flood (wet-close) all dry portions of Pond 2.
- Establish surface and ground water quality monitoring systems and perform all other activities necessary to ensure compliance with all ARARs.
- Implement institutional controls (ICs) to prevent future residential development, to prevent swimming, and to prevent consumption of fish by humans.
- Defer, for not more than one year after the effective date of the ROD, decisions concerning the remediation of contaminated soils, tailings, and groundwater in the area below Pond 1, pending evaluation of various wet- and dry-closure alternatives and public review.

2.2.2 Inactive Area OU

- Remove all tailings and contaminated soils from the adjacent portion of the bypass channel and from the area below Pond 1 not planned for wet-closure. Consolidate the wastes over existing dry tailings within the western portion of Pond 1.
- Modify, or enlarge if necessary, the adjacent portion of the bypass channel to safely route flood flows up to 70,000 cfs, which is one-half the estimated PMF for the combined flows of Silver Bow, Willow, and Mill Creeks. Soils and gravels that have copper concentrations below 500 milligrams per kilogram (mg/kg) and meet geotechnical requirements will be used for raising and strengthening the existing berms and constructing new berms.
- Raise, strengthen, and armor with soil cement the north-south aspect of the Pond 1 berm. In accordance with specified state safety standards for high hazard dams and for the protection of human health and the environment, the reconstructed berm must withstand the estimated maximum credible earthquake (MCE) for this area.

In addition, the reinforced berm must be constructed to withstand flood flows up to 70,000 cfs (0.5 PMF) in the enlarged bypass channel.

- Stabilize the east-west aspect of the Pond 1 berm. The reconstructed berm must withstand a MCE for this area, thus protecting against the movement of contained pond bottom sediments or tailings into the uncontaminated or wet-closed areas below Pond 1 in accordance with specified state dam safety standards, and for the protection of human health and the environment.
- Extend and armor the north-south aspect of the Pond 1 berm approximately 2,400 feet in a north-northeasterly direction. This extended berm will be constructed to provide MCE protection and the ability to withstand one-half the estimated PMF (70,000 cfs) in the adjacent bypass channel.
- Relocate the lowermost portion of the bypass channel and convert the present channel into a groundwater interception trench. The relatively straight reach of the bypass channel, from the apex of the existing Pond 1 berm to the historic Silver Bow Creek channel, will be relocated north of the extended berm. The entire reach of the bypass channel that is adjacent to the inactive area will be reconstructed, reclaimed, and restored to a more natural, meandering condition. Other excavated areas will be reclaimed and restored to their natural condition.
- The converted groundwater interception trench will be deepened and pumps will be installed to allow for a pump-back system. Intercepted water that fails to meet specified standards will be pumped back to the active area for treatment. Monitoring wells and surface water quality monitoring stations will be placed at strategic locations.
- Construct wet-closure berms to enclose the submerged and partially submerged tailings and contaminated soils. Within the eastern portion of Pond 1 and along the historic Silver Bow Creek channel below Pond 1, these smaller berms will create a series of cells, which when flooded will vary in depth from a minimum of 1 foot to a maximum of 6 feet.
- Chemically fix (immobilize) the tailings and contaminated soils, now enclosed by smaller berms, by incorporating lime and lime slurry onto or into them.
- Flood the wet-closure cells with water adjusted to a pH greater than 8.5 and maintain proper water surface elevations in the wet-closure cells.
- Cover the dry tailings and contaminated soils within the western portion of Pond 1 with 2 inches of limestone, 12 inches of fill, and 6 inches of a suitable soil cap. This dry-closed area will be contoured to control runoff and seeded with native vegetation.
- Construct a runoff interception system along the east side of the inactive area. This system will prevent floods originating in the eastern hills from entering the wet-

closure cells. It will be designed to intercept one-half of the PMF, which is estimated to be 8,500 cfs at its peak. A collection system or other engineered solution will be constructed to prevent excessive sediments from entering the Clark Fork River immediately below.

- Install toe drains along the armored berms and construct a collection manifold for both the active and inactive areas. The water collected will be pumped to the active area for treatment if it exceeds final point discharge standards specified in Attachment 5 to the Warm Springs Ponds Active Area unilateral administrative order.
- Implement long-term ecological monitoring. By means of an unbiased set of measurements, this monitoring effort will concentrate on the effects of biological systems living in contact with metals in the water and substrate of ponds and wetlands environments. The results will validate or invalidate the decision to chemically fix, wet-close and contain in place the exposed and submerged tailings and contaminated soils.
- Implement ICs to prevent residential development, swimming, domestic well construction, and disruption of dry-closure caps.

2.3 Rocker Operable Unit

Table 1 presents the summary of ARARs for the Rocker OU, as presented in the ROD (EPA 1995b). A summary of the selected remedy from the ROD is presented below:

- Excavate and treat arsenic-contaminated soils above 1,000 parts per million (ppm).
- Dispose of treated soils in an onsite repository.
- Cover arsenic-contaminated soils ranging from 380 ppm to 1,000 ppm remaining on site with 18 inches of clean soil and revegetate.
- Treat contaminated groundwater and rely on natural attenuation to achieve cleanup standards.
- Construct an expanded capacity water supply system for the community.
- Monitor and demonstrate that the requirements of the ROD have been met. Return the groundwater resource to the community and provide operation and maintenance of the repository and soil covers.
- Implement ICs to ensure non-residential use of the OU and prevent domestic groundwater use until cleanup is achieved.

