SIXTH FIVE-YEAR REVIEW REPORT FOR IRON MOUNTAIN MINE SUPERFUND SITE SHASTA COUNTY, CALIFORNIA

PREPARED BY

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FOR

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Executive Summary

This is the sixth Five-Year Review (FYR) for the Iron Mountain Mine (IMM) Superfund Site (Site), located near Redding, California. The purpose of this FYR is to review information to determine if the interim remedies are, and will continue to be, protective of human health and the environment.

The Iron Mountain Mine was mined from the 1860's through 1963 for copper, gold, pyrite, silver, and zinc. Operations included open pit mining, adits and stoping inside Iron Mountain, milling, ore transportation via railroad and tramway, a cyanide leaching plant, cementation plants, ore roasting areas, and a smelter. Exposure of the mine workings, waste rock piles, and the open pit mine to oxygen and water have produced acid mine drainage (AMD) management issues. Numerous historical fish kills in the Sacramento River were attributed to AMD from the Main Mine Area. The Site was added to the National Priorities List in September 1983.

The interim remedies for the Site consist of a combination of source control, AMD collection and treatment, and water management components, including clean water diversions and coordinated releases of contaminated surface water from Spring Creek Debris Dam (SCDD) into dilution flows from Shasta Dam. The remedial action objective for the Site has been defined as eliminating the IMM discharges that are harmful to the environment in order to protect the Sacramento River ecosystem from releases of heavy metals and prevent adverse impacts on water quality and beneficial uses of the Sacramento River below Keswick Dam.

This FYR assessment found that the remedies implemented under RODs 1 through 5 are operating as intended and the operation and maintenance (O&M) at the Site has been satisfactory over the past 5 years. The interim remedial actions completed under RODs 1 through 4 have afforded substantial protection for the valuable Sacramento River ecosystem by eliminating 98 percent of the historical metals discharges from the Site since the issuing of ROD 1 in 1986. The interim remedial actions were designed to meet protective water quality criteria in the Sacramento River downstream of Keswick Dam, to the extent practicable. The results of water quality sampling performed between January 2013 and December 2017 indicate that Minnesota Flats Treatment Plant effluent substantially complied with Clean Water Act effluent limitations for copper, zinc, cadmium, and pH. Additionally, copper and zinc concentrations in the Sacramento River below Keswick Dam substantially complied with the *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* (Basin Plan) standards.

The remedial actions selected in RODs 1 through 5 are interim actions and leave some releases of hazardous substances unabated. EPA invoked a waiver of applicable or relevant and appropriate requirements (ARARs) for the "interim measures". The IMM interim remedy relies on the Bureau of Reclamation water management actions to provide for the safe release of the continuing IMM contaminant discharges from the Boulder Creek watershed, which are estimated to constitute less than 5 percent of the overall historical IMM discharges of copper and zinc. The Bureau of Reclamation water management actions are necessary to reduce the likelihood of uncontrolled spills and meet Basin Plan standards in the Sacramento River below Keswick Dam. EPA expects

exceedances of water quality standards downstream of Keswick Dam on the rare occasions when large early winter storms follow very dry summers. EPA did not intend the IMM interim remedies to meet water quality objectives in the immediate receiving waters. IMM interim access controls, security measures, governmental agreements, and governmental controls are effectively controlling potential human exposures and preventing adverse impacts on the integrity or protectiveness of the interim remedial measures implemented under RODs 1 through 5.

The interim remedial actions implemented at IMM, selected in RODs 1 through 4 for Operable Units (OUs) 1 through 4, are protective of human health and the environment. The remedy at OU 5 currently protects human health and the environment because the removal of contaminated sediment from Spring Creek Arm, and disposal of dredged sediment in the CDF adjacent to Spring Creek Reservoir, mitigates the risk of releasing contaminated sediment. However, in order for the remedy to be protective in the long-term, operational controls selected in ROD 5, including limited restrictions on the Keswick Reservoir water elevation to prevent mobilization of sediment remaining in Spring Creek Arm, need to be officially recorded to ensure protectiveness.

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List of Abbreviations

1980 MOU	*Memorandum of Understanding (MOU) to Implement Actions to Protect the Sacramento River System from Heavy Metal Pollution from Spring Creek and Adjacent Watersheds*
2000 Settlement	December 18, 2000 Consent Decree
µg/L	micrograms per liter
AIG	American International Group, Inc.
AMD	acid mine drainage
ARAR	applicable or relevant and appropriate requirement
Basin Plan	*The Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and San Joaquin River Basin*
BLM	Bureau of Land Management
CCR	California Code of Regulations
CDF	confined disposal facility
CDFW	California Department of Fish and Wildlife (formerly California Department of Fish and Game)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
Consent Decree	December 18, 2000 Consent Decree
CTR	California Toxics Rule
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ft^3/sec	cubic feet per second
FYR	Five-Year Review
FS	feasibility study
GLP	Global Loss Prevention, Inc. (formerly American International Group Consultants, Inc.)
HDS	high-density sludge
IMM	Iron Mountain Mine Superfund Site
IMMI	Iron Mountain Mines, Inc.
IMO	Iron Mountain Operations
mg/L	milligrams per liter

msl	mean sea level
MFTP	Minnesota Flats Treatment Plant
MOU	1980 Memorandum of Understanding, *Memorandum of Understanding (MOU) to Implement Actions to Protect the Sacramento River System from Heavy Metal Pollution from Spring Creek and Adjacent Watersheds*
NOAA Fisheries	National Oceanic and Atmospheric Administration Marine Fisheries Service
OHV	off-highway vehicle
O&M	operation and maintenance
OU	Operable Unit
ppb	parts per billion
PRC	PRC Environmental Management, Inc.
Reclamation	United States Bureau of Reclamation
RI Report	*Remedial Investigation Report, Iron Mountain Mine Superfund Site, Redding, California*
ROD	Record of Decision
SCDD	Spring Creek Debris Dam
SCPP	Spring Creek Power Plant
SCRR	Slickrock Creek Retention Reservoir
Site	Iron Mountain Mine Superfund Site
SOW	October 2000 *Statement of Work, Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (revised 2013)
Spring Creek Arm	Spring Creek Arm of Keswick Reservoir
State	State of California
TMDL	total maximum daily load
treatment plant	Minnesota Flats Treatment Plant
Water Board	Central Valley Regional Water Quality Control Board

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy, in order to determine if the remedy will continue to be protective of human health and the environment. The U.S. Environmental Protection Agency (EPA) documents the methods, findings, and conclusions of reviews in five-year review reports. In addition, EPA identifies issues found during the review, if any, and document recommendations to address them.

EPA has prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 40 Code of Federal Regulation (CFR) Section 300.430(f)(4)(ii) of the National Contingency Plan and EPA policy.

This is the sixth FYR for the Iron Mountain Mine (IMM) Superfund Site (Site). The triggering action for this statutory review is the completion date of the previous FYR. This FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

The Site consists of six Operable Units[1] (OU). This FYR addresses interim remedial actions completed for OU-1 through OU-5. For OU-6, the Boulder Creek watershed, EPA is currently preparing a remedial investigation (RI) report to describe the nature and extent of the remaining contaminants at OU-6 and determine the risk posed by those contaminants to human health and the environment.

Lily Tavassoli, EPA Remedial Project Manager for the Site, led the IMM Superfund Site Five-Year Review, which began on June 2, 2017. Cynthia Wetmore, EPA; and Benino McKenna, Hydrologist, Alison Suess, Chemist, and Allison Burcham, Environmental Engineer, with the U.S. Army Corps of Engineers (USACE) participated. Kate Burger, California Regional Water Quality Control Board and McKinley Lewis, California Department of Toxic Substances Control Department provided State agency support.

[1] During cleanup, a site can be divided into a number of distinct areas depending on its complexity. These areas, called operable units (OUs), may address geographic areas, specific problems, or media where a specific action is required.

Table 1. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Iron Mountain Mine (IMM) Superfund Site		
EPA ID: CAD980498612		
Region: 9	**State:** CA	**City/County:** Redding/Shasta County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Lily Tavassoli		
Author affiliation: EPA Region 9		
Review period: 9/28/2013 - 9/27/2018		
Date of site inspection: 10/24/2017		
Type of review: Statutory		
Review number: 6		
Triggering action date: 9/27/2013		
Due date *(five years after triggering action date)*: 9/27/2018		

1.1. Background

The Iron Mountain Mine (IMM) Superfund Site (Site) is located in Shasta County, California, approximately 9 miles northwest of Redding, California. The Iron Mountain Mines are the southernmost mines in the West Shasta Mining District, which encompass more than a dozen sulfide mines that have been mined for copper, gold, pyrite, silver, and zinc. The Site includes former surface and underground mine workings, waste rock piles, tailings piles, abandoned mining facilities, and former smelting areas.

The Iron Mountain Mine was mined from the 1860's through 1963 for copper, gold, pyrite, silver, and zinc. Operations included open pit mining, adits and stoping inside Iron Mountain, milling, ore transportation via railroad and tramway, a cyanide leaching plant, cementation plants, ore roasting areas, and a smelter. Exposure of the mine workings, waste rock piles, and the open pit mine to oxygen and water have produced acid mine drainage (AMD) management issues. Numerous historical fish kills in the Sacramento River were attributed to AMD from the Main Mine Area. The Site was added to the National Priorities List in September 1983.

1.2. Physical Characteristics

The Site comprises approximately 4,400 acres that includes the mining property on Iron Mountain, several inactive underground mines; an open pit mine; areas that were mined by side-hill mining activities; other areas disturbed by mining or mineral processing activities; numerous waste dumps; process tailings piles; abandoned mining facilities; mine drainage conveyance and treatment facilities; and the downstream reaches of Boulder Creek, Slickrock Creek, Spring Creek, Spring Creek Reservoir, Keswick Reservoir, and the Sacramento River.

The Sacramento River is a source of drinking water for Redding and other municipalities. The Central Valley Project facilities in Northern California are important components of California's water supply system. Central Valley Project operates under a complex operational plan to supply agricultural and drinking water, produce power, and address environmental concerns.

The fishery resources, other aquatic species, and the ecosystem of Keswick Reservoir and the Sacramento River below Keswick Dam are the primary natural resources at risk from uncontrolled heavy metal discharges from IMM. The National Oceanic and Atmospheric Administration (NOAA) considers the Upper Sacramento River to be the most important salmon spawning area in California. The Sacramento-San Joaquin River system is the principal producer of Chinook salmon caught in California's ocean fisheries (California Department of Fish and Wildlife [CDFW], 2018a). The Sacramento River downstream from Keswick Dam contains four races of anadromous Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*). Chinook salmon (fall-, late fall-, spring-, and winter-run) migrate into, spawn, incubate, and rear immediately downstream from Keswick Dam. The federal Endangered Species Act and the California Endangered Species Act (NOAA Fisheries, 2018a) list Sacramento River winter-run Chinook salmon as endangered. They list Central Valley spring-run Chinook salmon as a threatened species (CDFW, 2018b). The federal Endangered Species Act lists fall-run and late-fall-run Chinook salmon as species of concern (CDFW, 2018b). The Central Valley distinct population segment of steelhead and the southern distinct population segment of North American green sturgeon are federally listed as threatened (NOAA Fisheries, 2018b and 2018c). NOAA believes Green sturgeon use Sacramento River habitats as far upstream as Shasta County.

1.2.1. Main Mine Area

The Shasta County Planning Division has zoned the Main Mine Area as Mineral Resource. The T.W. Arman Revocable Trust (Arman Trust) owns most of the land in the Main Mine Area; the federal government owns the remainder, managed by the Bureau of Land Management (BLM). Access is limited because IMM is a designated Superfund site under CERCLA. There are no full-time residents at IMM. Iron Mountain Operations (IMO) personnel work in shifts to operate and maintain the remedial infrastructure at IMM. The land uses in the Main Mine Area historically have been limited to mainly mining-related activities.

The Main Mine Area is remote from populated areas because of the rugged terrain. The nearest community is Keswick, a community of approximately 450 residents located four miles from the IMM gate. The nearest city is Redding, approximately nine miles away, with a population of approximately 90,000 people.

The adjacent land is largely undeveloped, with a rugged topography and a few former forestry roads. Directly to the east of Iron Mountain Mine is a BLM-managed off-highway vehicle (OHV) park, the Chappie-Shasta OHV area.

1.2.2. Iron Mountain Road

Public roads in the area include the asphalt-covered Iron Mountain Road and gravel roads in the Chappie-Shasta OHV Area, northeast of Iron Mountain Road. There are three private residences along Iron Mountain Road between the community of Keswick and IMM. BLM operates a public, outdoor firing range along the west side of Iron Mountain Road.

1.2.3. Spring Creek Debris Dam Area

The federal government owns, and the United States Bureau of Reclamation (Reclamation) manages, the Spring Creek Debris Dam (SCDD) area. Reclamation will operate SCDD to manage water discharged from the Site in perpetuity; therefore, the land use and ownership will not change. The federal government also owns, and Reclamation manages, all access roads to the Confined Disposal Facility (CDF) located in the SCDD area.

1.2.4. Lower Keswick Reservoir Area

Spring Creek Arm and Lower Keswick Reservoir are classified as Public Lands; the general plan map (Shasta County Department of Resource Management, 2004) indicates that most of the land surrounding these areas is public land that will not be developed for residential, commercial, or industrial use. The area is used for recreational boating and fishing. A former railroad track along the west bank of Keswick Reservoir is now a multiuse trail for the public.