2.4 Butte Mine Flooding Operable Unit

Table 1 presents the summary of ARARs for the Butte Mine Flooding OU, as presented in the ROD (EPA 1994). A summary of the selected remedy from the ROD is presented below:

- Intercept and treat all surface water from the Horseshoe Bend area using a high density lime precipitation treatment system. Recycle the treated water back into the Montana Resources mining operations or discharge into Silver Bow Creek.
- Keep the water level in the Berkeley Pit system below the critical water level (CWL) (5,410 feet) through pumping, treatment, and discharge to Silver Bow Creek (or use for some other beneficial uses).
- Track the elevations and quality of water inflows into the Berkeley Pit and West Camp systems against the CWL for both the Berkeley Pit and the West Camp. Update this information annually and use in models of the Berkeley Pit and West Camp to provide EPA and Montana Department of Environmental Quality (DEQ) with a projected date at which the CWLs will be met. The effectiveness of this monitoring plan is reviewed every 3 years by EPA and DEQ.
- Produce a focused feasibility study 24 months before mine closure or before the Berkeley Pit reaches the CWL. At that time, EPA will evaluate information about all existing and emerging technologies to select a final treatment technology for the Berkeley Pit water prior to discharge of this water into Silver Bow Creek. This treatment technology will treat the Berkeley Pit water to Montana and other pertinent water quality standards.
- Institute a long-term, comprehensive monitoring program.
- Implement an IC program to restrict use of contaminated groundwater (the Butte Alluvial and Bedrock Controlled Groundwater Area was established in 2009, which combines the Mine Flooding and Priority Soils OUs aquifers into one administrative unit - BSBC 2009) has been established.
- Create and implement a public education program to inform the public on the progress of the Mine Flooding project.

The ESD (USEPA 2002) modifies the selected remedy ROD in the following ways:

- It adds more stringent contaminant requirements for the water discharge from the treatment plant. The cadmium standard was the most important standard made more stringent by the ESD because of a post-ROD change in water quality standards by the State of Montana.
- It acknowledges DEQ's primary responsibility for the active mine area and the Yankee Doodle Tailings Pond and EPA's responsibility for the sludge repository.

- It acknowledges EPA's prior decision to send West Camp contaminated water into the Butte Priority Soils Operable Unit (BPSOU) as long as it can be handled effectively there.
- It notes that a full feasibility-study-level examination of different treatment options for the mine flooding water is no longer required.
- It allows stormwater from uptown Butte to be diverted to the Berkeley Pit and sludge from the Horseshoe Bend treatment plant to go to Berkeley Pit.

2.5 Streamside Tailings Operable Unit

Table 1 presents the summary of ARARs for the Streamside Tailings OU (SST OU), as presented in the ROD (EPA 1995a). A summary of the selected remedy from the ROD is presented below:

- Remove tailings/impacted soils from the floodplain where (a) they are saturated by groundwater, (b) in-place treatment would not be effective due to thickness of tailings or lack of buffer material between the tailings and groundwater, or (3) treated tailings/impacted soils could be eroded into Silver Bow Creek. Place excavated tailings/impacted soils in mine waste relocation repositories outside of the floodplain or transport to the Opportunity Ponds disposal area.
- Remove fine-grained in-stream sediments from depositional areas and place in repositories with excavated tailings/impacted soils. After removal of contaminated in-stream sediments, reconstruct the channel bed and streambank.
- Excavate, treat, and/or cap all contaminated railroad materials that pose a risk to human health or the environment. Placed excavated railroad materials in the repositories.
- No separate remedial action is planned for groundwater or surface water. Remedial activities for SST OU tailings/impacted soils and for sources of contaminants upstream or off site under other cleanup actions are expected to reduce contaminant releases to groundwater and surface water with the goal of ultimately attaining state water quality standards.
- The ROD called for an ICs program which will be coordinated through a joint effort of the Butte-Silver Bow and Anaconda-Deer Lodge local governments.

The ESD presented the following nine changes from the remedy described in the ROD (DEQ 1998):

- An increase in the volume of tailings/impacted soil in the SST OU.
- Modifications to the alignment of Silver Bow Creek and the channel profile (i.e., elevation profile).

- Use of a temporary stream diversion during and after construction to facilitate dewatering and excavation of near-stream tailings and to enhance floodplain and streambank revegetation efforts.
- Changes in the criteria for instream sediment removal as a result of other design changes.
- Modifications to the mine waste relocation repository design.
- The inclusion of sediment basins to contain contaminated overland flow run-on from offsite mine waste sources.
- Elimination of treatment wetlands as the end land use in Subarea 1.
- Changes in the estimated schedule to implement the SST OU remedy.
- An increase in the estimated cost of the SST OU remedy.

2.6 Butte Priority Soils Operable Unit

Table 1 presents the summary of ARARs for the BPSOU, as presented in the ROD (EPA 2006). A summary of the selected remedy from the ROD is presented below:

The selected remedy includes components to address contaminated solid media (mine waste, soil, and residential soil and dust), surface water (base flow and stormwater runoff), and alluvial groundwater. The selected remedy for these media is summarized in the subsections that follow.

2.6.1 Solid Media

Residential Contamination. EPA’s action levels for residential, commercial/ industrial, and recreational soils and dust are:

Contaminant of Concern	Exposure Scenario	Concentration
Lead	Residential	1,200 mg/kg
	Non-residential	2,300 mg/kg
Arsenic	Residential	250 mg/kg
	Commercial	500 mg/kg
	Recreational	1,000 mg/kg
Mercury	Residential	147 mg/kg
	Residential (vapor)	0.43 micrograms per cubic meter

The selected remedy requires residential areas above these action levels, in yards or in indoor dust in living spaces, be remediated if a pathway exists. The selected remedy calls for a Residential Metals Abatement Program similar to the current Lead

Intervention and Abatement Program administered by the Butte-Silver Bow County (BSBC) Health Department. The Residential Metals Abatement Program will expand the current Lead Intervention and Abatement Program to include arsenic and mercury. The expansion of this program in the selected remedy requires that all residential properties within the BPSOU must be sampled, assessed, and abated if action levels are exceeded, within a reasonable time frame, for arsenic, lead, and mercury. Abatement includes cleaning up yard soils, indoor dust, and attic dust. Abatement can be done through the existing program and can be integrated with the established comprehensive abatement components of the existing program.

Non-Residential Contamination. Contaminated solid media located in non-residential areas at the BPSOU site include waste rock piles, smelter wastes, milling wastes, and contaminated soils. Solid media in non-residential areas including commercial areas, open areas, non-active mining areas, etc. may exceed action levels. These areas may also pose a threat to the environment as a result of stormwater runoff. For example, runoff from these areas is a source of copper and zinc loading to receiving waters. Contaminated solid media shall be addressed through a combination of source removal, capping, and land reclamation.

Reclaimed areas, including cover soil caps, must achieve the performance standards described by EPA in the Butte Reclamation Evaluation System (BRES), which is attached to the ROD as Appendix E. The BRES is a site-specific tool to evaluate the stability, integrity, and degree of human and environmental protectiveness afforded by EPA-sanctioned response actions or other past reclamation action initiated on lands impacted by mining within the OU. The information obtained from the evaluation will be used to assure that completed response actions both past and future are effective, are meeting established performance standards, and are maintained to protect human health and the environment.

The BPSOU ROD then provides more specific direction regarding remediation of different categories of contaminated solid media and specific source areas. Those details will not be summarized here.

2.6.2 Groundwater

Under the selected remedy, buried and partially saturated wastes in the Metro Storm Drain (MSD) and Lower Area One (LAO) areas will be left in place with appropriate groundwater monitoring and ICs. This will provide a continued understanding of the extent of groundwater contamination and long-term protection of human health and surface water resources. The contaminated alluvial groundwater in the MSD and in LAO will be captured and routed to a lime treatment facility for treatment and discharge to Silver Bow Creek. The groundwater collection and treatment system has and will significantly reduce the loading of metals to Silver Bow Creek. The groundwater remedy will provide the level of protection of Silver Bow Creek needed to achieve remedial action objectives during non-wet weather (base flow) conditions.

Under the selected remedy, groundwater captured in the interception and collection systems at LAO and MSD will be combined with contaminated base flow from Missoula Gulch and the groundwater from the West Camp bedrock system of the Mine Flooding OU for combined treatment in the Butte Treatment Lagoons (a lime treatment facility) and discharged to Silver Bow Creek. The treatment facility will be evaluated and possibly re-designed or modified during remedial design. If monitoring data demonstrate that the existing system is not effectively capturing the contaminated groundwater, contaminated groundwater is leaving the site, or the system is not otherwise effective, additional groundwater capture systems and/or extraction wells will be implemented to ensure full effectiveness of the system.

The ROD waived groundwater quality ARARs for the alluvial aquifer at BPSOU. A controlled groundwater area (the Butte Alluvial and Bedrock Controlled Groundwater Area – BSBC 2009) has been established to prevent domestic use of this water and to prevent any well development that would exacerbate or spread existing contamination.

2.6.3 Surface Water

The selected remedy for surface water is directed at achieving the primary objectives of returning Silver Bow Creek to its beneficial uses and protecting downstream receptors from releases of contamination from BPSOU. The selected remedy for surface water consists of the following components:

1. The Surface Water Management Program, which utilizes best management practices (BMPs) to address contaminated storm water runoff and improve storm water quality. The BMPs that will be implemented include, but are not limited to, source controls including waste removal, engineered sediment controls, curb and gutters, subsurface drains, detention/retention basins, and routing storm flows away from receiving waters.
2. Excavation and removal to a repository of contaminated sediments from the stream bed, banks, and adjacent floodplain along Blacktail Creek and Silver Bow Creek, from just above the confluence of Blacktail Creek and MSD to the beginning of the reconstructed Silver Bow Creek floodplain at LAO. Following removal of the instream sediments, further evaluation of surface water quality in this area will be conducted. If groundwater inflow is found to adversely affect surface water quality, additional hydraulic controls and groundwater capture shall be implemented.
3. Capturing and treating storm water runoff up to a specified maximum storm event, if BMPs implemented under the Surface Water Management Program do not achieve the goal of meeting surface water standards in Silver Bow Creek, Grove Gulch, and Blacktail Creek during storm water events.

4. Hydraulic control, capture, and treatment of contaminated groundwater to prevent its discharge to Silver Bow Creek surface water (as described above for groundwater).
5. Instream flow augmentation as appropriate. Flow augmentation will not be considered until the major remedial components described in this ROD are designed and implemented.