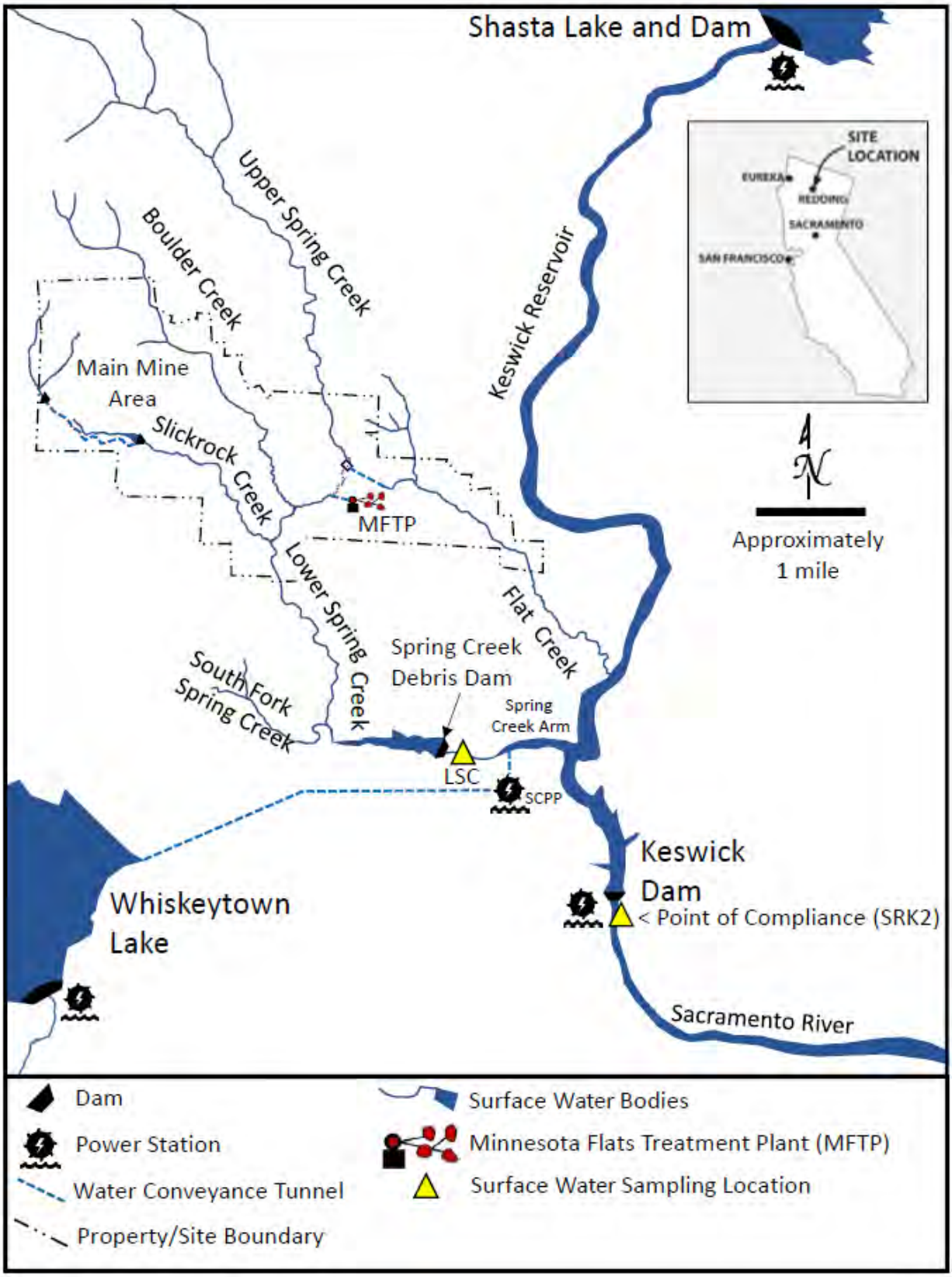

Figure 1. Location Map for the Iron Mountain Mine Superfund Site

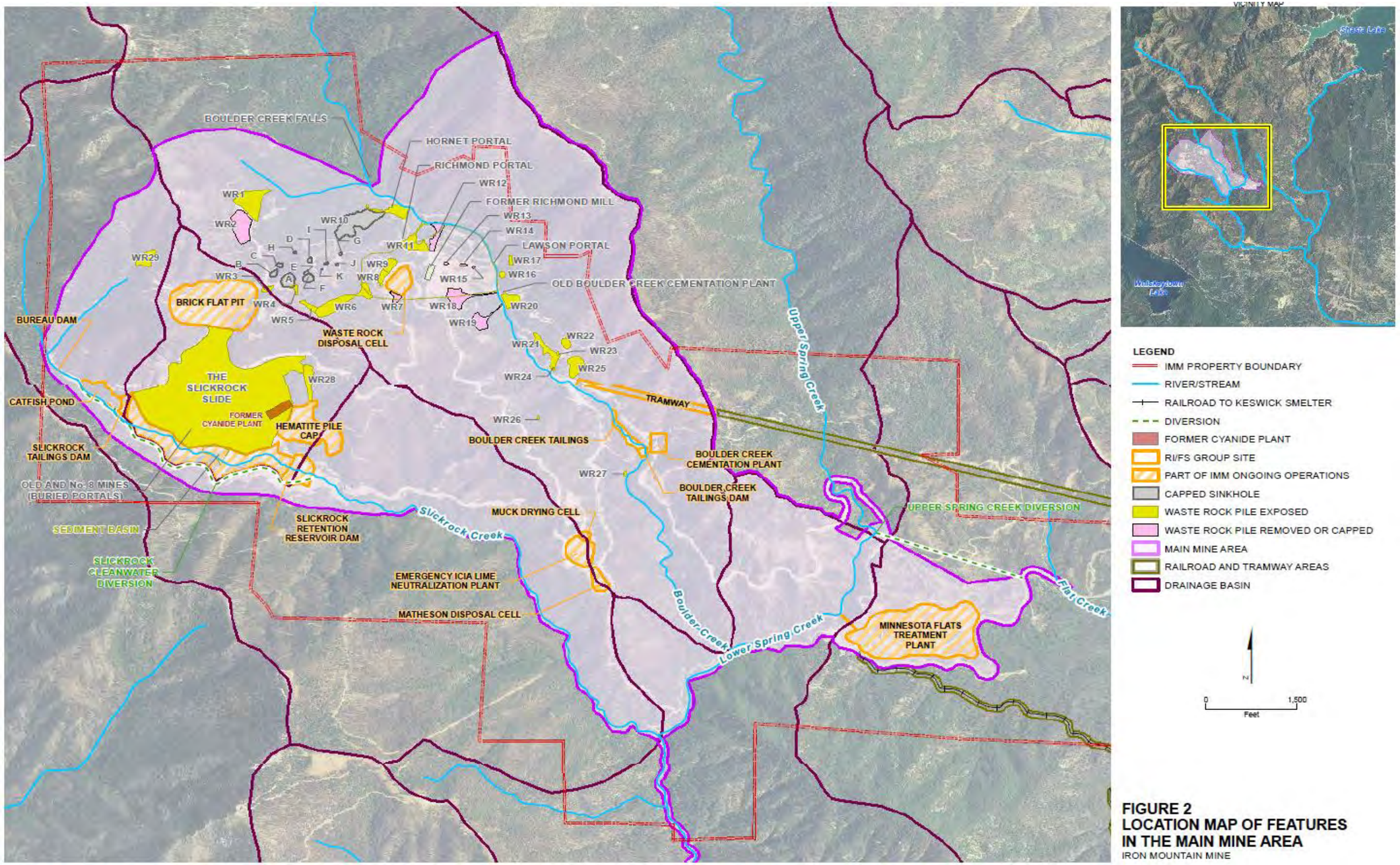

Figure 2. Detailed Map of the Iron Mountain Mine Superfund Site

1.3. Hydrology

The Site is located in a mountainous region that contains numerous, deeply incised creeks. The Main Mine Area is located on a ridge that drains to Boulder Creek on the north and Slickrock Creek on the south (see Figure 1). Boulder Creek and Slickrock Creek are tributaries to Lower Spring Creek, which flows into the Spring Creek Reservoir and then into Keswick Reservoir. The Upper Spring Creek diversion sends up to 850 cubic feet per second (ft^3/sec) of clean water into Flat Creek, allowing additional storage for contaminated water in Spring Creek Reservoir. The diversion marks the divide between Upper Spring Creek and Lower Spring Creek. The Minnesota Flats Treatment Plant (treatment plant) discharges treated water to Lower Spring Creek.

The mines (including the Richmond Mine, Hornet Mine, and Old/No. 8 Mine Seep), waste rock piles, and tailings piles discharge acidic waters that typically have high concentrations of heavy metals. These discharges are referred to collectively as acid mine drainage (AMD). AMD from the Site has historically affected the downstream reaches of Boulder Creek, Slickrock Creek, Lower Spring Creek, Spring Creek Reservoir, Keswick Reservoir (including Spring Creek Arm and the main body of Keswick Reservoir), and the Sacramento River.

2. Remedial Actions Summary

2.1. Basis for Taking Action

The contaminants of concern identified by EPA are acidity and toxic metals, which include copper, cadmium, and zinc. All of these contaminants are present in the AMD discharges from the underground, side hill, open pit mine workings, and area sources in the Slickrock Creek and Boulder Creek watersheds. The exceedances of water quality standards and the accumulation of toxic sediments downstream from IMM historically caused severe ecological impacts and posed a potential threat to human health.

2.2. Remedy Selection, Implementation, Operation and Maintenance

EPA and the State of California (State) settled cost recovery litigation with the primary potentially responsible party (PRP) in December 2000 (2000 Settlement). The 2000 Settlement assures that the interim remedial actions selected in RODs 1 through 4 will be operated and maintained. Pursuant to the 2000 Settlement, Global Loss Prevention, Inc. (GLP) (formerly American International Group [AIG] Consultants, Inc.), on behalf of the PRP, performs the operation and maintenance (O&M) of the interim remedial actions implemented pursuant to the RODs 1 through 4 for 30 years (through the year 2030). O&M is being performed in accordance with the *Statement of Work Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (SOW) (EPA, 2000, revised 2013). IMO is the Site Operator, under GLP.

1986 Record of Decision (ROD 1): Sitewide

The 1986 ROD (ROD 1) selected an interim remedy for the Site, to be implemented in a phased approach to include a balance of source control, treatment, and water management controls. The Remedial Action Objectives (RAOs) are summarized in Table 2.

ROD 1 recommended the Site cleanup program be designed to meet the State of California *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* [Basin Plan] criteria in the Sacramento River below Keswick Dam except during the worst-case year.

The interim remedy identified specific projects, including:

- Construction of a partial cap over the Richmond mineralized zone, including Brick Flat Pit (the open pit mine on top of Iron Mountain) and several subsidence areas
- Construction of a diversion for Upper Slickrock Creek, around the waste rock and slide debris, to avoid contamination of clean water and reduce the flow from the "big seep"
- Construction of a diversion for Upper Spring Creek to avoid contamination of the clean water and filling Spring Creek Reservoir
- Installation of perimeter controls as necessary to minimize any direct contact threats
- A study of the feasibility of filling mine passages with low-density cellular concrete
- Construction of a diversion for the South Fork of Spring Creek (formally eliminated in ROD 4 in preference for a "dam and treat" remedial approach)
- Enlargement of SCDD, the exact size of which would be determined after an evaluation of the effectiveness of the other remedies (formally eliminated in ROD 4 in preference for a "dam and treat" remedial approach)

Table 2. Iron Mountain Mine Record of Decision (ROD) Summary

Record of Decision (ROD)	ROD 1	ROD 2	ROD 3	ROD 4	ROD 5
ROD Title; Date	*Record of Decision, Iron Mountain Mine, Redding, California*; October 3, 1986	*Record of Decision, Boulder Creek Operable Unit, Iron Mountain Mine, Shasta County, California*; September 30, 1992	*Record of Decision, Old/No. 8 Seep, Iron Mountain Mine, Shasta County, California*; September 24, 1993	*Record of Decision, Iron Mountain Mine, Shasta County, California*; September 30, 1997	*Record of Decision, Iron Mountain Mine, Shasta County, California*; September 30, 2004
Remedial Action Objectives	The following key general objectives were defined: • To minimize off-site contaminant migration via surface water runoff and seepage, and • To mitigate impacts and minimize the migration of contaminants that have already moved from the site through receiving waters	The overall remedial action objective was defined as eliminating the IMM discharges that are harmful to the environment. ROD 2 stated that "results from implementation of remedial actions for sources in the Boulder Creek Operable Unit will be important considerations in setting remedial action objectives for an overall final site remedy."	Same as ROD 2	As with ROD 2, the overall remedial action objective was defined as eliminating the IMM discharges that are harmful to the environment. EPA also identified three primary goals for the IMM Superfund remedial action in ROD 4: 1. Comply with the water quality criteria established under the Clean Water Act. 2. Reduce the mass discharge of toxic heavy metals through application of appropriate control technologies. 3. Minimize the need to rely on special releases of California's valuable water resources to ensure compliance with water quality standards in the Sacramento River through special releases of waters to dilute toxic spills of IMM contaminants.	The overall objective of EPA's IMM Superfund cleanup program was defined as eliminating IMM AMD discharges that are harmful to human health and the environment. Remedial action objectives for contaminated sediment in Spring Creek Arm included the following: • Protect the Sacramento River ecosystem from releases of heavy metals from Spring Creek Arm by preventing the mobilization and redeposition of contaminated sediment into important fishery spawning habitats in the Sacramento River below Keswick Dam. • Prevent adverse impacts on water quality and beneficial uses of the Sacramento River below Keswick Dam by reducing the metal loads and suspended solids associated with contaminated sediment discharges from Spring Creek Arm to the Sacramento River. Achievement of RAOs was expected to result in additional ancillary benefits listed in ROD 5.
Implemented Remedy Components	• Construction of a partial cap over the Richmond mineralized zone, including Brick Flat Pit and several subsidence areas	• Treatment of the AMD discharges from the Richmond and Lawson adits in a lime neutralization treatment plant	Treatment of the AMD discharges from the Old/No. 8 Mine Seep at the treatment plant, as appropriately modified	Treatment of AMD from the Slickrock Creek area sources, including: • Design and construction of a retention reservoir to collect	• Dredging sediment that was most susceptible to erosion in Spring Creek Arm

Record of Decision (ROD)	ROD 1	ROD 2	ROD 3	ROD 4	ROD 5
	• Construction of a diversion for Upper Slickrock Creek, around the waste rock and slide debris • Construction of a diversion for Upper Spring Creek Installation of perimeter controls as necessary to minimize any direct contact threats	• Consolidation and capping of seven waste piles • Disposal of the IMM treatment plant sludges in a landfill constructed in Brick Flat Pit		AMD discharges in the Slickrock Creek Basin for treatment • Surface-water diversion facilities • Hematite-erosion-control structure • Upgrades to the treatment plant and pipeline	• Disposing of the sediment in a CDF adjacent to Spring Creek Reservoir • Institutional controls, including operational controls and CDF access and use restrictions
Operational Controls	ROD 1 stated that under the 1980 MOU, "the Bureau of Reclamation agreed to operate SCDD and the Shasta Dam water management system in such a manner that, to the extent possible, sufficient dilution water would be available to ensure that State water quality criteria below Keswick Dam would be met."	Same as ROD 1	Same as ROD 1	Same as ROD 1	The following operational controls were selected in ROD 5: 1. Current operational controls that require Reclamation to restrict Keswick Reservoir elevations during release events from SCPP and SCDD to minimize the potential for erosion of sediment in the Spring Creek Arm will be revised. Operational restrictions would be removed except for periods during rare storm events where continued operational restrictions are necessary to assure that remaining sediments do not erode into the environment. 2. Current operational controls will be continued that require Reclamation to operate SCDD releases to comply with water quality ARARs in the Sacramento River below Keswick Dam, and to continue low-flow releases from SCPP as necessary to flush Spring Creek Reservoir water through the Spring Creek Arm.
Chemical-Specific ARARs or Performance Criteria	ROD 1 recommended the overall cleanup program be designed to meet the State of California Basin Plan criteria	ROD 2 identified the chemical-specific ARARs for the treatment plant as the Clean Water Act effluent limitations	Same as ROD 2	Same as ROD 2 ROD 4 also evaluated the proposed CTR as "To Be	The following performance criteria were defined in ROD 5 for the dredging operations during implementation of the

Record of Decision (ROD)	ROD 1	ROD 2	ROD 3	ROD 4	ROD 5
	except during the worst-case year, at which time the EPA water quality criteria for protection of aquatic life would be met. The EPA water quality criteria for protection of aquatic life listed in ROD 1 were not carried forward in subsequent RODs.	for discharges of mine drainage from copper mines, exercise of best professional judgment under the Clean Water Act, Safe Drinking Water Act MCLs and nonzero MCL goals at the water intake to the City of Redding, and the Basin Plan water quality objectives. MCLs included the following; other criteria are provided in subsequent rows of this table. Copper: N/A Cadmium: 5 ppb Zinc (Secondary MCL): 5,000 ppb ROD 2 stated that EPA is relying upon the ARAR waiver for "interim measures" (40 CFR § 300.430 (f)(ii)(C)(*1*) for remedy selection with respect to the Boulder Creek OU and therefore is waiving the Basin Plan water quality objectives and the Fish and Game § 5650 standards which would necessitate elimination of all releases as ARARs for this operable unit. EPA's overall goal at the site remains achieving these water quality objectives and Fish and Game standards.		Considered Standards" rather than potential ARARs criteria, as the proposed CTR were not yet finalized at the time of ROD 4. The proposed CTR were included in the ARARs waived (see below).	interim remedial action. These performance criteria are no longer applicable now that interim remedial action has been completed. • Discharges of sediment from Spring Creek Arm shall not cause exceedances of the chemical-specific ARARs at the compliance point. The applicable numeric standards were defined as the Basin Plan maximum concentration and CTR continuous concentration criteria for the Sacramento River below Keswick Dam. • Basin Plan turbidity standards shall be achieved at the compliance point during dredging operations. • Return water discharged from the CDF shall not exceed the relevant and appropriate effluent limitation guidelines established for existing point sources at copper and zinc mines in 40 Code of Federal Regulations 440.102(a) and 440.103(a) • Sediment that is susceptible to erosion shall be removed (or contained through residual management) to 560 feet above mean sea level (msl) or to an elevation determined by further analysis to prevent erosion under the following operational condition: • Combined release from SCDD and SCPP up to 6,600 ft3/sec and Keswick Reservoir elevation of 574 feet msl or greater.
Treatment Plan Effluent Limitations					

Record of Decision (ROD)	ROD 1	ROD 2	ROD 3	ROD 4	ROD 5
ARAR	Effluent limitations for mine drainage at 40 CFR Part 400, Subpart J, which are achievable by using lime treatment and precipitation	Effluent limitations for existing point sources at copper and zinc mines in 40 CFR§§440.102(a) and 440.103(a) were deemed relevant and appropriate for the treatment plant effluent.	Same as ROD 2	Same as ROD 2	Same as ROD 2; effluent limitation guidelines were deemed relevant and appropriate for CDF effluent.
Cadmium (ppb ppb)	Not specified	Daily maximum: 100 30-day average: 50	Same as ROD 2	Same as ROD 2	Same as ROD 2
Copper (ppb)	Not specified	Daily maximum: 300 30-day average: 150	Same as ROD 2	Same as ROD 2	Same as ROD 2
Lead (ppb)	Not specified	Daily maximum: 600 30-day average: 300	Same as ROD 2	Same as ROD 2	Same as ROD 2
Zinc (ppb)	Not specified	Daily maximum: 1,500 30-day average: 750	Same as ROD 2	Same as ROD 2	Same as ROD 2
pH	Not specified	6.0 to 9.0 Applies only to discharges to Flat Creek	Same as ROD 2	Same as ROD 2	Not retained as performance criteria for CDF effluent
TSS (mg/L)	Not specified	Daily maximum: 30 30-day average: 20 Applies only to discharges to Flat Creek	Same as ROD 2	Same as ROD 2	Not retained as performance criteria for CDF effluent
ARARs Waived (Numerical, see also Narrative below)					
Cadmium (ppb) [a]	Basin Plan: 0.22; EPA: 0.55	Basin Plan: 0.22	Same as ROD 2	Same as ROD 2; Proposed CTR	Basin Plan: 0.22; CTR: 1.1; National Toxics Rule
Copper (ppb) [a]	Basin Plan: 5.6; EPA: 5.4	Basin Plan: 5.6	Same as ROD 2	Same as ROD 2; Proposed CTR	Basin Plan: 5.6; CTR: 4.1; National Toxics Rule
Zinc (ppb) [a]	Basin Plan: 16; EPA: 47	Basin Plan: 16	Same as ROD 2	Same as ROD 2; Proposed CTR	Basin Plan: 16; CTR: 54; National Toxics Rule
Narrative Standards	N/A	Fish and Game Code Section 5650 which prohibits discharge of contaminants "deleterious to fish, plant life, or bird life."	Same as ROD 2	Same as ROD 2	Fish and Game Code Section 5650 SWRCB Resolution 92-49
Target Compliance Point (see also "ARARs Waiver")	Sacramento River below Keswick Dam: ROD 1 stated that federal water quality standards would be met in the Sacramento River below Keswick Dam but not in the immediate receiving waters as	Sacramento River below Keswick Dam (same as ROD 1) MCLs and MCLGs would only apply to the area of the Sacramento River near Redding's Jewel Creek Intake.	Sacramento River below Keswick Dam (similar to ROD 2)	Sacramento River below Keswick Dam (similar to ROD 2)	Sacramento River below Keswick Dam: ROD 5 stated that the RAOs focus on the protection of the Sacramento River ecosystem, and do not require the removal of all contaminated sediment to

Record of Decision (ROD)	ROD 1	ROD 2	ROD 3	ROD 4	ROD 5
	required by the Clean Water Act.				eliminate ecological risks in the Spring Creek Arm or Keswick Reservoir due to the ongoing IMM metal discharges.
ARARs Waiver (Narrative)	Fund-balancing waiver, 40 CFR § 300.68(i)(5)(ii): ROD 1 stated that State and Federal standards would probably not be met in portions of Spring Creek, Slickrock Creek, Boulder Creek, and Keswick Reservoir at any time. ROD 1 stated that the selected alternative would achieve water quality at a point below Keswick Dam. The cost of meeting water quality objectives in the stream near the source was determined to be extremely large, and fund balancing was used to select a less costly remedy. ROD 4 stated that through a formal action in 1991 known as an "explanation of significant difference", EPA revoked the fund balancing waiver upon which EPA relied for ROD1.	Waiver for interim measures: ROD 2 stated that the selected remedy does not address all sources of contaminant discharges at the site and cannot provide for compliance with the chemical-specific ARARs of the Basin Plan and for compliance with Fish and Game Code Section 5650 which prohibits discharge of contaminants "deleterious to fish, plant life, or bird life." EPA invoked the CERCLA Section 121(d)(4)(A) waiver for "interim measures." ROD 2 also stated that Boulder Creek and Slickrock Creek do not comply with ambient water quality criteria, and remediation of sources in the ROD 2 interim action would not allow for compliance with these standards without further actions. Therefore, EPA relied upon a waiver for "interim measures" and was not requiring that the discharge meet ambient water quality criteria in surface waters receiving the discharge.	Waiver for interim measures: Similar to ROD 2. ROD 3 also stated that EPA was not requiring that the discharge from the treatment plant meet the ambient water quality criteria in lower Spring Creek for this interim action.	Waiver for interim measures: Similar to ROD 2. ROD 4 also stated the following: • State Basin Plan standards would be met below Keswick Dam except during IMM AMD spills from SCDD, which were projected to occur on a frequency of once every 8 to 10 years. • Regular exceedances of the State Basin Plan standards (and the proposed CTR) are likely to continue in areas of Keswick Reservoir and in the Spring Creek watershed without further response action at the Site. • Continuous exceedances of the State Basin Plan standards and proposed CTR were expected to remain in water bodies above SCDD, even after implementation of the interim remedy.	Waiver for interim measures: ROD 5 stated that EPA was relying on the ARARs waiver for "interim measures" (CERCLA § 121(d)(4)(A); 40 CFR § 300.430(f)(ii)(C)(*1)*) for this remedial action. EPA does not anticipate that the ROD 5 interim remedy, in conjunction with the other remedies implemented to date, would be sufficient to ensure compliance with (1) the numeric, chemical-specific water quality standards contained in the National Toxics Rule, CTR, and the Basin Plan for copper, cadmium, or zinc, (2) California Fish and Game Code § 5650, and (3) applicable requirements of SWRCB Resolution 92-49. ROD 5 also stated that the National Toxics Rule, Basin Plan or CTR criteria would not be achieved in Spring Creek, its tributaries, or in portions of Keswick Reservoir under all circumstances following completion of the interim action, as these water bodies are impacted by remaining discharges of AMD from the IMM Site.