2.6.4 Institutional Controls

The selected remedy includes the following minimum ICs:

1. A controlled groundwater area will be established in the alluvial aquifer technical impracticability (TI) zone to prevent domestic use of contaminated water, exacerbation or spreading of existing contamination, or release of highly contaminated groundwater to surface water resources through irrigation.
2. County zoning and permit requirements will be implemented to ensure that capped waste areas, discrete areas of waste left in place, and other control measures such as storm water controls are not disturbed, mismanaged, or inappropriately developed and that waste taken from these areas is disposed of at the Butte Mine Waste Repository or, if identified as a hazardous waste, at a Resource Conservation and Recovery Act C facility. These controls and permits are best implemented with adequate funding for appropriate redevelopment and re-use of affected sites.
3. Notices will be placed with property deeds for all areas where wastes were capped and left in place or where engineered controls were constructed or other discrete wastes were left in place. The deed notices will notify current and subsequent landowners of the presence of these wastes or engineered controls and ensure that these wastes are not disturbed. In addition, fencing and signs may be required to ensure the integrity of caps and engineered controls.
4. Where private landowners require fencing or use posting for legitimate reasons relating to the prevention of remedy disruption, the selected remedy requires the installation of these fences or signs.

2.6.5 Operations and Maintenance

The selected remedy requires the development of long-term and integrated comprehensive monitoring and operation and maintenance plans for all aspects of the selected remedy.

Section 3

Changes to ARARs

Table 2 summarizes changes to water quality standards identified as ARARs. The most significant change noted during this review was a lowering of the arsenic human health-based standard for arsenic in surface water and groundwater under the State of Montana water quality standards (Circular DEQ-7, published in 2008). This lowering of the arsenic standard brings the state human health-based standards in line with the federal maximum contaminant limit (MCL) for arsenic. This change in water quality standards applies to all OUs included in this Five-Year Review.

In December 2009, EPA published a final rule aimed at reducing pollution from construction and development sites (EPA 2009, 2010). Effective February 2010, the rule imposes an enforceable numeric turbidity limit of 280 nephelometric turbidity units (NTU) on storm water discharges from large construction and development sites. The final rule requires permittees to collect samples of storm water discharges and to comply with the numeric turbidity limitation. For construction activity that disturbs 20 or more acres of land at one time, the rule is phased in over 18 months (by August 1, 2011). For construction disturbances greater than 10 acres, the rule is phased in over 4 years (by February 2, 2014). The rule includes non-contiguous land disturbances that take place at the same time and are part of a larger common plan of development or sale. This change applies to all OUs included in this Five-Year Review.

In addition to the standards identified above, several ARARs have been modified or repealed since the time of the ROD. However, these changes are not anticipated to have significant impacts on remedy protectiveness.

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Section 4

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				Warm Springs Ponds - Active OU 4	Warm Springs Ponds - Inactive OU 12	Rocker OU 7	Butte Mine Flooding OU 3	Streamside Tailings OU 1	Butte Priority Soils OU 8	
Federal ARARs										
Groundwater										
40 CFR § 141		Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs)	Contaminant	R&A - Waiver for Mercury and Arsenic	R&A - Waiver for Mercury and Arsenic	R&A	R&A (Outside of TI Waiver Area)	R&A	R&A (Outside of TI Waiver Area)	
40 CFR § 264, Subpart F		Resource Conservation and Recovery Act - Releases from Solid Waste Management Units	Contaminant	R&A	R&A	R&A				
Air										
40 CFR § 50.12		Clean Air Act - National Primary and Secondary Air Quality Standards for Lead	Contaminant	A	A		A			Standard is 1.5 micrograms per cubic meter (ug/m ³) (90-day average)
40 CFR § 50.6		Clean Air Act - National Primary and Secondary Air Quality Standards for PM10	Contaminant	A	A		A			Standard is 150 ug/m ³ (24-hour average), 50 ug/m ³ (annual average)
Surface Water										
40 CFR § 122 and 125		National Pollutant Discharge Elimination System (NPDES) Stormwater Regulations - General Conditions and Industrial Conditions	Contaminant						A	
29 CFR §§ 1910.1000, 1910.1018(c), and 1910.1025(c),		Occupational Safety and Health Requirements	Contaminant	A						
16 USC §§ 661 et seq		Fish and Wildlife Coordination Act	Location	A	A	A	A	A	A	
16 USC §§ 1531-1543; 50 CFR § 402		Endangered Species Act	Location	A	A	A	A	A	A	
16 USC § 470; 36 CFR § 800		National Historic Preservation Act	Location	A	A	A	A	A	A	
16 USC § 469		Archaeological and Historical Preservation Act	Location	A	A	A	A	A	A	
36 CFR § 62.6		Historic Sites, Buildings, and Antiquities Act	Location			A	A	A	A	
16 USC §§ 703 et seq.		Migratory Bird Treaty Act	Location			A	A	A	A	
17 USC §§ 668 et seq.		Bald Eagle Protection Act	Location			A	A	A	A	
25 USC § 3001		Native American Grave Protection and Repatriation Act	Location						A	
43 CFR §§10.1 - 10.17		Native American Grave Protection and Repatriation Act	Location						A	
40 CFR § 264.18 (a) and (b)		Resource Conservation and Recovery Act (RCRA) (Requirements for Siting Repositories)	Location	A	A	A - Treatment R&A - Re-Disposal	A	R&A	R&A	
Executive Order 11,988		Floodplain Management Order	Location	A	A	A	A	A	A	
Executive Order 11,990		Protection of Wetlands Order	Location	A	A	A	A	A	A	
40 CFR 230		Section 404(b)(1) guidelines for Specifications of Disposal Sites for Dredged Material	Location			A		A		
40 CFR § 257.3		Criteria for Classification of Solid Waste Disposal Facilities and Practices	Action			A	A	A	A	
40 CFR § 258, Subparts B, C, D, E, and F		Criteria for Municipal Solid Waste Landfills	Action				A			
40 CFR § 50.12		Clean Air Act - National Primary and Secondary Air Quality Standards for Lead	Action			A	A	A	A	Standard is 1.5 ug/m ³ (90-day average)
40 CFR § 50.6		Clean Air Act - National Primary and Secondary Air Quality Standards for PM10	Action			A	A	A	A	Standard is 150 ug/m ³ (24-hour average), 50 ug/m ³ (annual average)
40 CFR §§ 61.145 and 150		National Emission Standards for Hazardous Air Pollutants - Asbestos Demolition and Waste Disposal	Action			A				
30 CFR § 816		Permanent Program Performance Standards - Surface Mining Activities	Action	R&A	R&A	R&A		R&A	R&A	
30 CFR § 784		Underground Mining Permit Applications - Minimum Requirements for Operating and Reclamation Plan	Action			R&A		R&A	R&A	
40 CFR § 230		Section 404(b)(1) guidelines for Specifications of Disposal Sites for Dredged Material	Action	A	A	A		A	A	

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				Warm Springs Ponds - Active OU 4	Warm Springs Ponds - Inactive OU 12	Rocker OU 7	Butte Mine Flooding OU 3	Streamside Tailings OU 1	Butte Priority Soils OU 8	
40 CFR § 231		Section 404(C) Procedures	Action	A	A					
33 CFR §§ 323 and 330		Permits for Discharges of Dredged or Fill Material into Waters of the U.S.; National Permit Program	Action	A	A					
40 CFR §121, 122, and 125		Clean Water Act - General Conditions and Industrial Activity Conditions	Action	A		A		A	A	40 CFR § 450 promulgated December 2009. Effective February 1, 2010, the New Source Performance Standards include a numeric limit for turbidity of 280 NTU for discharge from construction activity disturbances (phased in over 18 months for 20+ acres, or 4 years for 10+ acres)
40 CFR § 440		Ore Mining and Dressing Point Sources	Action				A	A		
40 CFR § 440.104		Effluent Limits under New Source Performance Standards	Action	A			A			
40 CFR § 144		Underground Injection Control	Action			A	A	A	A	
		RCRA								
40 CFR §264.97		Groundwater Monitoring Requirements (Only contaminants in the ROD monitored)	Action	R&A	A					
40 CFR § 264.111		Closure Performance Standards	Action	R&A	A					
40 CFR § 264.116 and .119;		Requirements for Notice and Deed Restrictions								
40 CFR 264.228(a)(2)(i);		Dewatering of Wastes Prior to Disposal	Action	R&A	R&A	R&A	R&A	R&A	R&A	
40 CFR 264.228(a)(2)(iii)(B), (C) and (D) and .251(C), (D), and (Run-on and Run-off Controls								
40 CFR §§ 257.3-1(a), 257.3-2 through 257.3-4		Classification Criteria for Solid Waste Disposal Facilities	Action	R&A	A					
40 CFR § 262		Standards Applicable to Generators of Hazardous Waste	Action			A				
40 CFR § 263		Standards Applicable to Transporters of Hazardous Waste	Action			A	A	A	A	
40 CFR §§ 264.170 - 178		RCRA - Use and Management of Containers	Action			A				
40 CFR § 264.221 (f), (g), and (h)		RCRA - Design and Operating Requirements for Surface Impoundments	Action	R&A	A					
40 CFR § 264.226		RCRA - Design and Operating Requirements for Surface Impoundments - Monitoring and Inspection	Action	R&A						
40 CFR §§ 264.600-603		RCRA - Miscellaneous Treatment, Storage, and Disposal Units	Action			A				
40 CFR §§ 265.400-406		RCRA - Chemical, Physical, and Biological Treatment	Action			A				
40 CFR §§ 264.250 - 259		RCRA - Waste Piles	Action			A				
29 CFR § 1926 20 CFR §§ 1910.120 and 1910.132		Occupational Safety and Health Administration Worker Protection	Action	A						
State ARARs										
Surface Water										
MCA §§ 75-5-101 et seq.		Montana Water Quality Act								
ARM 17.30.607(1)	ARM 16.20.604(1)	Silver Bow Creek (Mainstem) from Blacktail Creek to Warm Springs Creek is classified "I" for water use Clark Fork River from Warm Springs Creek to Cottonwood Creek is classified "C-2" Other waters within the Clark Fork Drainage are classified "B-1"	Contaminant	A (Arsenic and Mercury Waiver)	A	A	A	A	A	
ARM 17.30.627	ARM 16.20.622	"C-2" Classification Standards	Contaminant	A	A					
ARM 17.30.623		"B-1" Classification Standards	Contaminant		A				A	
ARM 17.30.628	ARM 16.20.623	"I" Classification Standards	Contaminant			A	A	A	A	
ARM 17.30.637	ARM 16.20.633	General Prohibitions on Discharges	Contaminant				A	A	A	