- Notes:
- [a] The Basin Plan and CTR criteria for copper, cadmium, and zinc concentrations are for dissolved constituents and are hardness dependent. Objectives presented in this table assume a hardness of 40 mg/L.
- N/A: Not applicable
- AMD: acid mine drainage
- Basin Plan: The Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and San Joaquin River Basin

- CDF: Confined Disposal Facility
- CTR: California Toxics Rule
- MCL: Maximum Contaminant Level
- MOU: State Water Resources Control Board, U.S. Water and Power Resources Service, and California Department of Fish and Game. 1980. Memorandum of Understanding (MOU) to Implement Actions to Protect the Sacramento River System from Heavy Metal
- Pollution from Spring Creek and Adjacent Watersheds. January.
- OCAP: Bureau of Reclamation. 2004. Long-term Central Valley Project Operations Criteria and Plan, CVP-OCAP. June 30.
- OU: Operable Unit
- ROD: Record of Decision
- SCDD: Spring Creek Debris Dam
- SCPP: Spring Creek Power Plant
- Spring Creek Arm: Spring Creek Arm of Keswick Reservoir

The interim remedies selected under ROD 1 and all subsequent RODs rely on water management components of the *Memorandum of Understanding (MOU) to Implement Actions to Protect the Sacramento River System from Heavy Metal Pollution from Spring Creek and Adjacent Watersheds* (1980 MOU) (State Water Resources Control Board et al., 1980). The 1980 MOU is an agreement among the State Water Resources Control Board, the Water and Power Resources Service (the predecessor of Reclamation), and the California Department of Fish and Game (currently CDFW). It establishes the short- and long-term actions and responsibilities of the agencies in minimizing toxicity problems near Spring Creek. As part of the 1980 MOU, Reclamation agreed to operate the Spring Creek Debris Dam and the Shasta Dam water management system in a manner that would dilute the discharges from IMM to meet water quality criteria in the Sacramento River downstream of Keswick Dam, to the extent practicable.

ROD 1 invoked a fund-balancing waiver to select a remedy which most closely approaches the level of protection provided by applicable or relevant and appropriate requirements (ARARs) considering the specific fund-balanced sum of money available for the Site. ROD 1 stated that federal water quality standards would be met in the Sacramento River below Keswick Dam for protection of the salmon population, but State and Federal water quality standards would not be met in the immediate receiving waters, including portions of Spring Creek, Slickrock Creek, Boulder Creek, and Keswick Reservoir. The ROD 1 fund-balancing waiver was revoked in 1991 under an Explanation of Significant Difference; subsequent RODs invoked an ARARs waiver for interim measures as discussed below.

2.2.1. ROD 1 Remedy Implementation

On July 19, 1988, EPA initiated construction of the partial cap. EPA constructed flexible soil/bentonite caps in seven subsidence areas over the Richmond mineralized zone and capped the lower portion of Brick Flat Pit. As part of the Brick Flat Pit cap construction, EPA used tailings from the Minnesota Flats area (and several other tailings piles) that contained relatively high concentrations of cadmium, copper, and zinc as fill material beneath an impermeable membrane lining system. EPA completed construction of the partial cap in July 1989.

EPA, through an interagency agreement with Reclamation, began construction of the Slickrock Creek diversion in July 1989 and completed construction in January 1990. The diversion consists of a small stilling pool and diversion dam, a 36-inch-diameter, urethane-lined, concrete pipeline approximately 1 mile in length, and an energy-dissipation structure.

Construction of the Upper Spring Creek diversion began in July 1990, and the diversion began operating in January 1991. The Upper Spring Creek diversion consists of a large, grated, drop-inlet structure (that prevents large rocks and debris from entering the diversion while allowing the creek flows to drop into a rock trap and then into a short tunnel), a 54-inch-diameter, urethane-lined concrete pipeline several thousand feet in length, and an impact structure to dissipate the kinetic energy of the diverted flows prior to discharge to Flat Creek.

2.2.2. ROD 1 Operation and Maintenance

No significant unanticipated O&M efforts were required after removal of the Minnesota Flats tailings pile; construction of the Brick Flat Pit cap, the subsidence area partial caps, and related surface water controls; and construction of the Slickrock Creek clean water diversion.

The Upper Spring Creek diversion has functioned as designed. However, the urethane pipeline lining system has deteriorated since it was constructed and is an ongoing O&M issue. In 2002, a stilling basin was excavated in Spring Creek, upstream from the inlet trash rack, to settle out small rocks and gravel, to reduce erosion of the lining system. This stilling basin has been very effective. After annual inspections of the piping system, the IMO repairs locations with significant deterioration with mortar or grout. EPA has requested that the Site Operator develop a plan for evaluating the refurbishment and long-term maintenance of the liner system; a consultant has been retained for repair design and the project is currently in the data collection phase.

2.2.3. 1992 Record of Decision (ROD 2): Boulder Creek

In ROD 2, EPA selected treatment of the AMD discharges from the Richmond and Lawson adits in a lime neutralization treatment plant, as well as the consolidation and capping of seven waste piles in a landfill to be located at the Site. EPA provided for disposal of the IMM treatment plant sludges in a landfill to be constructed in the inactive open pit mine, Brick Flat Pit, to meet regulatory requirements for this use.

In ROD 2, EPA invoked an ARAR waiver for interim measures (40 CFR § 300.430 (f)(ii)(C)(*1*)) for remedy selection with respect to the Boulder Creek operable unit. EPA waived the Basin Plan water quality objectives and the Fish and Game §5650 standards which would necessitate elimination of all releases as ARARs for this operable unit. ROD 2 stated that the goal of the overall remedy, including the activities in ROD 1, ROD 2, and RODs of subsequent operable units, is to achieve compliance with the Basin Plan water quality objectives and Fish and Game standards in the Sacramento River downstream of Keswick Dam. As with ROD 1, ROD 2 stated that the selected remedy would not achieve water quality objectives in the immediate receiving waters, including Boulder Creek and Slickrock Creek.

Table 2 shows a summary of RAOs defined in ROD 2, including chemical-specific ARARs or performance criteria, and treatment plant effluent limitations.

2.2.4. ROD 2 Remedy Implementation

The PRP began construction of the aerated simple-mix components of the treatment plant in late summer 1993 and completed construction in September 1994. They constructed the associated support facilities, including the AMD collection and conveyance system, the sludge drying beds, roadway improvements, and the sludge landfill in Brick Flat Pit. The PRP completed the construction of required emergency storage facilities (the final required component of the interim remedy) in September 2000. EPA designed the HDS modifications to the treatment plant and constructed them from spring 1996 to January 1997. In 2002, the Brick Flat Pit dam was raised, which provided an additional 25 to 30 years of storage capacity for treatment sludge.

The PRP excavated, consolidated, and capped seven largely pyritic waste piles in a disposal cell at the Site.

2.2.5. ROD 2 Operation and Maintenance

The Site Operator has properly operated the treatment plant, and there have been no significant, unanticipated O&M requirements during the FYR period. The treatment plant is effectively reducing heavy metal discharges from the Site, removing, on average, 99.7 percent of dissolved metals from the AMD inflow. Total metal concentrations in the treatment plant effluent were substantially within the Clean Water Act effluent limits for copper and zinc mining operations (40 CFR § 440.102(a) and 440.103(a)) specified in ROD 2, and in most cases, were well below these limits during the FYR period.

In 2010, the Site Operator made an operational change to optimize metals removal. In accordance with the SOW (EPA, 2000, revised 2013), the Site Operator previously maintained Reactor Tank 1 at pH 8.4 or higher. However, when they operated both reactors during high AMD inflow, the pH in Reactor Tank 2 was not specifically controlled, and was dropping as iron continued to oxidize. The Site Operator now monitors the pH in Reactor Tank 2, and controls lime addition to the sludge recycle tank to keep the pH in Reactor Tank 2 above 8.4. Since this change, dissolved cadmium and zinc concentrations in the treatment plant effluent have been lower.

2.2.6. 1993 Record of Decision (ROD 3): Old/No. 8 Mine Seep

In the 1993 ROD (ROD 3), EPA documented remedy selection of treatment of the AMD discharges from the Old/No. 8 Mine Seep at the treatment plant, as appropriately modified. RAOs, chemical specific ARARs, and the ARARs waiver identified in ROD 3 are the same as discussed in Section 2.2.4 for ROD 2, as summarized in Table 2.

2.2.7. ROD 3 Remedy Implementation

The PRP designed and constructed the facilities to collect and convey AMD from Old /No. 8 Mine to the treatment plant. The PRP constructed the necessary aerated simple-mix components of the treatment plant by September 1994. EPA constructed the HDS modifications to the treatment plant, which became effective in January 1997. The PRP completed the construction of required emergency storage facilities in September 2000.

2.2.8. ROD 3 Operation and Maintenance

The Old/No. 8 Mine Seep is located on the north side of Slickrock Creek, near the sedimentation basin. There are two groundwater extraction wells and two grit chambers in the Old/No. 8 Mine Seep area. The Site Operator extracts AMD at a rate of approximately 40 to 300 gallons per minute from the Old/No.8 Mine Seep wells. The AMD flows through one of the grit chambers, then to the treatment plant through the 18-inch-diameter Old/No. 8 Mine Seep pipeline. AMD from the Old/No. 8 Mine Seep pipeline, and discharge from SCRR, flow via the same pipeline to the treatment plant; so, the Site Operator must consider discharge from both sources to operate the Slickrock Creek AMD control systems properly. Inspections of all AMD pipelines and associated components are conducted daily by IMO.

2.2.9. Record of Decision (ROD 4): Water Management

In the 1997 ROD (ROD 4), EPA documented remedy selection for the Slickrock Creek watershed. The remedy included construction of a 220-acre-foot retention reservoir to collect AMD discharges in the Slickrock Creek Basin for treatment, surface-water diversion facilities, a hematite erosion-control structure, an additional AMD conveyance pipeline, and a tunnel for gravity discharge of treated effluent to Spring Creek. The interim remedy treats essentially all of the Slickrock Creek area AMD, which comprises approximately 60 to 70 percent of the copper load and 40 to 50 percent of the cadmium and zinc load associated with the previously uncontrolled IMM discharges.

ROD 4 RAOs are summarized in Table 2. ROD 4 chemical-specific ARARs are the same as those discussed in Section 2.2.4 for ROD 2, and are summarized in Table 2. In addition, in ROD 4 EPA evaluated the proposed California Toxics Rule (CTR) as "To Be Considered Standards" rather than potential ARARs criteria, as the proposed CTR was not final at the time of ROD 4.

EPA expected the ROD 4 interim remedy to result in better water quality in the Sacramento River by limiting discharges of copper, cadmium, zinc, and acidity from the Site, thereby reducing the number of days and the degree of exceedances of the State Basin Plan standards (and the proposed CTR) in the Sacramento River and Keswick Reservoir.

As discussed for ROD 2, since the interim actions leave some releases of hazardous substances unabated, EPA invoked an ARARs waiver for “interim measures” (CERCLA § 121(d)(4)(A) and 40 CFR §300.430(f)(ii)(C)(*1*)) for this remedial action. EPA did not anticipate that the ROD 4 interim remedy, in conjunction with the other remedies implemented to date, would be sufficient to ensure compliance with Basin Plan water quality objectives and California Fish and Game Code Section 5650. ROD 4 provided additional details on the expected compliance with water quality ARARs, including the following:

- State Basin Plan standards were expected to be met below Keswick Dam except during IMM AMD spills from SCDD, which were projected to occur on a frequency of once every 8 to 10 years.
- Regular exceedances of the State Basin Plan standards (and the proposed CTR) were likely to continue in areas of Keswick Reservoir and in the Spring Creek watershed without further response action at the Site.
- Continuous exceedances of the State Basin Plan standards and proposed CTR were expected to remain in water bodies above SCDD, including Spring Creek, Slickrock Creek, and Boulder Creek, even after implementation of the interim remedy.

2.2.10. ROD 4 Remedy Implementation

By September 2000, the PRP completed hydraulic upgrades to the treatment plant, AMD conveyance pipelines from SCRR, roadway and culvert upgrades, and the discharge tunnel from the treatment plant to Spring Creek.

EPA started construction of the dam in June 2001. During the spillway excavation in November and December 2001, movement of the hillslope above the planned spillway was observed. An investigation

indicated an ancient landslide occupied approximately 5 acres, up to 120 feet deep, above the spillway excavation. EPA stabilized the slope with a high-capacity tieback anchor system. The Department of Water Resources, Division of Safety of Dams required spillway design modifications, grout program modifications, and placement of fibercrete over a substantial portion of the right abutment. Slope stabilization and associated design modifications delayed the completion. The project was substantially complete on May 19, 2004, and EPA and the State determined the project was operational and functional on August 26, 2004.

2.2.11. ROD 4 Operation and Maintenance

The *Operations and Maintenance Manual, Slickrock Creek Retention Reservoir Project* (CH2M HILL, 2004a) outlines the O&M requirements for SCRR. The O&M manual provides operation, inspection, maintenance, monitoring, and security requirements for SCRR and appurtenances, clean water diversions, AMD diversions, spillway, outlet works, sedimentation basin, and upstream hematite pile.

Significant O&M items have included: erosion on the downstream face of the SCRR dam; difficulties addressing clean water runoff from the right abutment, immediately upstream from the spillway; and an increased rate of scaling in sections of the AMD pipeline where the relatively higher pH water from SCRR is conveyed. No other significant, unanticipated O&M efforts were required after completion of SCRR.

EPA expected completion of SCRR and associated facilities, in combination with completed interim remedial actions to control the sources of AMD, to result in a total reduction of contaminant discharge from SCDD to 5 percent of the pre-1994 discharge. For Water Years 2005 through 2017, the actual copper and zinc discharged from SCDD was less than 3 percent of the pre-1994 discharge.

2.2.12. Record of Decision (ROD 5): Sediment

In ROD 5, EPA documented selection of an interim remedial action to dredge contaminated sediment that was most susceptible to erosion in Spring Creek Arm, and to dispose of the sediment in a CDF adjacent to Spring Creek Reservoir. Similar to RODs 2, 3, and 4, ROD 5 invoked the ARARs waiver for "interim measures" for this remedial action. EPA did not anticipate that the ROD 5 interim remedy, in conjunction with the other remedies implemented to date, would be sufficient to ensure compliance with (1) the numeric, chemical-specific water quality standards contained in the National Toxics Rule, CTR, and the Basin Plan for copper, cadmium, or zinc, (2) California Fish and Game Code § 5650, and (3) applicable requirements of SWRCB Resolution 92-49. ROD 5 also stated that the National Toxics Rule, Basin Plan or CTR criteria would not be achieved in Spring Creek, its tributaries, or in portions of Keswick Reservoir under all circumstances following completion of the interim action, as these water bodies are impacted by remaining discharges of AMD from the IMM Site.

Remedial action objectives developed in ROD 5 are summarized in Table 2. The RAOs focused on the protection of the Sacramento River ecosystem, and did not require the removal of all contaminated sediment to eliminate ecological risks in the Spring Creek Arm or Keswick Reservoir due to the ongoing IMM metal discharges.

Performance criteria for the dredging operation, summarized in Table 2, are no longer applicable since that interim remedial action is complete (see below). By meeting these performance criteria, the remedy also achieved remedial action objectives.

The selected interim remedy requires institutional controls, including CDF access and use restrictions and continued operational controls. Operational controls include restrictions on Keswick Reservoir water elevations during rare storm or flood events, to prevent erosion of sediment that remains at deeper depths in Spring Creek Arm. As with RODs 1 through 4, the interim remedy in ROD 5 relies on Reclamation to operate SCDD releases to comply with water quality ARARs in the Sacramento River below Keswick Dam, to the extent practicable.