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ARM 17.30.705		Non-Degradation of Surface Water Quality	Contaminant						A	
ARM 17.30.1203	ARM 16.20.925	Incorporation of 40 CFR 125 standards for technology-based treatment requirements in MPDES permits	Contaminant			A	A	A	A	
ARM 17.30.1342 - 1344		MPDES Permit Requirements	Contaminant						A	
ARM 17.30.601; ARM 17.30.1101 et seq.; ARM 17.30.1301		MDEQ General Stormwater Permits	Contaminant						A	
MCA §§ 75-5-605		Prohibition on Causing Surface Water or Groundwater Pollution	Contaminant			A	A	A	A	
Groundwater										
MCA § 85-2-505		Groundwater Act - Construction and Maintenance of Groundwater Monitoring Wells	Contaminant	A						
ARM 17.30.1006 (REVISED IN 2006)	ARM 16.20.1002; ARM 16.20.1003	Classification of Groundwater into Classes I through IV Based on Beneficial Uses, and Establish Standards (standards not applicable within TI Waiver area)	Contaminant		A	A	A	A	A	
ARM 17.30.1011	ARM 16.20.1011	Non-Degradation of Groundwater Quality	Contaminant	A	A		A	A	A	
Air										
ARM 17.8.222	ARM 16.8.815	Federally-Approved State Implementation Plan (SIP) of Lead Air Quality Standards	Contaminant	A	A	A	A	A	A	Standard is 1.5 ug/m ³ (90-day average)
ARM 17.8.223	ARM 16.8.821	Federally-Approved State Implementation Plan (SIP) of PM-10 Air Quality Standards	Contaminant	A	A	A	A	A	A	Standard is 150 ug/m ³ (24-hour average), 50 ug/m ³ (annual average)
ARM 17.8.604	ARM 16.8.1302	Open Burning Prohibitions	Contaminant		A					
ARM 17.8.308 (1) and (2)	ARM 16.8.1401 (1) and (2)	Control of Airborne Particulate Matter	Contaminant		A					
ARM 17.8.220	ARM 16.8.818	Standard for Settled Particulate Matter	Contaminant	A	A					Standard is 10 grams per square meter (g/m ²)
ARM 17.8.308 (3)	ARM 16.8.1401 (4)	Particulate Control Requirements Within Non-Attainment Areas	Contaminant	A	A					
ARM 17.8.308 (4)	ARM 16.8.1401 (3)	Road Dust Suppression	Contaminant	A						
ARM 17.8.304	ARM 16.8.1404	Visible Air Contaminants	Contaminant		A					
REPEALED	ARM 16.8.1427	Odor Control	Contaminant		A					
ARM 17.24.761		Air Resources Protection - Fugitive Dust	Contaminant		A					
17.74.102	ARM 16.42.102	Occupational Safety and Health - Arsenic and Lead Exposure Limits	Contaminant	R&A						
MCA §§ 75-10-201 et seq.	ARM 16.14.505	Solid Waste Management Regulations	Location		A	A	A	A	A	
MCA §§ 75-7-101 et seq.	ARM 36.2.404	Natural Streambed and Land Preservation Act	Location		A			A	A	
MCA § 75-7-102		Natural Streambed and Land Preservation Act - Soil Erosion and Sedimentation	Location	A						
MCA §§ 76-5-401 et seq.		Floodplain and Floodway Management Act	Location	A	A	A				
ARM 36.15.601, 602, and 701		Allowed Uses Within Floodway	Location			A		A	A	
ARM 36.15.604		Minimum Criteria for Permits	Location			A			A	
ARM 36.15.605 and 703		Prohibited Uses Within Floodway	Location			A		A	A	
ARM 36.15.606		Permits for Flood Control Works	Location	R&A	A					
ARM 36.15.801		Allowed Uses Where Floodway Not Designated - Wildlife Management and Natural Areas	Location	A						
ARM 36.15.216		Applicable Considerations in Use of a Floodway	Location			A		A	A	
ARM 36.15.601(2), 603, 606, 701(3)(c), 701(3)(d), 702(1), 702(2)		Specific Obstructions or Uses	Location			A		A	A	
ARM 17.54.702	ARM 16.44.702	Standards and Requirements for Permitted Facilities - REPEALED	Location	R&A						
MCA § 85-2-505		Groundwater Act - Construction and Maintenance of Groundwater Monitoring Wells	Action		A	A	A	A		
ARM 17.30.1011	ARM 16.20.1011	Non-Degradation of Groundwater Quality	Action			A			A	
MCA § 75-5-602		Water Quality Act - Discharges to publically owned treatment works	Action				A			