2.2.13. ROD 5 Remedy Implementation

EPA completed the remedial design for the ROD 5 interim remedy, the Spring Creek Arm of Keswick Reservoir Sediment Removal Remedial Action, in September 2007. EPA began construction in fall 2008 and substantially completed it in October 2011.

In December 2008, EPA completed Phase 1: building the access road and clearing the borrow pit area and CDF footprint.

In summer 2009, EPA finished Phase 2 construction: building the CDF, three lift stations to convey sediment from Spring Creek Arm to the CDF, and the conveyance pipeline; and installing the lime slaking and polymer treatment systems. EPA then conducted sediment removal and treatment activities October 13, 2009, to December 12, 2009, and March 31, 2010, to June 8, 2010. These activities included hydraulic dredging in Spring Creek Arm; sediment treatment with lime, polymer, and coagulant; water quality monitoring in Keswick Reservoir and the Sacramento River throughout dredging; CDF effluent monitoring during dredging and dewatering; and demobilization of the Phase 2 equipment and facilities.

During Phase 3, EPA removed approximately 3,500 yd^3 of sediment from the SCDD outlet works, spillway, and lower Spring Creek channel, transported it to the secondary cell of the CDF, closed the CDF, and implemented the O&M program. To close the CDF, EPA graded the dredged sediments and capped the primary and secondary cells. EPA substantially completed closure by October 25, 2011, and determined the CDF to be "Operational and Functional" on October 26, 2012, when responsibility was transferred to DTSC.

2.2.14. ROD 5 Operation and Maintenance

DTSC currently performs quarterly inspections and O&M of the CDF in compliance with the *Work Pan for Implementation of the Post-closure Operations and Maintenance Plan for the Spring Creek Sediment Confined Disposal Facility* (Remedy Engineering, 2013). Annual reports document inspections, sampling, repairs, and updated settlement surveys for the CDF.

3. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2013 FYR for the Iron Mountain Mine Site stated the following:

The interim remedial actions implemented at IMM selected in RODs 1 through 4 for OUs 1 through 4 are protective of human health and the environment.

The interim remedial actions implemented at IMM selected in ROD 5 for OU-5 is protective of human health and the environment in the short term. To remain protective of the environment over the long term, operational controls selected in ROD 5, including limited restrictions on the Keswick Reservoir water elevation to prevent mobilization of sediment remaining in Spring Creek Arm, need to be officially recorded.

The 2013 FYR included one issue and recommendation. This recommendation and the current status is discussed below.

Table 3. Status of Recommendations from the 2013 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date
5	Operational controls selected in ROD 5 are being followed by Reclamation, but controls specifying limited restrictions on Keswick Reservoir water elevations have not been officially recorded.	Implement operational controls selected in ROD 5 through the 1980 MOU update.	Ongoing	An update to the 1980 MOU was drafted in 2011 and reviewed by all parties involved (EPA, DTSC, CDFW, RWQCB and Reclamation). In 2018 the parties met multiple times to discuss updates to the MOU.	N/A

3.1. Work Completed at the Site during this Five-Year Review Period

With respect to the remedy at OU5, after taking over in October 2012 DTSC initiated quarterly inspections, water monitoring, and O&M of the CDF in compliance with the *Work Plan for Implementation of the Post-closure Operations and Maintenance Plan for the Spring Creek Sediment Confined Disposal Facility* (Remedy Engineering, 2013). To date, DTSC has reported routine O&M work, security monitoring, filtrate monitoring, stormwater monitoring, cap inspection and monument survey results quarterly. They report on all work annually, including details of all non-routine O&M work.

In summer 2012, IMO placed riprap and shotcrete in Boulder Creek to minimize erosion, and cleaned the horizontal drains at the toe of the landslide. The last FYR included a recommendation that the Site Operator extend these improvements to minimize further bank and channel erosion and continue to monitor displacement of the landslide and effectiveness of the drainage improvements. In 2013, IMO

extended the Step pools in Boulder Creek, and further extended them in 2016 to assist in minimizing erosion.

IMO annually reported on maintenance of the surface water diversions and remedy components associated with the Boulder Creek landslide, and the infrastructure monitoring the landslide.

In the previous Five-Year Review Inspection, EPA noted that clean water runoff originating above the right abutment of SCRR was flowing subsurface, discharging behind the dam, and being collected for treatment. EPA recommended that the Site Operator design and implement a long-term plan for routing drainage above the right abutment of SCRR to the clean water diversion. In 2015, the Site Operator did construct a diversion structure to divert the clean water, and it is performing well, despite severe storm impacts during 2016.

Since IMO repaired settlement along the south SCRR perimeter road in 2010, this area needs close monitoring to verify that no additional settlement or longitudinal cracking of the pipeline occurs. IMO repaired the SCRR perimeter road and documented the repairs in monthly progress reports during the reporting period. They also inspected SCRR annually as part of the SCRR pipeline inspection.

The prior Five-Year Review included a recommendation to closely monitor the AMD pipeline sections conveying the higher pH water from SCRR. The rate of scaling had increased in recent years, so EPA also recommended that the AMD pipeline be acid-washed, or a more effective strategy be employed, as necessary, to prevent excessive scaling inside the pipeline from causing a discharge of AMD. IMO drafted a detailed SOP for regularly taking acidic water from the Boulder Creek side of the pipeline to dissolve the scale in the Slick Rock Creek side. IMO has not finalized this SOP.

After the previous Five-Year Review Inspection, EPA recommended that the Site Operator scan all as-built drawings without electronic backups into a high-resolution electronic format for redundancy. Some of the as-built drawings in the IMO office were the only known copies, and the information could be lost in the case of significant water damage, fire, or other unanticipated event. During the current Five-Year Review Inspection, EPA verified that the Site Operator has electronically scanned all historical as-built drawings.

The October 2000 *Statement of Work, Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (SOW) was revised on December 16, 2013. The SOW summarizes the steps necessary for the Site Operator to operate and maintain the interim remedies at the Iron Mountain Mine (IMM). The SOW includes activities such as routine and non-routine operation and maintenance, emergency response actions to ensure continuous operation of the IMM remedy, replacement of major and minor equipment on an as-needed basis, response to changing Site conditions to ensure continuous achievement of the Performance Standards and other requirements, and performance of any and all other actions necessary to meet the Performance Standards and requirements.

During the winter of 2016, the Site experienced historic rainfall levels, and the resulting flows created the need for additional work. Due to limited remaining Sludge Drying Bed capacity following high utilization of the Treatment Plant during this extremely wet winter, a winter sludge haul was initiated on March 27 to empty Sludge Drying Bed #4, and prepare that sludge bed for continuing treatment operations for the balance of 2017. Sludge Drying Bed #3 was also partially emptied to balance equipment and personnel

utilization until an adequate work area could be established in Sludge Drying Bed #4. The winter sludge haul was completed as of the end of April, with Sludge Drying Bed #4 emptied of sludge and the sand bed and perimeter drains rebuilt and ready for service on May 1, 2017.

On July 23, 2018, the Carr Fire began approximately 5 miles west of the site. Over the course of several days, the fire moved towards and ultimately through the property and destroyed site infrastructure including power poles/lines, AMD conveyance pipelines, and culverts. Additionally, EPA conducted an Emergency Response action to address a fire inside the Richmond Mine which had impacted hundreds of feet of AMD pipeline as well as ventilation and electrical equipment. Throughout the fire, capture and collection of AMD was uninterrupted due to minimal damage to underground piping as well as redundancy in pipelines. However, operation of MFTP was suspended for approximately one week while the fire was most active. During this time, AMD flows accumulated in the Slickrock Retention Reservoir and the 1,000,000-gallon stainless steel tank (Tank 14). Assessment of damage and repairs of site infrastructure will continue beyond the mandated completion date of this report.

4. Five-Year Review Process

4.1. Community Notification, Involvement and Site Interviews

EPA placed a public notice in the *Record Searchlight* on April 21, 2018, stating that EPA was conducting a five-year review. The notice provided the project manager's contact information, and invited community participation and input. No comments were received by EPA. The results of the review and the report will be made available on the EPA's site webpage and at the Site information repository located at the Redding Library and the EPA Superfund Records Center.

During the FYR process, EPA conducted interviews and documented any perceived problems or successes with the currently implemented remedies**.** Site operators were interviewed along with personnel from state agencies including RWQCB and DTSC. These interviews can be found in Appendix F. EPA did not identify any significant problems regarding the Site during the interviews. The parties interviewed acknowledge the remedies are successful in removing the discharge of metals from the Site. The work completed at the site during the reporting period continues to demonstrate positive and productive communications among the agencies involved (EPA, RWQCB, DTSC, Reclamation and CDFW).

During the winter storms in 2016, the historic rainfall totals resulted in flows that required 24-hour operations at the Site, and high utilization of the treatment plant. Elevated lime usage and diminished sludge drying bed capacity prompted a winter sludge haul that further stressed resources. Despite conditions from the winter 2016 storms, the site remedies performed as designed, and no exceedances were reported. All parties interviewed acknowledge the winter of 2016 was an example of the Site's collaborative success.

State agencies commented that it would be prudent to begin looking forward to the 2030 remedy transfer, and the continued operations of the site will require equipment and infrastructure to be in the best possible condition at the time of transfer. Recent retirements of key personnel highlight the importance of the communication and transfer of institutional knowledge to new personnel now and for the pending 2030

transfer. To facilitate this, the RWQCB recommends having semiannual stakeholder meetings, of all parties involved, to disseminate new information, to promote continued communication, and to continue the success of the remedy.

4.2. Data Review

4.2.1. Treatment Plant and CDF Operational Performance

At the Minnesota Flats Treatment Plant (treatment plant, or MFTP), approximately 1.6 billion gallons of AMD were treated between January 2013 and December 2017 (see Appendix C for Data Review Figures). Monthly flow varies between 4,000,000 gallons/month and 168,000,000 gallons/month, depending on the season. Flow is typically higher December to April, typically peaking around February, and lower May to November, typically minimum around August. The reporting period for this Five-Year Review includes data gaps during the summer minimum flow months, when IMO completes repairs and upgrades to the MFTP.

From January 2013 through December 2017, approximately 2 million pounds of zinc and 600,000 pounds of copper were removed from the Site contaminant discharges (Figure 3). By comparison, between 2008 through 2012, IMM interim remedial actions prevented the discharge of approximately 3 million pounds of zinc and 870,000 pounds of copper by treating approximately 2 billion gallons of AMD. The reduction in zinc and copper load treated from the previous Five-Year Review period can be attributed to the lower overall AMD inflow.

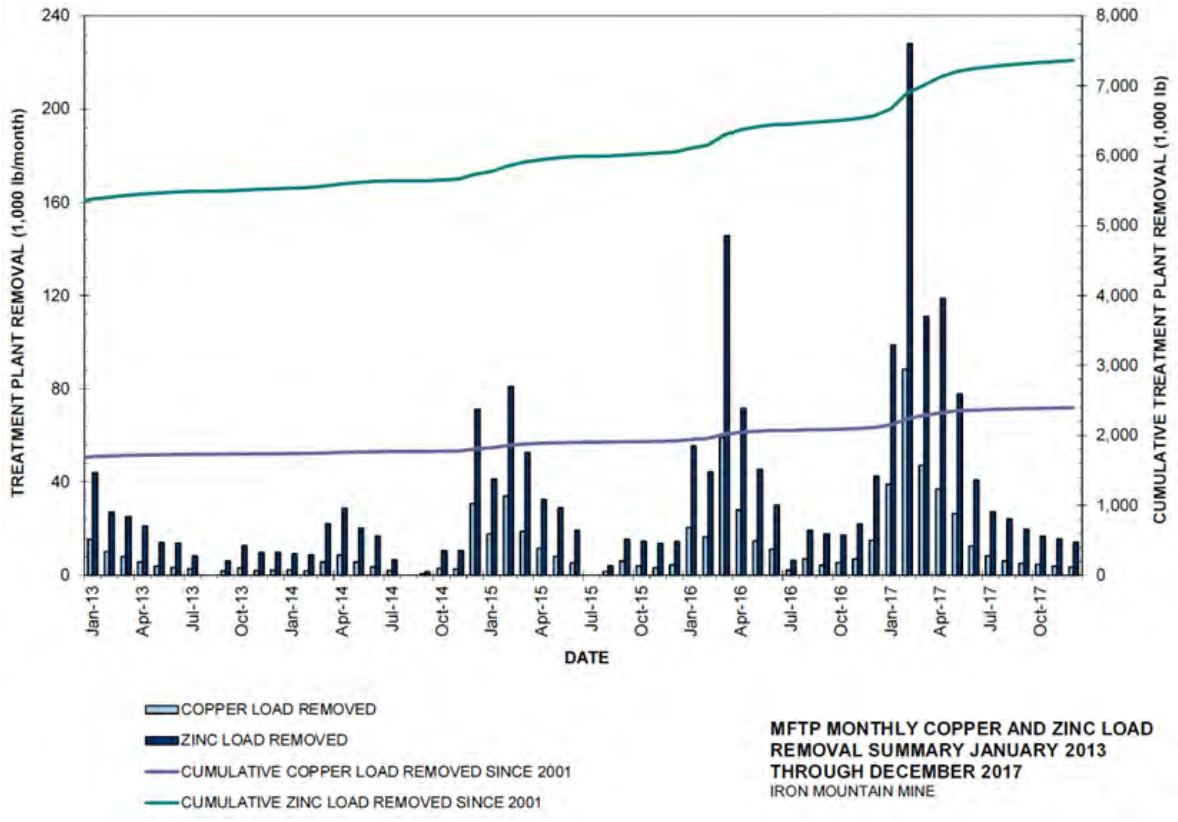

Figure 3. MFTP Monthly Copper and Zinc Load Removal Summary; January 2013 to December 2017

The treatment plant effluent metal concentrations substantially comply with, and, in most cases, are well below, performance criteria specified in Records of Decisions (Table 2). The MFTP achieved the daily Clean Water Act (CWA) requirements for total zinc for 99 percent of the days reported from January 2008 through December 2017, with eight days experiencing exceedances of the daily CWA limit for total zinc. The MFTP achieved the daily CWA requirements for total copper for 98 percent of the days from January 2013 through December 2017, with forty-one days exceeding the daily CWA limit for total copper. No exceedances of the daily CWA limits for cadmium in the MFTP effluent were observed from January 2013 through December 2017. No exceedances of the daily CWA limits for pH of the MFTP effluent were observed by IMO from January 2013 through December 2017. The small number of exceedances are largely correlated to excessive rainfall seasons. As stated previously, both EPA and DTSC expect exceedances of water quality standards downstream of Keswick Dam on occasions when large early winter storms follow very dry summers.

The CDF compliance monitoring was conducted quarterly and annual reports were issued for 2012, 2014, 2015 and 2016. During the transition of oversight from EPA to DTSC, regular site visits were suspended and no data was collected from August to November 2013, thusly there was no annual report completed for 2013. Filtrate monitoring from the effluent outfall pipes for the Five-Year Review period reported no exceedances of the effluent compliance standards as set forth in ROD 5 and are consistent with historical results.

Table 4. CDF Effluent Compliance Standards

Parameter	Unit	30-day Average	Daily Maximum
Cadmium (total)	µg/L	50	100
Copper (total)	µg/L	150	300
Lead (total)	µg/L	300	600
Mercury (total)[a]	µg/L	1	2
Zinc (total)	µg/L	750	1,500

[a] Meeting a mercury standard is a project goal requested by the Central Valley Regional Water Quality Control Board (EPA, 2007). An effluent compliance standard for mercury was not included in ROD 5.

Note:

µg/L = micrograms per liter

4.2.2. Water Quality in the Sacramento River below Keswick Dam

This section evaluates the effectiveness of remedial actions in reducing copper and zinc discharges from the site during the period from January 2013 through December 2017. USACE evaluated the effectiveness based on the observed copper and zinc load removed from the contaminant discharges at the IMM site and the reduction in the copper and zinc discharges from SCDD, located downstream from the IMM site. Surface water from IMM flows via Spring Creek through Spring Creek Reservoir (the impoundment created by SCDD) and into the Sacramento River at Keswick Reservoir.

The metal load in Lower Spring Creek (LSC), downstream from SCDD, represents the metal load contribution from IMM to Sacramento River, and is composed of effluent from the IMM treatment plant and area sources of AMD in the Boulder Creek watershed. Contaminants from Boulder Creek and treated effluent from MFTP discharge through SCDD into Keswick Reservoir. Samples are collected from the

surface water discharging from SCDD at sampling location LSC (Figure 1) to monitor pH, total copper, total zinc, and total cadmium in the reservoir discharge.

There has been a significant decrease in total copper and total zinc measured at the Lower Spring Creek since the remedies have been implemented (Figure 4). Prior to the remedies being implemented, total zinc concentrations often exceed its Daily Maximum Discharge Standard of 1500 µg/L and total copper concentrations frequently exceed its Daily Maximum Discharge Standard of 300 µg/L. Over the past five years, total copper concentrations measured at the Lower Spring Creek have ranged from approximately 50 µg/L to 150 µg/L, and total zinc concentrations ranged from approximately 90 µg/L to 800 µg/L.