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MCA § 75-5-605		Water Quality Act - Prohibition on Pollution							A	
ARM 17.30.601; ARM 17.30.1101 et seq.; ARM 17.30.1301		MDEQ General Stormwater Permits	Action						A	
ARM 17.30.637	ARM 16.20.633	General Prohibitions on Discharges	Action	A						
ARM 17.30.641	ARM 16.20.635	Water Quality Sampling Methods	Action				A			
ARM 17.30.646	ARM 16.20.642	Bioassays - Tolerance Concentrations	Action				A			
ARM 17.30.705		Non-Degradation of Surface Water Quality	Action						A	
ARM 17.30.715		Criteria for Non-Significant Changes in Water Quality	Action						A	
ARM 17.30.1342 - 1344		MPDES Permit Requirements	Action						A	
ARM 17.38.101(3)	ARM 16.20.401(3)	Public Water Supply - Construction Standards	Action				A	A		
ARM 17.30.1101 et seq.	ARM 16.20.6012 et seq., ARM 16.20.1301 et seq., ARM 16.20.1314	Water Quality Act - Stormwater Discharges and General Permits	Action			A				
17.30.1322 and 1345	ARM 16.20.1310 and 1321	Best Management Practices and Monitoring	Action	A						
MCA §§ 75-2-101 et seq.		Montana Clean Air Act	Action				A	A		
ARM 17.8.214	ARM 16.8.814	Hydrogen Sulfide Ambient Air Standard	Action				A	A		Standard 0.05 ppm, not to exceed more than once per year
ARM 17.8.222	ARM 16.8.815	Lead Ambient Air Standard	Action				A	A		Standard is 1.5 ug/m ³ (90-day average)
ARM 17.8.223	ARM 16.8.821	PM-10 Ambient Air Quality Standard	Action				A	A		Standard is 150 ug/m ³ (24-hour average), 50 ug/m ³ (annual average)
ARM 17.8.604	ARM 16.8.1302	Open Burning Prohibitions	Action				A	A	A	
ARM 17.8.308 (1) and (2)	ARM 16.8.1401 (1) and (2)	Control of Airborne Particulate Matter	Action			A	A	A	A	
ARM 17.8.220	ARM 16.8.818	Standard for Settled Particulate Matter	Action			A	A	A		Standard is 10 g/m ²
ARM 17.8.308 (4)	ARM 16.8.1401 (4)	Particulate Control Requirements Within Non-Attainment Areas	Action			A	A	A		
ARM 17.8.304	ARM 16.8.1404	Visible Air Contaminants	Action			A				
REPEALED	ARM 16.8.1427	Odor Control				A	A	A		
ARM 17.24.761		Air Resources Protection - Fugitive Dust	Action	R&A	A	A	A	A	R&A	
ARM 17.8.715	ARM 16.8.1103	Emission Control Requirements - BACT and LAER	Action			A				
ARM 17.8.204	ARM 16.8.807	Ambient Air Monitoring Methods	Action				A			
ARM 17.8.206	ARM 16.8.809	Ambient Air Sampling, Data collection, Recording Methods	Action				A			
MCA §§ 75-10-201 et seq. ARM 16.14.500 et seq.		Solid Waste Management Act	Action				A			
MCA § 75-10-214		Solid Waste Disposal on Private Property	Action	A						
ARM 17.50.504	ARM 16.14.504	Disposal Facility Classifications	Action				A			
ARM 17.50.505	ARM 16.14.505	Standards for Solid Waste Management Facilities	Action	R&A		A	A	A	A	
ARM 17.50.506	ARM 16.14.506	Design Criteria for Landfills	Action			A	A		A	
ARM 17.50.510 and 511	ARM 16.14.520 and 521	General and Specific Operation and Maintenance Requirements	Action			A	A		A	
ARM 17.50.523	ARM 16.14.523	Transportation of Solid Waste	Action	R&A		A	A	A	A	
ARM 17.50.530 and 531	ARM 16.14.530 and 531	Closure and Post-Closure Care for Landfills	Action			A	A		A	
ARM 17.54.702	ARM 16.44.702	Standards and Requirements for Facilities - Hazardous Waste Management - REPEALED	Action	R&A	A					
ARM 17.54.701-703	ARM 16.44.701-703	Standards and Requirements for Facilities - Hazardous Waste Management - REPEALED	Action							
MCA §§ 85-15-101 et seq.		Montana Dam Safety Act	Action				A			
ARM 36.14.202		Dam Construction	Action	A			A			
ARM 36.14.501		High-Hazard Dam Criteria	Action	A	A		A			
ARM 36.14.502		High-Hazard Dam Inflow Flood Design	Action	A	A		A			
MCA §§ 82-4-201 et seq.		Montana Strip and Underground Mine Reclamation Act								
ARM 17.24.631	ARM 26.4.631	Mine Reclamation - General Hydrology Requirements	Action	R&A	R&A	R&A		R&A	R&A	

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ARM 17.24.633	ARM 26.4.633	Mine Reclamation - Water Quality Performance Standards	Action	R&A		R&A		R&A	R&A	
ARM 17.24.634	ARM 26.4.634	Reclamation of Drainage Basins	Action	R&A	R&A	R&A		R&A		
ARM 17.24.635 - 637	ARM 26.4.635 - 637	Temporary and Permanent Diversions	Action	R&A	R&A			R&A	R&A	
ARM 17.24.638	ARM 26.4.638	Sediment Control Measures	Action	R&A	R&A	R&A		R&A	R&A	
ARM 17.24.639		Sedimentation Pond Requirements	Action						R&A	
ARM 17.24.640	ARM 26.4.640	Discharge from Sedimentation Ponds	Action		R&A	R&A		R&A	R&A	
ARM 17.24.641	ARM 26.4.641	Acid- and Toxic-Forming Spoils	Action			R&A			R&A	
ARM 17.24.643		Groundwater Protection	Action						R&A	
ARM 17.24.644	ARM 26.4.644	Protection of Groundwater Resource	Action	R&A	R&A					
ARM 17.24.645		Groundwater Monitoring	Action						R&A	
ARM 17.24.646		Surface Water Monitoring	Action						R&A	
ARM 17.24.501 and 501A	ARM 26.4.501 and 501A	Backfilling and Grading Requirements	Action	R&A	R&A	R&A		R&A	R&A	
ARM 17.24.505		Burial of Acid- and Toxic-Forming Materials	Action	R&A					R&A	
ARM 17.24.514	ARM 26.4.514	Contouring - REPEALED				R&A		R&A		
ARM 17.24.519	ARM 26.4.519	Settlement Monitoring	Action			R&A		R&A	R&A	
ARM 17.24.702	ARM 26.4.702	Redistribution and Stockpiling of Soil	Action			R&A		R&A	R&A	
ARM 17.24.703	ARM 26.4.703	Materials Other Than Soil	Action	R&A		R&A		R&A	R&A	
ARM 17.24.711	ARM 26.4.711	Establishment of Vegetation	Action	R&A		R&A		R&A	R&A	
ARM 17.24.713	ARM 26.4.713	Seeding and Planting	Action	R&A		R&A		R&A	R&A	
ARM 17.24.714	ARM 26.4.714	Soil Stabilization	Action	R&A		R&A		R&A	R&A	
ARM 17.24.716	ARM 26.4.716	Revegetation	Action	R&A		R&A		R&A	R&A	
ARM 17.24.717	ARM 26.4.717	Planting of Trees and Shrubs	Action					R&A	R&A	
ARM 17.24.718	ARM 26.4.718	Soil Amendments	Action	R&A		R&A		R&A	R&A	
ARM 17.24.719		Livestock Grazing - REPEALED	Action	R&A						
ARM 17.24.721		Eradication of Rills and Gullies	Action	R&A					R&A	
ARM 17.24.723		Monitoring - Vegetation, Soils, Wildlife	Action						R&A	
ARM 17.24.724		Revegetation Success Criteria	Action	R&A					R&A	
ARM 17.24.726		Vegetation Measurements	Action	R&A					R&A	
ARM 17.24.728	ARM 26.4.728	Composition of Vegetation - REPEALED	Action	R&A		R&A		R&A	R&A	
ARM 17.24.733		Measurement for Trees, Shrubs - REPEALED	Action						R&A	
ARM 17.24.751	ARM 26.4.751	Protection and Enhancement of Fish, Wildlife, and Related Environmental Values	Action	R&A		R&A				

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Table 2
Summary of Water Quality Standards and Changes
Silver Bow Creek/Butte Area NPL Site

Water Quality Standards (2010)								(From 2005 5-year Review)						
Compound	Surface Water				Groundwater			Surface Water				Groundwater		
	State ⁽¹⁾		Federal ⁽²⁾		State	Federal ⁽³⁾		Federal			State	Federal		
	Aquatic Life - Acute (ug/L)	Aquatic Life - Chronic (ug/L)	Human Health Standard (ug/L)	CMC (Acute) ⁽⁴⁾ (ug/L)	CCC (Chronic) ⁽⁵⁾ (ug/L)	Human Health Standard (ug/L)	MCL (ug/L)	Aquatic Life - Acute (ug/L)	Aquatic Life - Chronic (ug/L)	Human Health Standard (ug/L)	CMC (Acute) (ug/L)	CMC (Chronic) (ug/L)	Human Health Standard	MCL (ug/L)
Aluminum	750	87	N/A	750	87	N/A	N/A	750	87	N/A	N/A	N/A	N/A	N/A
Arsenic	340	150	10	340	150	10	10	340	150	18	340	150	20	10
Cadmium	0.52*	0.097*	5	2***	0.25***	5	5	1.05**	0.16**	5	3****	0.33****	5	5
Chromium	N/A	N/A	100	N/A	N/A	100	100	N/A	N/A	100	N/A	N/A	100	100
Copper	3.79*	2.85*	1300	2.337#	1.45#	1300	1300	7.3**	5.2**	1300	19.7****	12.7****	1300	1300
Iron	N/A	1000	300 ^a	N/A	N/A	300 ^a	N/A	N/A	1000	300 ^a	N/A	N/A	300 ^a	N/A
Lead	13.98*	0.545*	15	65***	2.5***	15	15	82***	3.2***	15	100.1****	3.9****	15	15
Manganese	N/A	N/A	50 ^a	N/A	N/A	50 ^a	N/A	N/A	N/A	50 ^a	N/A	N/A	50 ^a	N/A
Mercury	1.7	0.91	0.05	1.4***	0.77***	2	2	1.7	0.91	0.05	N/A	N/A	2	2
Selenium	20	5	50	N/A	5	50	50	20	5	50	N/A	N/A	50	50
Silver	0.374*	N/A	100	3.2	N/A	100	N/A	4.1***	N/A	100	N/A	N/A	100	N/A
Zinc	37*	37*	2000	120***	120***	2000	N/A	67**	67**	2000	N/A	N/A	2000	N/A

Shaded cells indicate standards which have changed subsequent to the last five-year review
Note: Hardness-dependent values (cadmium, copper, lead, silver, and zinc) are equivalent between the 2004 WQB-7 and 2008 DEQ-7 documents. See notes below.

ug/L - micrograms per liter

* - Value indicated is for a hardness of 25 mg/L as CaCO₃.

** - Value indicated is for a hardness of 50 mg/L as CaCO₃.

*** - Value indicated is for a hardness of 100 mg/L as CaCO₃.

**** - Value indicated is for a hardness of 150 mg/L as CaCO₃.

Standards are hardness-dependent. Value indicated is for a hardness of 84.6 mg/L as CaCO₃. Source: <http://www.epa.gov/waterscience/criteria/copper/2007/criteria-full.pdf>

^a - Indicates value is a secondary maximum contaminant level (MCL) based on aesthetics (taste, odor, staining)

1. Montana Numeric Water Quality Standards - Circular DEQ-7. February 2008.

2. Current National Recommended Water Quality Criteria; U.S. Environmental Protection Agency; <http://www.epa.gov/waterscience/criteria/wqctable/#mm>

3. Safe Drinking Water Contaminants and Federal Maximum Contaminant Levels (MCLs); U.S. Environmental Protection Agency; <http://www.epa.gov/safewater/contaminants/index.html>

4. CMC – Criteria Maximum Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

5. CCC - Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.