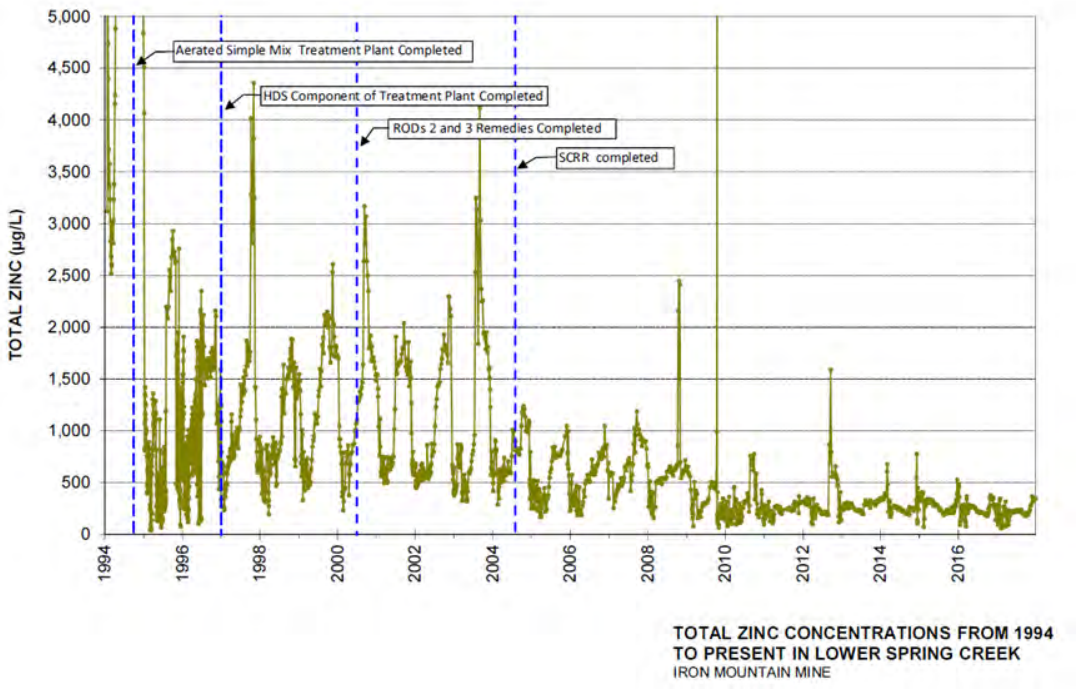

Figure 4. Total Zinc Concentrations 1994 to Present in Lower Spring Creek

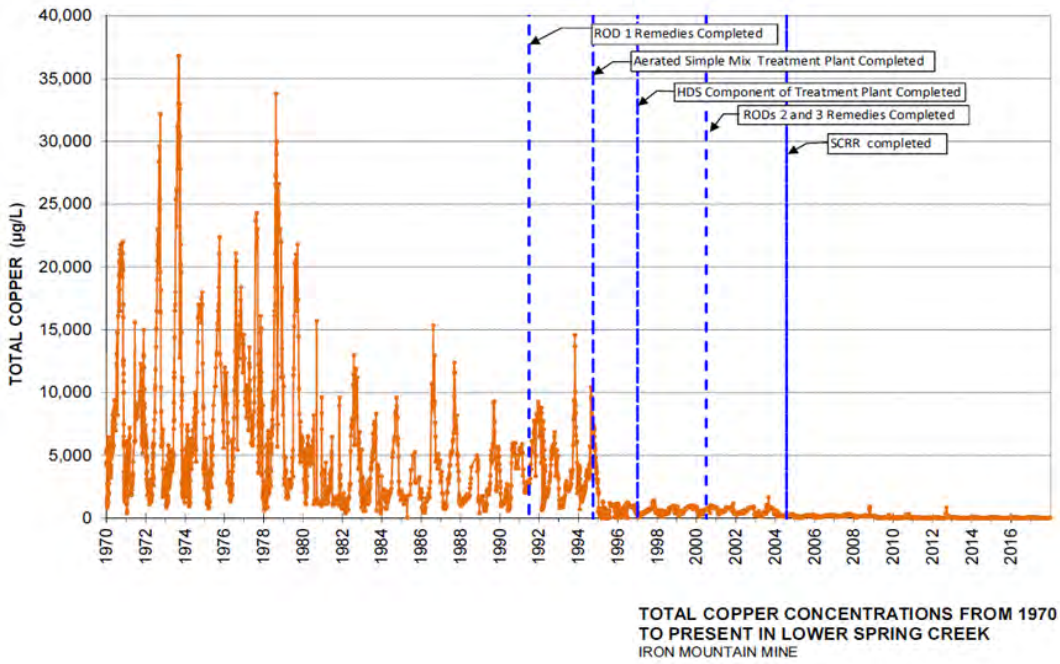

Figure 5. Total Copper Concentrations from 1970 to Present in Lower Spring Creek

To assess whether discharges from SCDD met water quality objectives for Sacramento River downstream of Keswick Dam, samples were collected at location SRK2 (Figure 1). Samples were also collected downstream of Shasta Dam (SRS). Weekly samples were collected from January 2013 to December 2017.

The dissolved zinc concentrations had one exceedance of the Basin Plan Maximum Limit of 16 µg/L in the period from January 2013 to December 2017, and had no exceedances of the California Toxics Rule (CTR) of 54 µg/L. For comparison, dissolved zinc concentrations in water discharges from Shasta Dam also had one exceedance of the Basin Plan Maximum Limit, and no exceedances of the CTR. The reported total zinc concentrations measured at SRK2 ranged from 3 µg/L to 22 µg/L for the reporting period but are not utilized in compliance screening with the Basin Plan or CTR maximum limits based on the aforementioned ARARs waiver by EPA for ROD 5.

The dissolved copper concentration measured at SRK2 and at SRS, did not exceed the Basin Plan limit of 5.6 µg/L on any of the days during which samples were collected. The dissolved copper concentrations at SRK2 exceeded the CTR of 4.1 µg/L on three of the days. For comparison, dissolved copper concentrations ranged from 0.5 µg/L to 4.5 µg/L in water discharges from Shasta Dam during the five-year period. The reported total copper concentrations the Site Operator measured at SRK2 ranged from 0.5 µg/L to 8.7 µg/L for the reporting period, but these are not utilized in compliance screening with the Basin Plan or CTR maximum limits.

The evaluation of the water quality below Keswick Dam for the reporting period demonstrates the continued effectiveness of the remedies established in RODs 1 through 5 to protect the Sacramento River as a drinking water source and as an important ecosystem habitat. Considering the historical levels of

heavy metals contributing to recorded fish kills and impacting water quality for the region, the 97% reduction in metals concentration is of significant note.

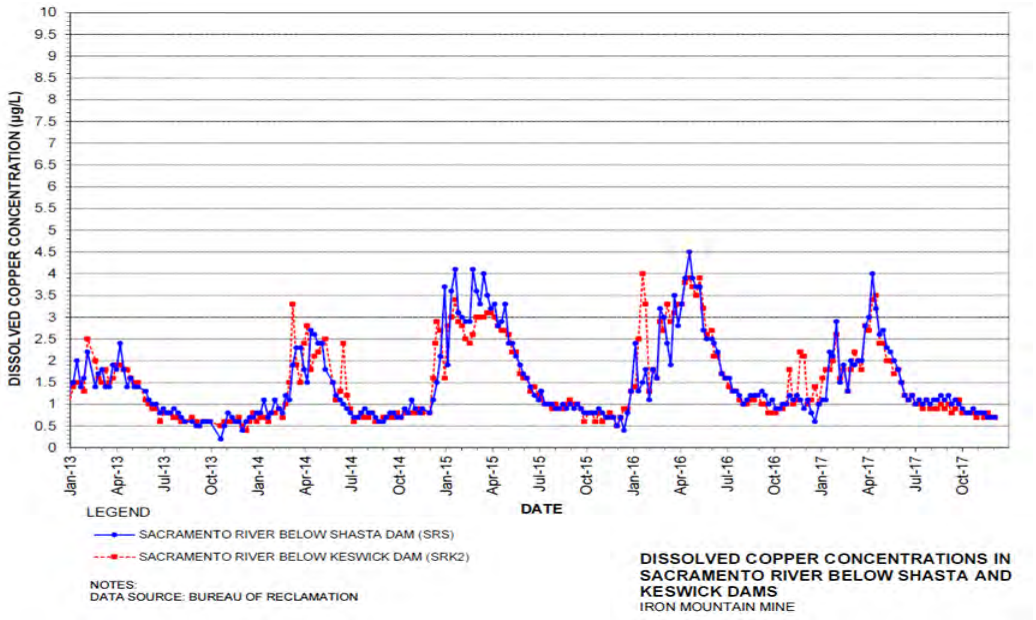

Figure 6. Dissolved Copper Concentrations in Sacramento River below Shasta and Keswick Dams

4.3. Site Inspection

Lily Tavassoli, EPA Remedial Project Manager and Benino McKenna, USACE Hydrogeologist inspected the Site on October 24, 2017. Kate Burger and Stacy Gotham, Water Board; Tom Wallis, CH2M HILL (consultant to EPA); Rudy Carver, IMO; Julie Diebenow, AIG; and Dan Wanket, GEI (consultant to AIG), also participated. The purpose of the inspection was to assess the protectiveness of the remedy.

The Site inspection team met at the site on the first day, and, after introductions and health and safety overviews, proceeded to tour the Minnesota Flats Treatment Plant and sludge drying beds. Later, the team drove up the Boulder Creek basin and visited the Boulder Creek Landslide, Lawson Portal, Richmond Portal, the former Richmond Mill, Brick Flat Pit, and, lastly, the Slickrock Retention Reservoir Dam.

On the second day the inspection team visited OU-5 and touring the Confined Disposal Facility, Spring Creek Debris Dam and Keswick Dam. After finishing the inspection of OU-5 several participants departed and the rest remained on site for interviews.

The Site is in good condition and is well maintained. No issues were identified during the Site Inspection that are expected to affect the protectiveness of interim remedies implemented under RODs 1 through 5.

5. Technical Assessment

5.1. Question A: Is the remedy functioning as intended by the decision documents?

The review of Site documents, water quality data, and Site inspection results indicates that the IMM interim remedies are functioning as intended by the decision documents. The Site Operator is properly operating and maintaining the treatment plant and Site. Operation and maintenance costs incurred over the Sixth FYR period were higher than expected due to the extremely heavy rainfall during the 2016 wet season. The inspection team did not identify any issues or observations that diminish the protectiveness of interim remedial actions implemented under RODs 1 through 5.

RODs 1 through 4 remedies include a combination of source control, treatment, and water management. The collection and treatment of AMD from the Richmond Mine, Lawson Mine, and Old No. 8 Mine adits, and the area sources of AMD from the Slickrock Creek watershed have eliminated 98 percent of the historical metals discharges from the Site. The treatment plant substantially complies with Clean Water Act effluent limits specified in RODs 2, 3, and 4, and in most cases, effluent concentrations are well below these limits. EPA's review of performance data indicates that the site operator is running the treatment plant properly. The clean water diversions at Spring Creek and Slickrock Creek have been effective at controlling discharges from sources in the Slickrock Creek watershed and minimizing the volume of contaminated water in Spring Creek Reservoir, thereby increasing the effectiveness of Reclamation water management operations.

The measures put in place by EPA's interim remedial action selected in ROD 5 addressed risks to aquatic receptors from potential releases of hazardous substances from Spring Creek Arm to the Sacramento River ecosystem. Removal of contaminated sediment from Spring Creek Arm, and disposal of dredged sediment in the CDF adjacent to Spring Creek Reservoir, mitigated the risk of releasing contaminated sediment. The ROD 5 interim action also provides an ancillary benefit of reducing restrictions on SCPP and Keswick Reservoir operations. The measures put in place by EPA for ROD 5 continue to function as intended

EPA designed the interim remedial actions selected in RODs 1 through 5 to protect the fishery resources and ecosystem of the Sacramento River below Keswick Dam from cadmium, copper, and zinc discharges from IMM to meet protective water quality criteria, to the extent practicable. Reclamation's water management actions remain key to providing for the safe release of the continuing IMM contaminant discharges from the Boulder Creek watershed, which are estimated to constitute less than 5 percent of the overall historical IMM discharges of copper and zinc. Reclamation controls discharges from Central Valley Project facilities, in accordance with the 1980 MOU and OCAP, to comply with the Basin Plan standards in the Sacramento River below Keswick Dam.

For analysis of the progress of the IMM interim remedies, the review team compared metal concentrations in the Sacramento River below Keswick Dam with the Basin Plan and CTR standards in samples collected by Reclamation as part of the routine monitoring program. However, EPA waived

compliance with the Basin Plan and CTR standards for copper, cadmium, and zinc (among other water quality ARARs) using the "interim actions" waiver but continue to track metal concentrations against the Basin Plan. During the rare occasions of heavy, early, winter storms following a very dry summer (estimated at once every 8 to 10 years in ROD 4, or 3 storm events in the 50-year 2009 water quality model scenario), immediate receiving waters, downstream of Keswick Dam, may not meet water quality objectives. The results of water quality sampling over the past 5 years (January 2013 through December 2017) indicate that copper, cadmium, and zinc concentrations in the Sacramento River below Keswick Dam met Basin Plan standards, and dissolved cadmium and dissolved zinc concentrations met CTR chronic exposure limits.

Institutional controls, which include IMM interim access controls, security measures, governmental agreements, and governmental controls, are effective. The institutional controls prevent potential human exposures and adverse impacts to the integrity or protectiveness of the interim remedial measures implemented under RODs 1 through 5. Reclamation followed operational controls EPA selected in ROD 5 over this FYR period, however, an update to the 1980 MOU should officially record the controls specifying limited restrictions on Keswick Reservoir water elevations to remain protective of the environment over the long term.

5.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

There were no revisions to laws or regulations that could affect the protectiveness of the interim remedial actions identified in RODs 1 through 5. Appendix D contains an analysis of ARARs.

The interim remedial actions have minimized the potential exposure and resultant threats to human health and the environment outside the Site caused by acid mine drainage discharges from contaminant sources addressed by the actions. Performance of the interim remedial actions relative to the three primary goals identified in ROD 4 is summarized below:

- During this FYR period, Discharges from the treatment plant and the surface water samples at the compliance point met water quality criteria (discussed under Question A).

- During this FYR period, the interim remedial actions reduced the mass discharge of toxic heavy metals by 97 percent from the historical discharges. This maintained the level of discharge reduction seen in the previous FYR review period.

- During this FYR period, no special releases of valuable water resources were needed to dilute contaminant discharges and attain protective water quality criteria.

The following summarizes the performance of the Spring Creek Arm of Keswick Reservoir Sediment Removal Remedial Action relative to the criteria in ROD 5:

- Sediment Removal actions in the Spring Creek Arm of Keswick Reservoir have reduced the overall volume of source material for heavy metal loads associated with contaminated sediment discharges from Spring Creek Arm to the Sacramento River.

- Management of the water level at the Spring Creed Debris Dam minimizes the mobilization of residual contaminated sediments in the Spring Creek Arm and protects water quality in the Sacramento River below Keswick Dam.

- Effluent limits for the CDF were achieved. Metals concentrations in effluent samples met compliance standards set in ROD 5.

5.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information was identified during the FYR that calls into question the protectiveness of the remedy. However, the increased frequency and intensity of emergency events at the site (high rainfall events and fires) provides a significant management challenge requiring substantial contingency planning. Although emergency planning is conducted by both EPA and AIG, it is anticipated that the higher frequency and intensity of emergency situations may have the potential to impact effectiveness of the remedy.

6. Issues/Recommendations

Table 5. OUs without Issues or recommendations

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU 1, OU 2, OU 3, OU 4

Table 6. Issues and Recommendations Identified in the Five-Year Review

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 5	**Issue Category: Operations and MaintenanceOperations and Maintenance**			
	Issue: Operational Controls selected in ROD 5 are being followed by Reclamation, but controls specifying limited restrictions on Keswick Reservoir water elevations have not been officially recorded.			
	Recommendation: Implement operational controls selected in ROD 5 through the update to the 1980 MOU.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other Bureau of Reclamation	EPA, along with DTSC and RWQCB as support agencies	1/1/2023

6.1. Other Findings

In addition, the review team recommends IMO address the following items, though they may not affect current and/or future protectiveness:

- In July and August 2018, the Carr Fire destroyed site infrastructure including power poles/lines, AMD conveyance pipelines, and culverts. Additionally, EPA conducted an Emergency Response action to address a fire inside the Richmond Mine which had impacted hundreds of feet of AMD pipeline as well as ventilation and electrical equipment. It is anticipated that with the increased frequency and intensity of emergency events (high rainfall events and fires), there will a larger threat to the effectiveness of the remedies. Contingency plans should be updated frequently and should utilize information yielded during recent emergencies.

In addition, the review team followed up on findings from the previous FYRs which do not affect protectiveness of the remedy in the short- or long-term. Below is an update to the status of these findings:

- During the previous Five-Year Review Inspection, the team noted that the urethane pipeline lining system for the Upper Spring Creek diversion has deteriorated since installation, and is an ongoing O&M issue. The Site Operator inspects the piping system annually, and repair locations that are deteriorated with mortar or grout. EPA provided for the Site Operator to restore or replace the reinforced concrete pipe lining system, as necessary (EPA, 2000). EPA recommended that the Site Operator develop a plan for evaluating the refurbishment and long-term maintenance of the liner system for submittal to EPA by December 2013. During the current review period IMO retained a contractor for repair design, and IMO is currently in the data collection phase of determining if the repair can be done, or if the solution can be accomplished with other inspection tools.

- During the previous Five-Year Review Inspection EPA noted that the concrete plugs in the ore chutes of the Richmond Adit continue to deteriorate. EPA recommended that the Site Operator develop a plan for submittal to EPA by December 2013 to address the failing chute plugs and the associated risks to worker safety, mine access, and the AMD conveyance and treatment system. During the current review period the Site Operator developed and submitted a workplan, which DTSC, IMO and EPA reviewed. The approach for long term management has not been finalized by EPA.

- In the previous three FYRs (EPA, 2003, 2008 and 2013), EPA recommended that the site owner determine the contents of the Essential Solutions, Inc. chemical storage tanks across the road from the cementation plant and provide proper containment, if required, or dispose of the contents properly. The site owner has not yet completed this work. Essential Solutions, Inc., and Arman Trust are developing a work plan for closure of the Ag-Gel pilot project. The objectives of the workplan potentially include adding the Ag-Gel tanks to a list of responsibilities of the property owner, which also includes forestry harvesting/thinning, and the demolition of the tramway and the remaining tanks and their contents.

- As EPA discussed in the Fourth FYR (EPA, 2008), the amount of filtrate has decreased significantly at Brick Flat Pit, and potential filtrate discharge pathways have not been confirmed. EPA recommended that the Site Operator continue to evaluate reasons for the reduced filtrate at Brick Flat Pit. During the current review period, IMO and EPA have discussed how to achieve consensus on the likely fate and transport of the filtrate with the long-term approach to management of Brick Flat Pit.

7. Protectiveness Statement

Table 7. Protectiveness Statement

Protectiveness Statement(s)		
Operable Unit:1 through 4	*Protectiveness Determination:* Protective	Click here to enter a date
Protectiveness Statement: The interim remedial actions implemented at Iron Mountain Mine selected in RODs 1 through 4 for OUs 1 through 4 are protective of human health and the environment. *The remedies for the Site consisting of a combination of source control, AMD collection and treatment, and water management components, including water diversions and coordinated releases of contaminated surface water from Spring Creek Debris Dam (SCDD) into dilution flows from Shasta Dam continue to function to protect human health and the environment.*		

Protectiveness Statement(s)		
Operable Unit: 5	*Protectiveness Determination:* Short-term Protective	Click here to enter a date
Protectiveness Statement: The interim remedial actions implemented at IMM selected in ROD 5 for OU-5 are protective of human health and the environment in the short term. To remain protective of the environment over the long term, operational controls selected in ROD 5, including limited restrictions on the Keswick Reservoir water elevation to prevent mobilization of sediment remaining in Spring Creek Arm, need to be officially recorded.		

8. Next Review

The next five-year review report for the Iron Mountain Mine Superfund Site is required five years from the completion date of this review.

Appendix A: List of Documents Reviewed

ARCADIS. 2015. *2015 Annual Spring Creek Confined Disposal Facility Operations and Maintenance Report for the Iron Mountain Mine Superfund Site*. December 2.

ARCADIS. 2016. *Final 2016 Annual Spring Creek Confined Disposal Facility Operations and Maintenance Report for the Iron Mountain Mine Superfund Site*. June 30.

California Department of Fish and Wildlife (CDFW). 2018a. *Central Valley Chinook Salmon Anadromous Assessment*. Available at: https://www.wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon/Anadromous-Assessment

CDFW. 2018b. *Chinook Salmon*. Available at: https://www.wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

Central Valley Regional Water Quality Control Board (Water Board). 1998. *The Water Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin. Fourth Edition.* Last updated October 2011.

GEI Consultants. 2016. *Desk-Top Geologic Study of Boulder Creek Landslide, Iron Mountain Mine, Shasta County, California.* April 29

Iron Mountain Operations (IMO). 2017. *March 2017 Monthly Progress Report*. March 20.

Iron Mountain Operations (IMO). 2017. *April 2017 Monthly Progress Report*. May 19.

Iron Mountain Operations (IMO). 2017. *June 2017 Monthly Progress Report*. July 20.

Iron Mountain Operations (IMO). 2017. *July 2017 Monthly Progress Report*. August 18.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). 2018a. *Chinook Salmon – Protected*. Available at: https://www.fisheries.noaa.gov/species/chinook-salmon-protected

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). 2018b. *Steelhead Trout*. Available at: https://www.fisheries.noaa.gov/species/steelhead-trout

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). 2018c. *Green Sturgeon*. Available at: https://www.fisheries.noaa.gov/species/green-sturgeon

Remedy Engineering, Inc. 2017. *2017 Annual Spring Creek Confined Disposal Facility Operations and Maintenance Report, Iron Mountain Mine Superfund Site, Redding, California.* May 31.

U.S. Environmental Protection Agency (EPA). 2013. *Fifth Five-Year Review Report for Iron Mountain Mine Superfund Site, Redding, California.* September.

U.S. Environmental Protection Agency (EPA). 2004. *Record of Decision, Iron Mountain Mine, Shasta County, California* (ROD 5). September 30.

U.S. Environmental Protection Agency (EPA). 1997. *Record of Decision, Iron Mountain Mine, Shasta County, California* (ROD 4). September 30.

U.S. Environmental Protection Agency (EPA). 1993. *Record of Decision, Old/No.8 Seep, Iron Mountain Mine, Shasta County, California* (ROD 3). September 24.

U.S. Environmental Protection Agency (EPA). 1992. *Record of Decision, Boulder Creek Operable Unit, Iron Mountain Mine, Shasta County, California* (ROD 2). September 30.

U.S Environmental Protection Agency (EPA). 2000. *Statement of Work Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (SOW). October

U.S Environmental Protection Agency (EPA). 2013. *Statement of Work Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (SOW). Revised December.

Appendix B: Site Chronology

Event	Date
IMM Listed on the National Priority List (Superfund List)	1983
OU-1 – "Sitewide": Richmond Partial Cap, Brick Flat Pit Cap, Slickrock Creek Diversion, Upper Spring Creek Diversion	
Remedial Investigation and Feasibility Study of Options Completed	1985
Feasibility Study Addendum Completed	1986
Interim ROD 1 Signed	1986
Upper Spring Creek Diversion Completed (final required component of interim remedy)	1992
OU-2 – "Boulder Creek": Richmond and Lawson Adits Acid Mine Drainage Treatment, Consolidation of Seven Waste Piles and Capping, Construction of Sludge Disposal Cell	
Remedial Investigation and Feasibility Study of Options Completed	1992
Interim ROD 2 Signed	1992
Aerated Simple Mix Component of Treatment Plant Completed	1994
HDS Component of Treatment Plant Completed	1997
Emergency Storage Facility for Treatment Plant Completed (final required component of interim remedy)	2000
First FYR	1993
OU-3 – "Old /No. 8 Mine Seep OU": Seep Discharge Treatment	
Remedial Investigation and Feasibility Study of Options Completed	1993
Interim ROD 3 Signed	1993
Emergency Storage Facility for Treatment Plant Completed (final required component of interim remedy)	2000
OU-4 – "Water Management OU": Dam and Treat Runoff from Slickrock Creek	
Remedial Investigation and Feasibility Study of Options Completed	1994
Feasibility Study Addendum Completed	1996
Interim ROD 4 Signed	1997
Slickrock Creek Retention Reservoir (SCRR) Completion	2004
Second FYR	1998
Third FYR	2003
Site Improvements under 2000 Settlement	
Brick Flat Pit Phase II Dam Raise	2002
Richmond Mine Adits and Drifts Rehabilitation Completed	2003
Construction of Mine Waste Disposal Cell ("muck cell")	2003
Boulder Creek Tailings Dam Improvements Completed	2004
Matheson Ore Transfer Station Restoration	2005

Event	Date
OU-5 – "Sediment": Remove Sediment Susceptible to Erosion from Spring Creek Arm of Keswick Reservoir	
Remedial Investigation and Feasibility Study of Options Completed	2004
Interim ROD 5 Signed	2004
Remedial Design Completed	2007
Spring Creek Arm of Keswick Reservoir Sediment Removal Remedial Action	
Implementation of remedy including hydraulic dredging and construction and closure of the Confined Disposal Facility.	2008-2011
"Operational and Functional" determination; EPA turned over the CDF to DTSC on October 26, 2012	2012
Fourth FYR	2008
Sitewide Remedial Investigation and Feasibility Study, including OU-6 – "Boulder Creek Area Sources"	Ongoing
Fifth FYR	2013
Sixth FYR	2018

Notes:
CDF = Confined Disposal Facility
DTSC = Department of Toxic Substances Control
HDS = High-density Sludge
OU = Operable Unit
ROD = Record of Decision
Spring Creek Arm = Spring Creek Arm of Keswick Reservoir

Appendix C: Data Review Figures

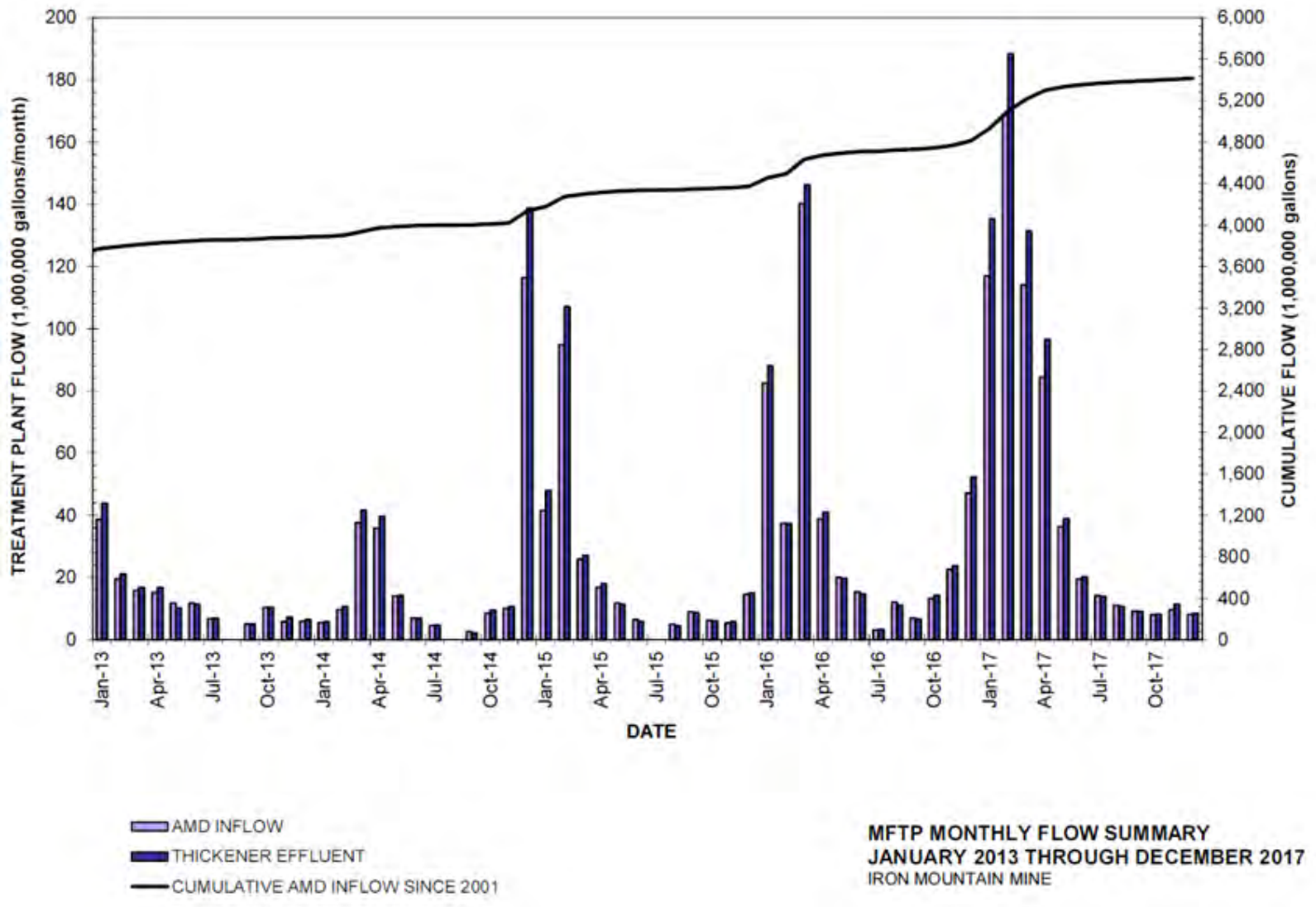

Figure C-1. MFTP Monthly Flow Summary

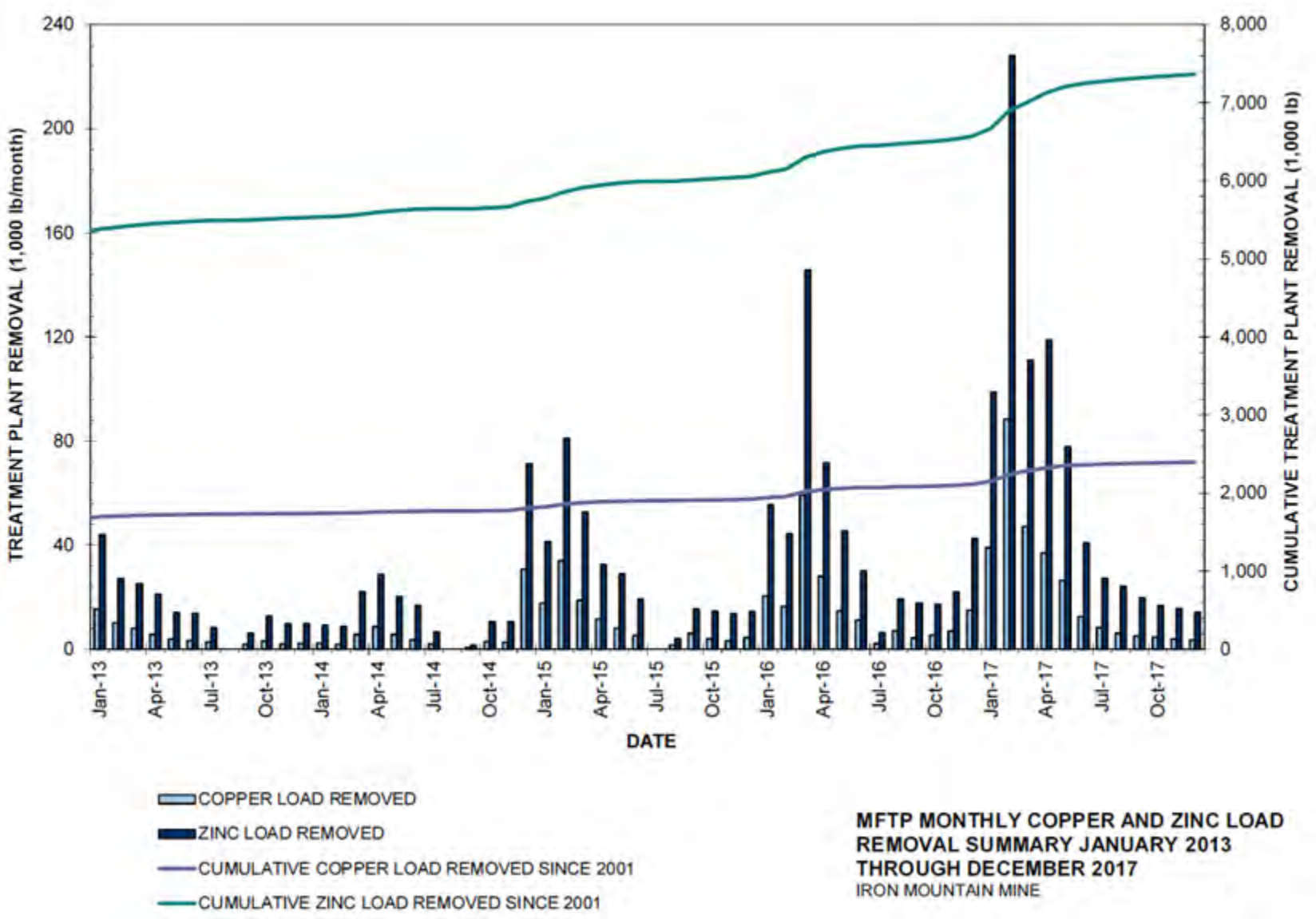

Figure C-2. MFTP Monthly Copper and Zinc Load Removal Summary

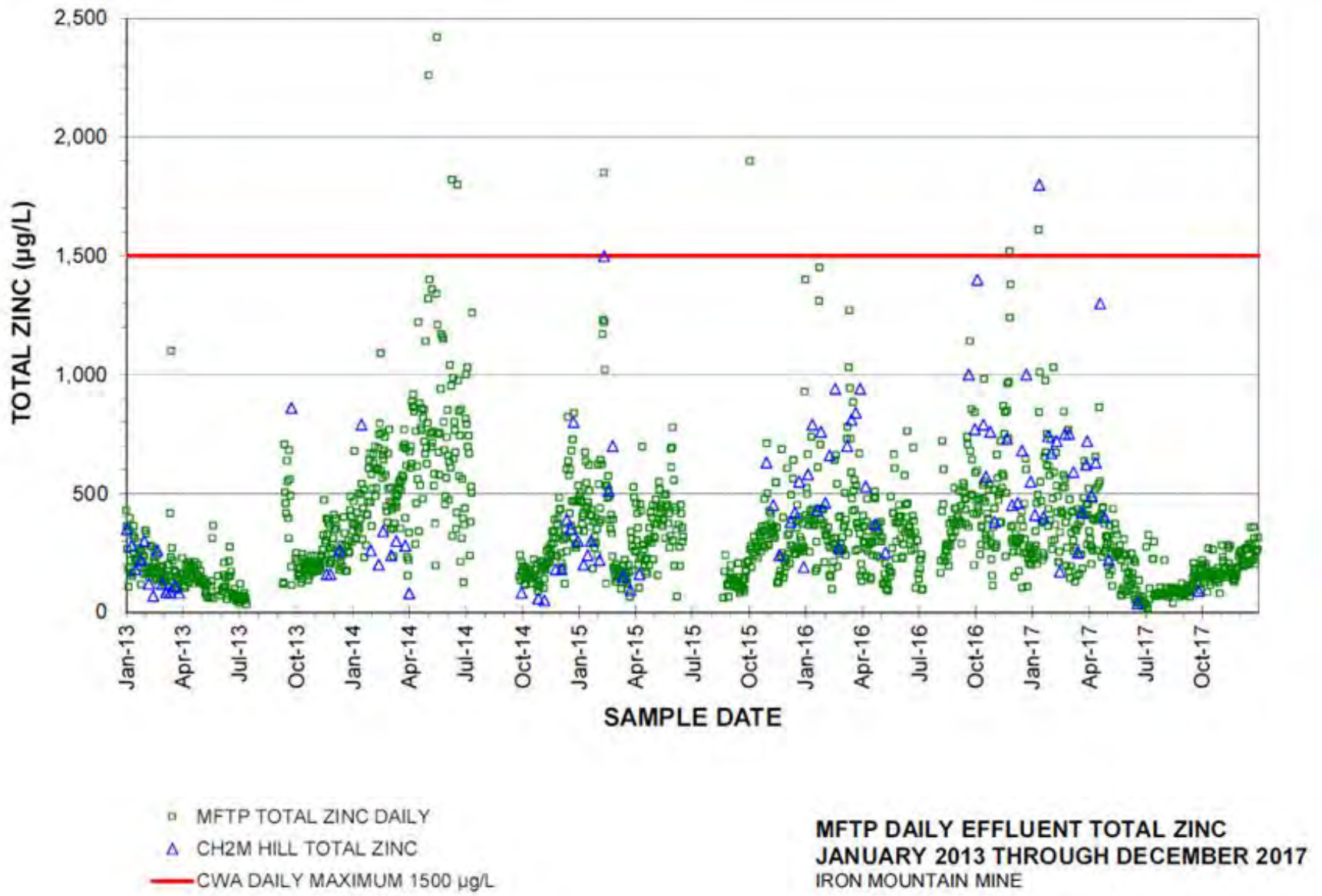

Figure C-3. MFTP Daily Effluent, Total Zinc

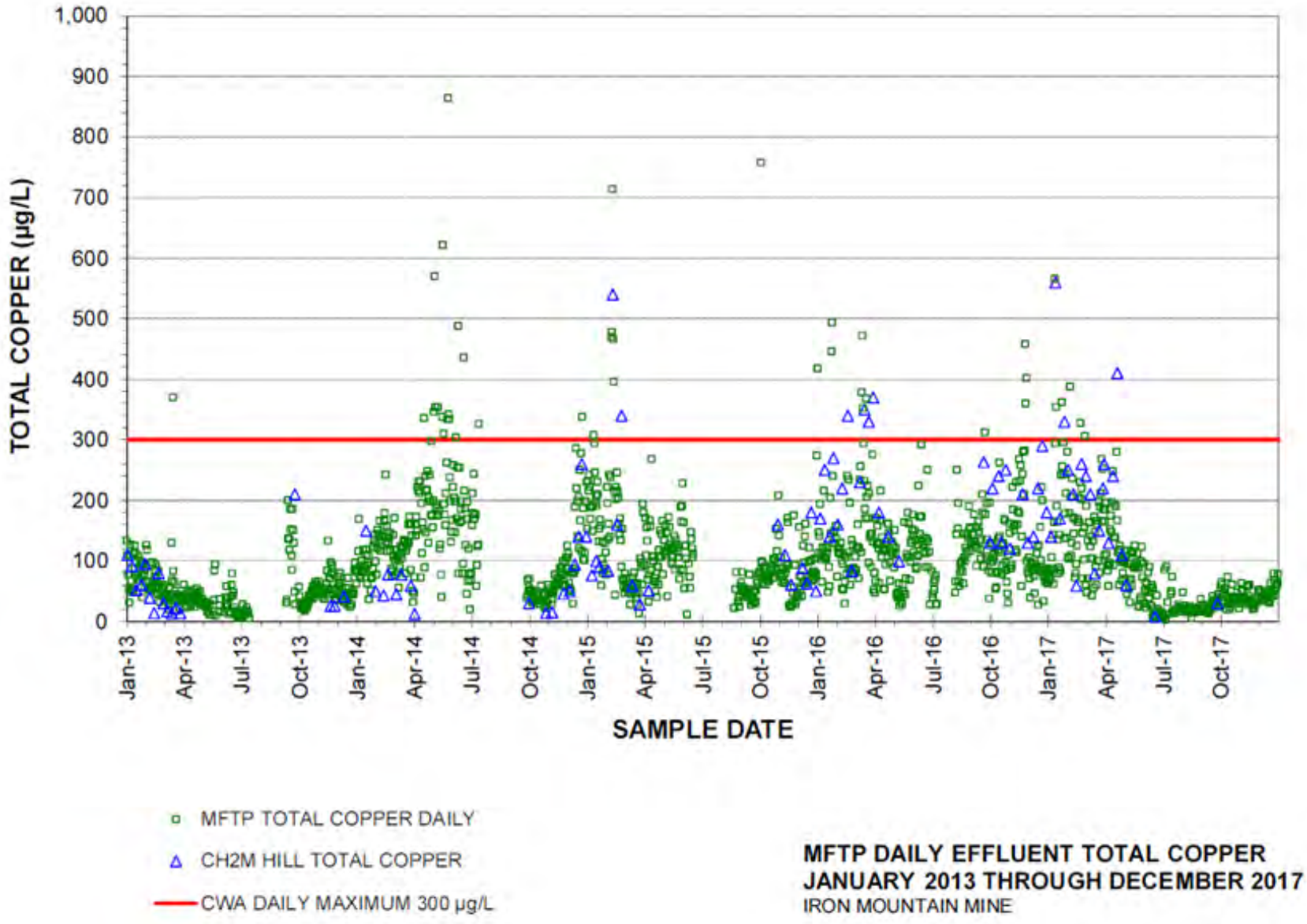

Figure C-4. MFTP Daily Effluent, Total Copper

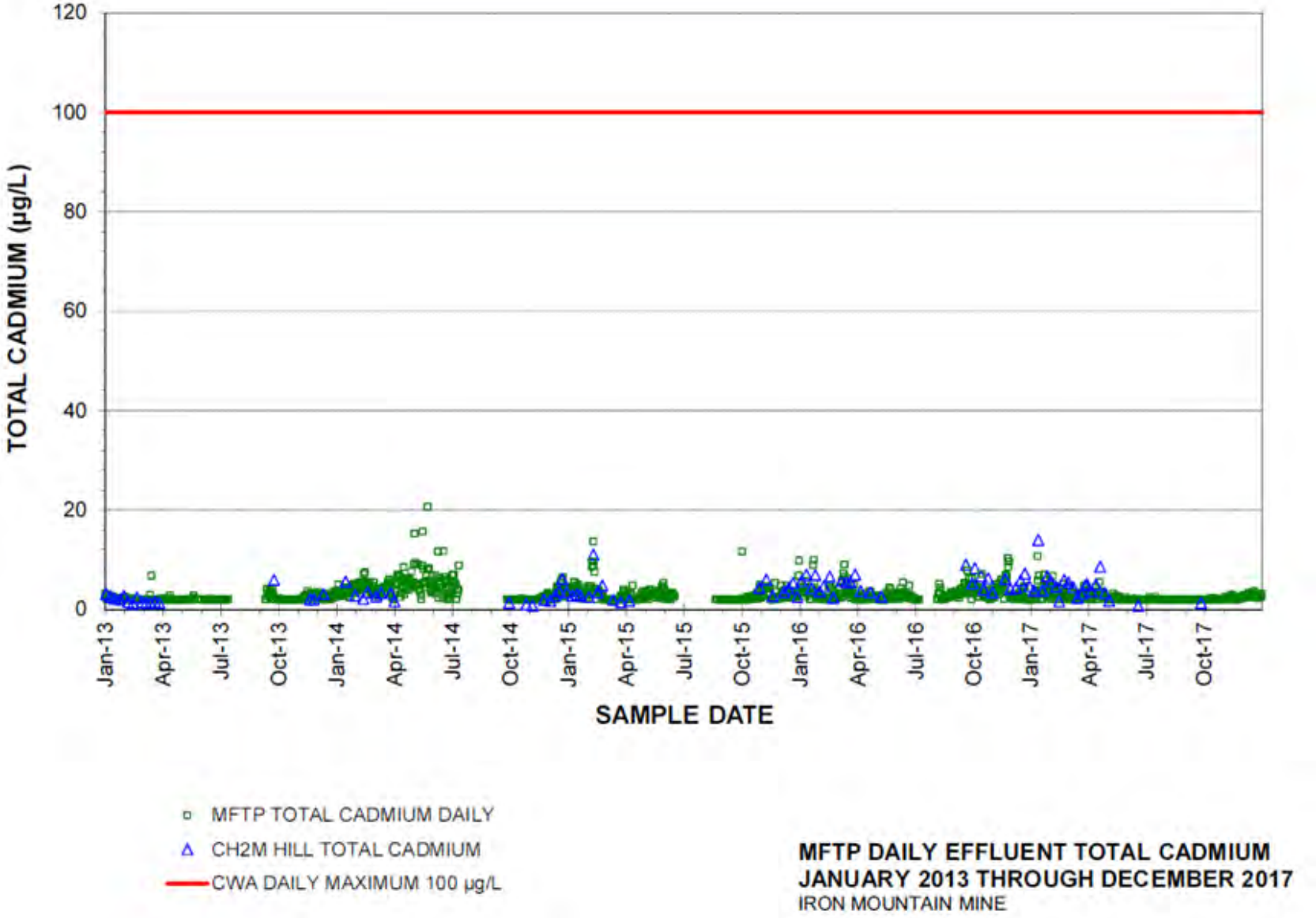

Figure C-5. MFTP Daily Effluent, Total Cadmium

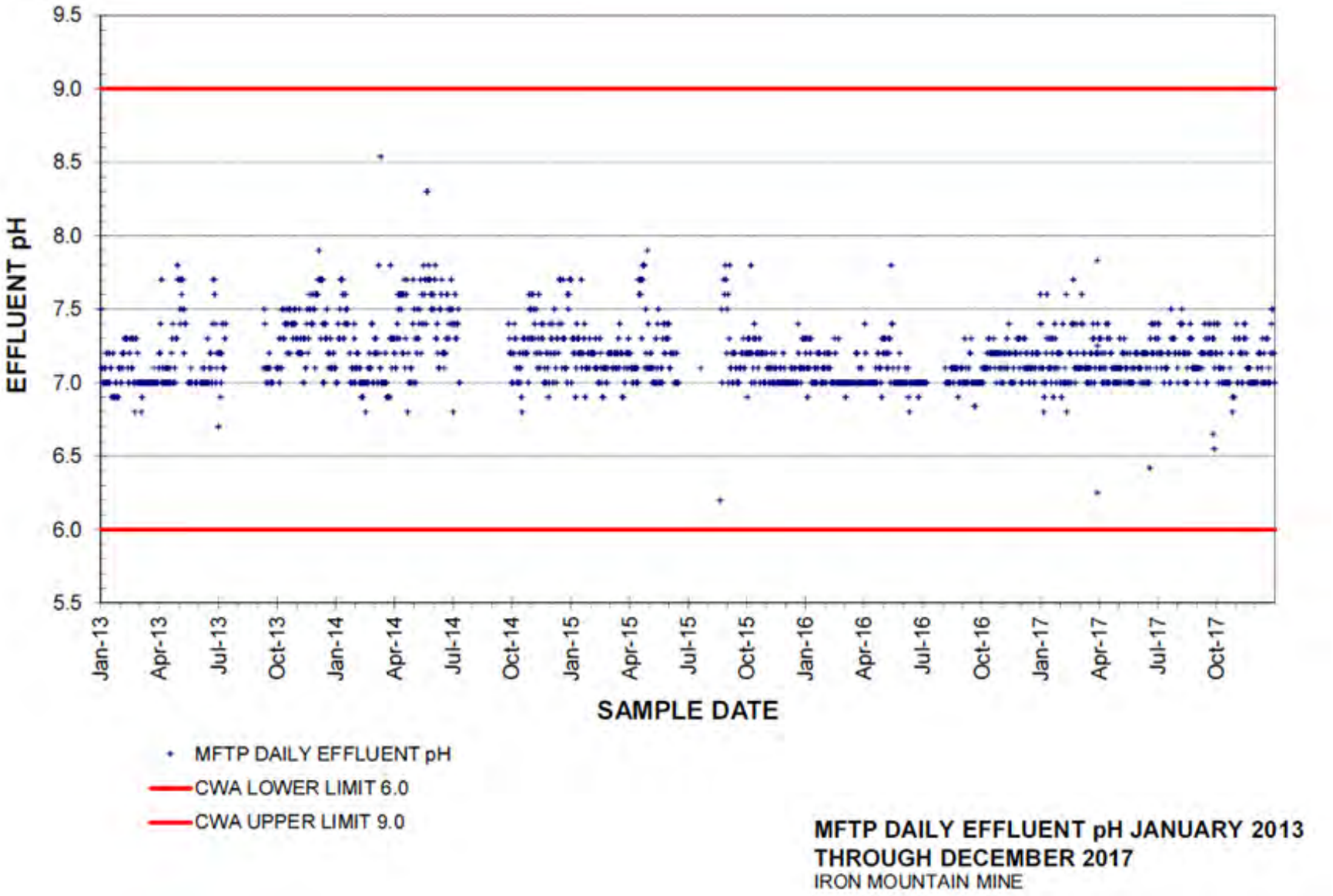

Figure C-6. MFTP Daily Effluent, pH

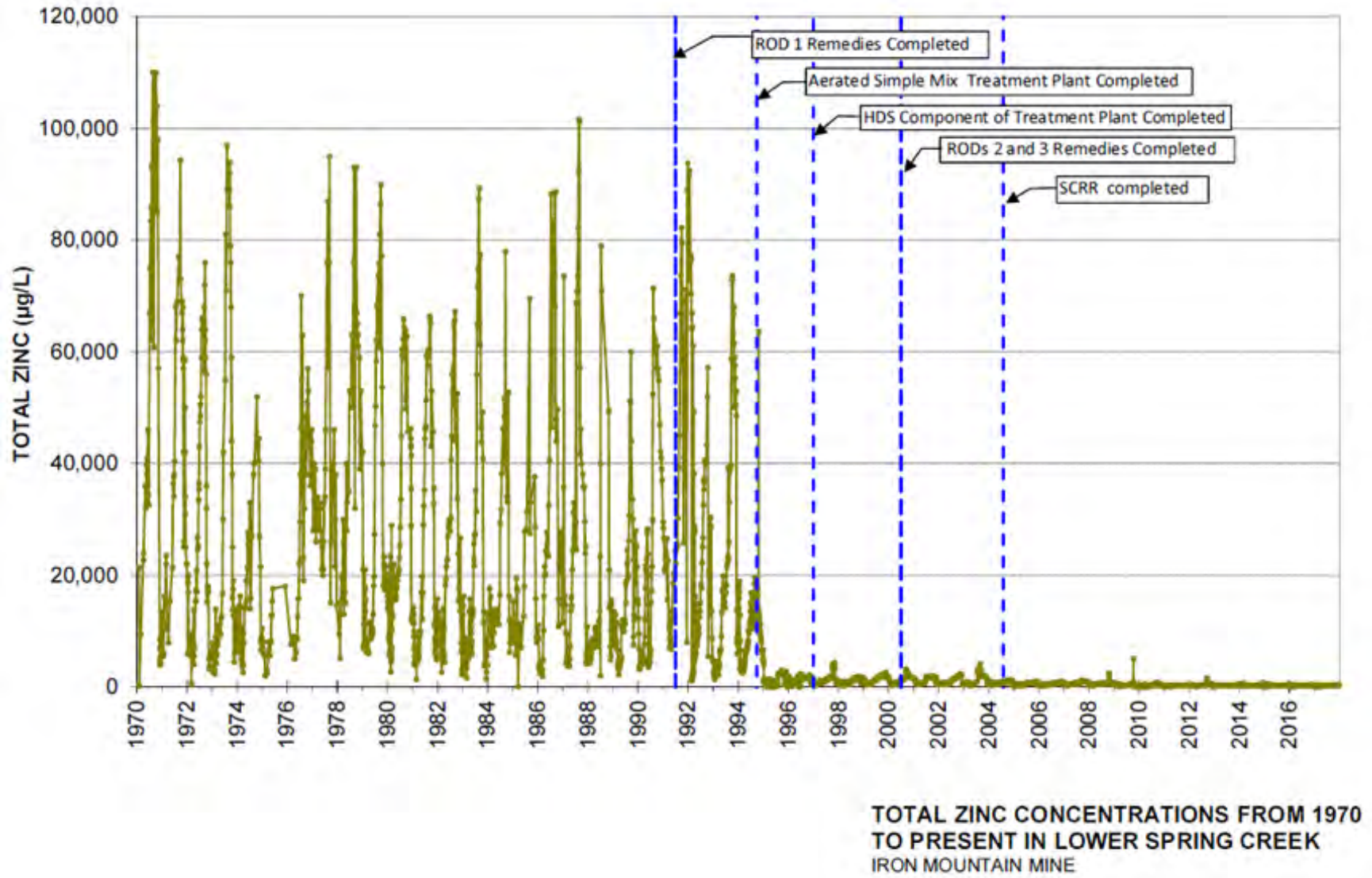

Figure C-7a. Total Zinc Concentrations from 1970 to Present in Lower Spring Creek

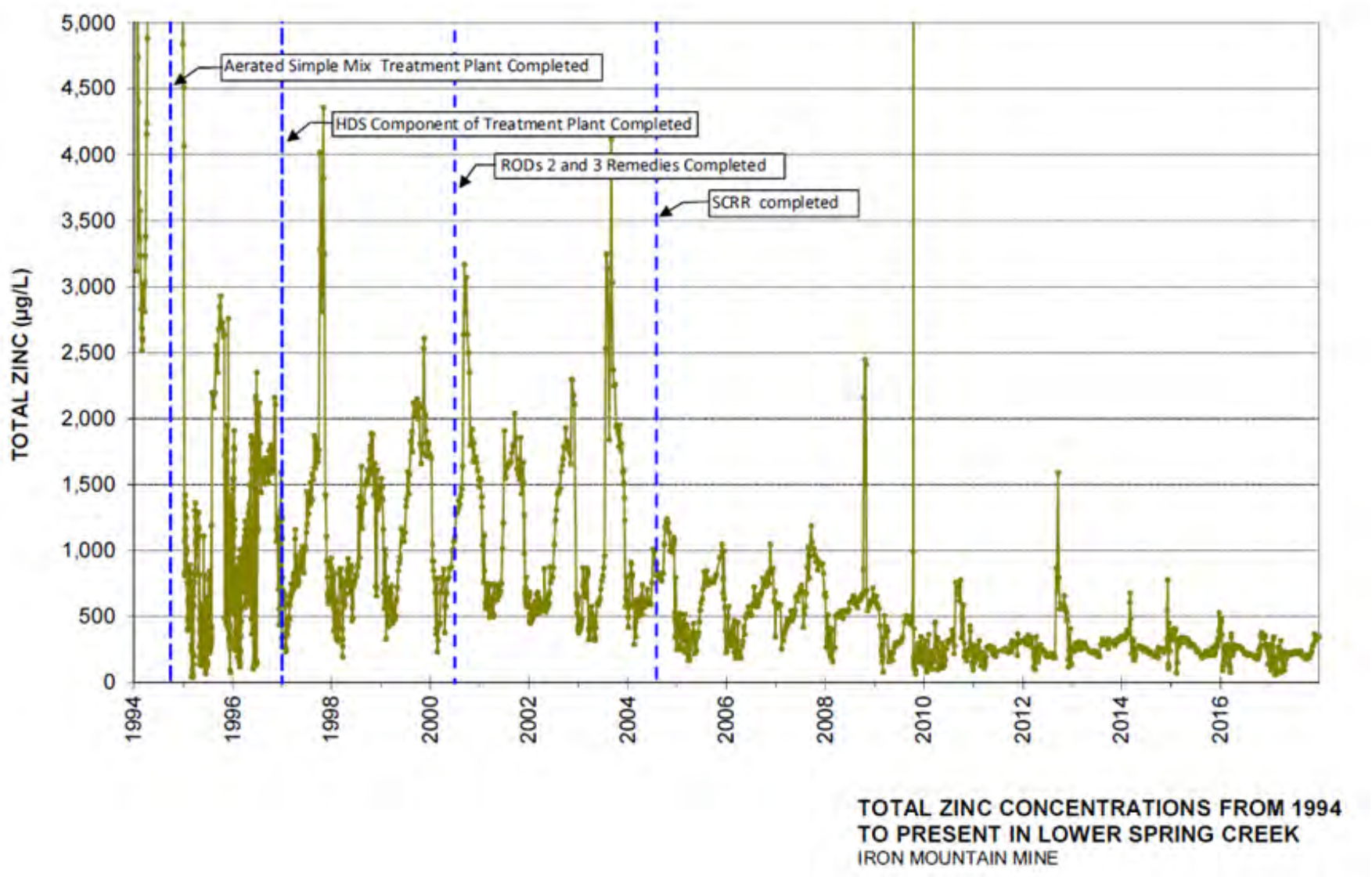

Figure C-7b. Total Zinc Concentrations from 1994 to Present in Lower Spring Creek

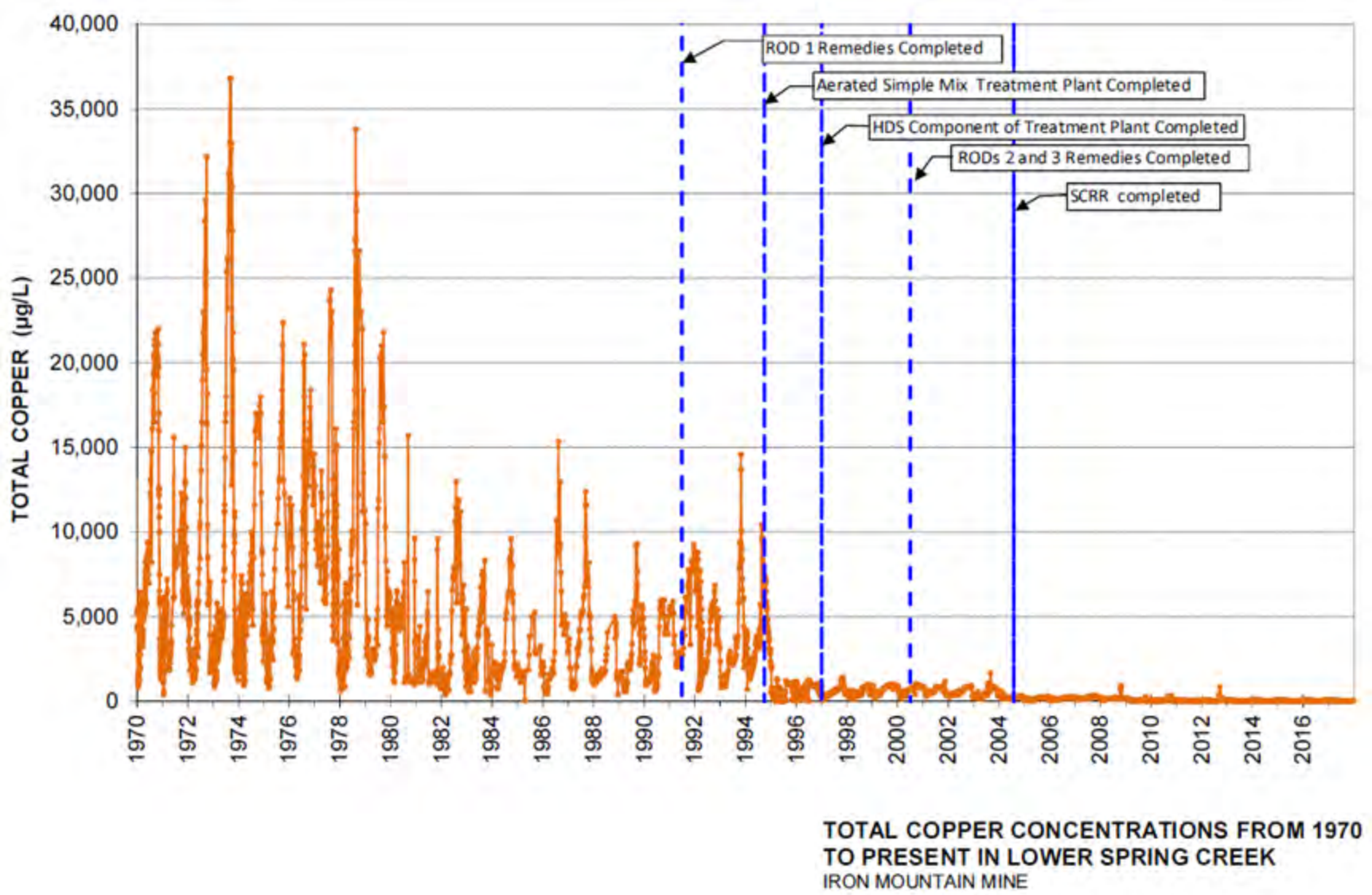

Figure C-8a. Total Copper Concentrations from 1970 to Present in Lower Spring Creek

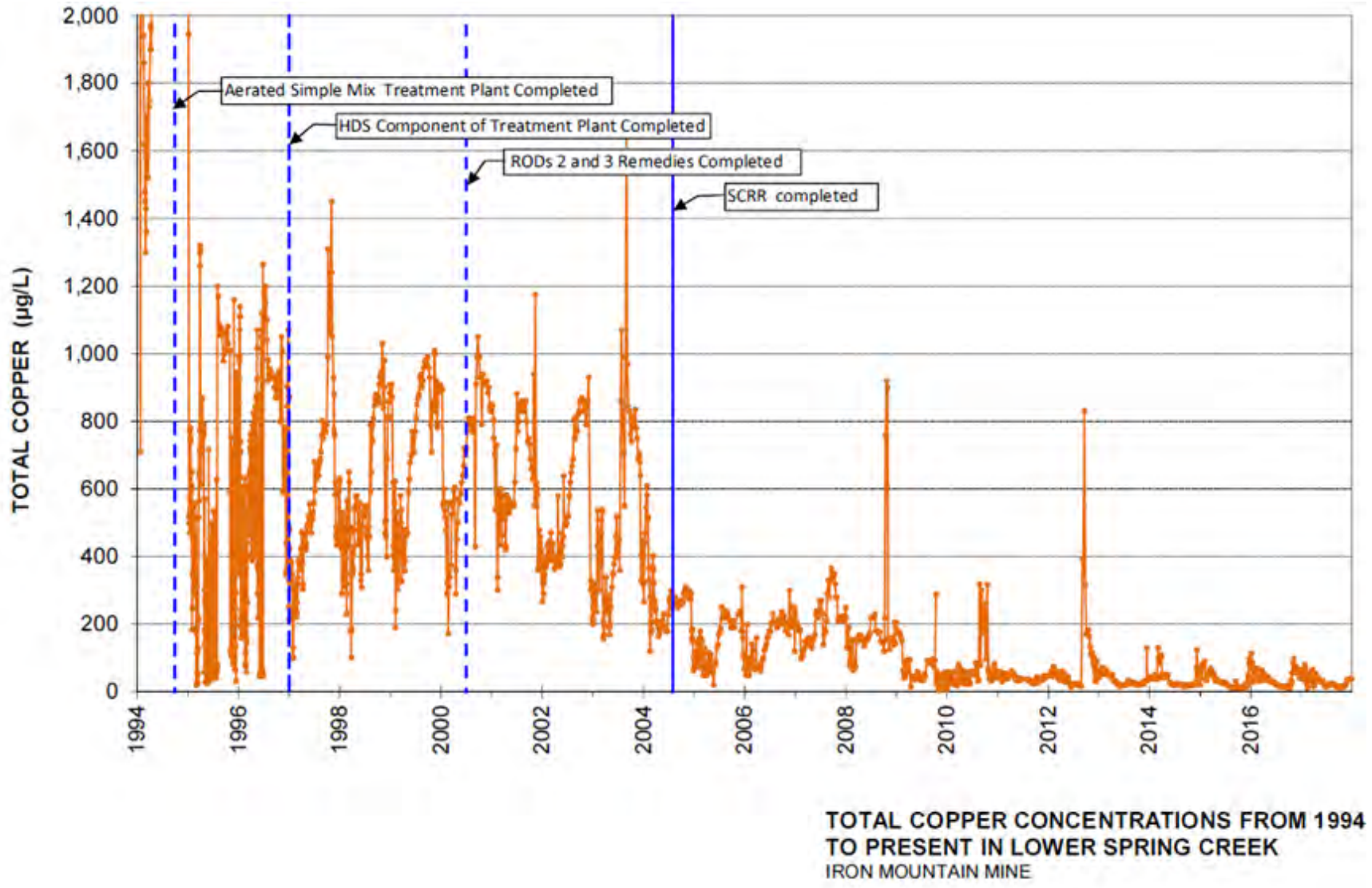

Figure C-8b. Total Copper Concentrations from 1994 to Present in Lower Spring Creek

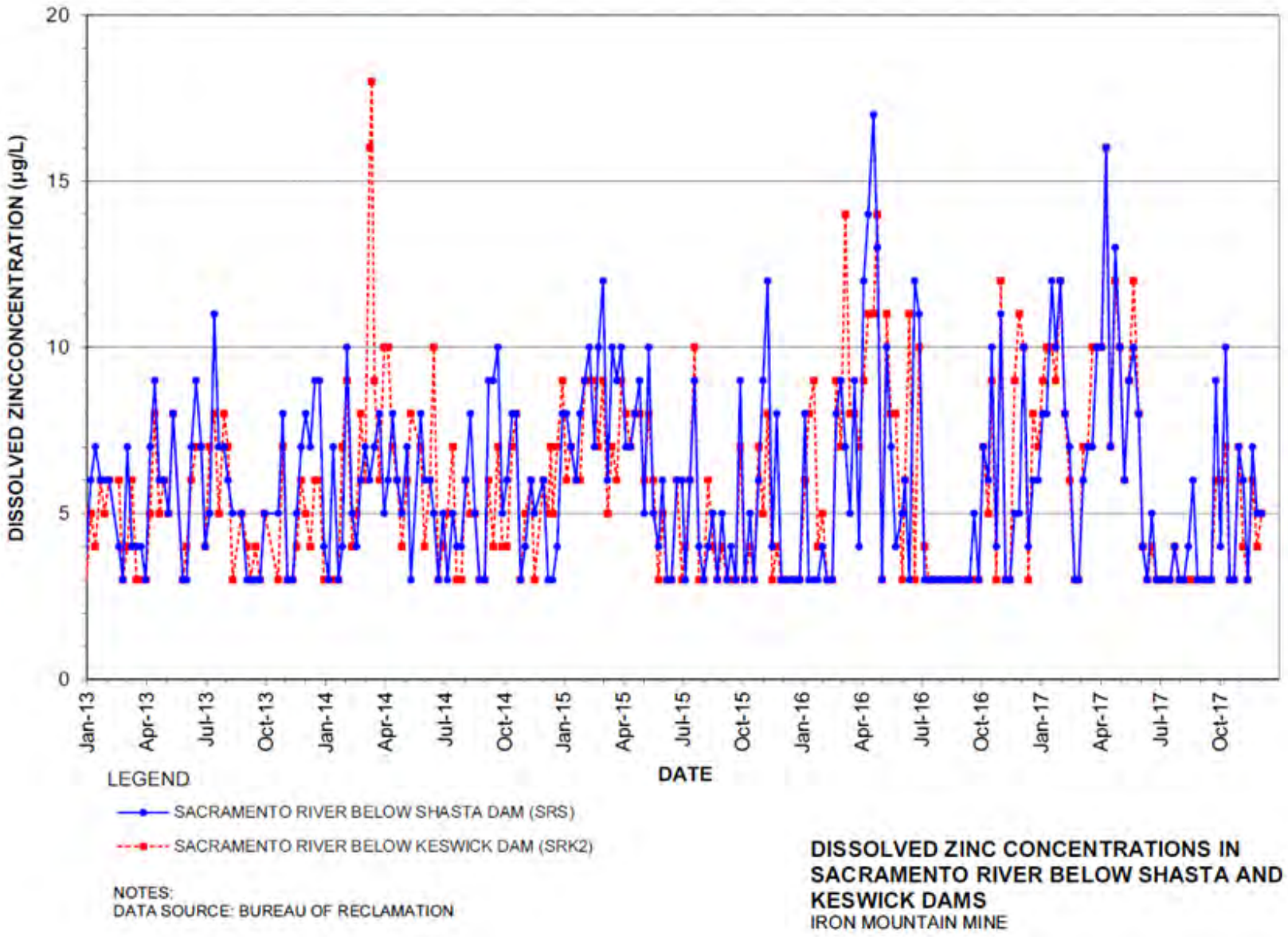

Figure C-9. Dissolved Zinc Concentrations in Sacramento River below Shasta and Keswick Dams

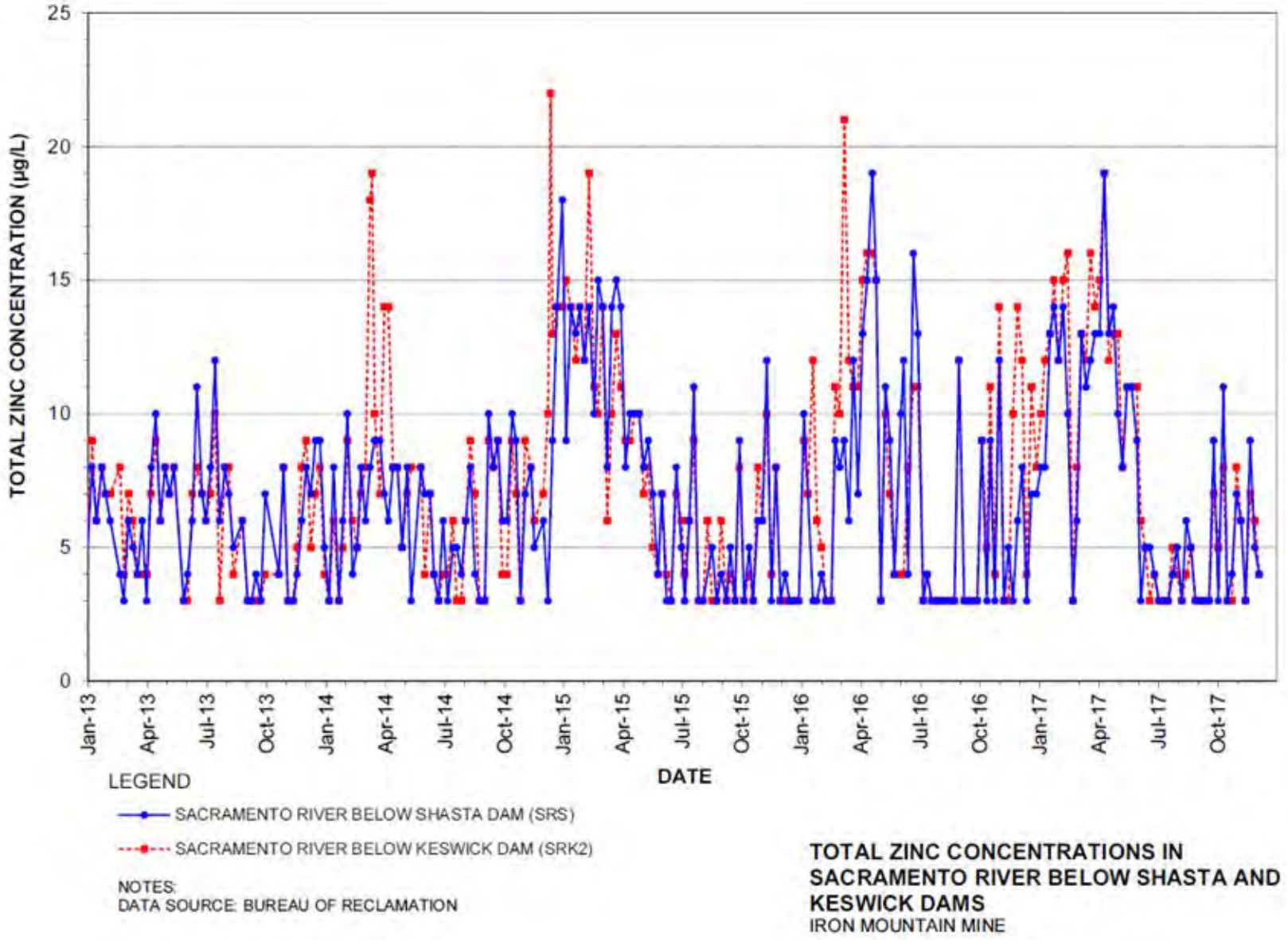

Figure C-10. Total Zinc Concentrations in Sacramento River below Shasta and Keswick Dams

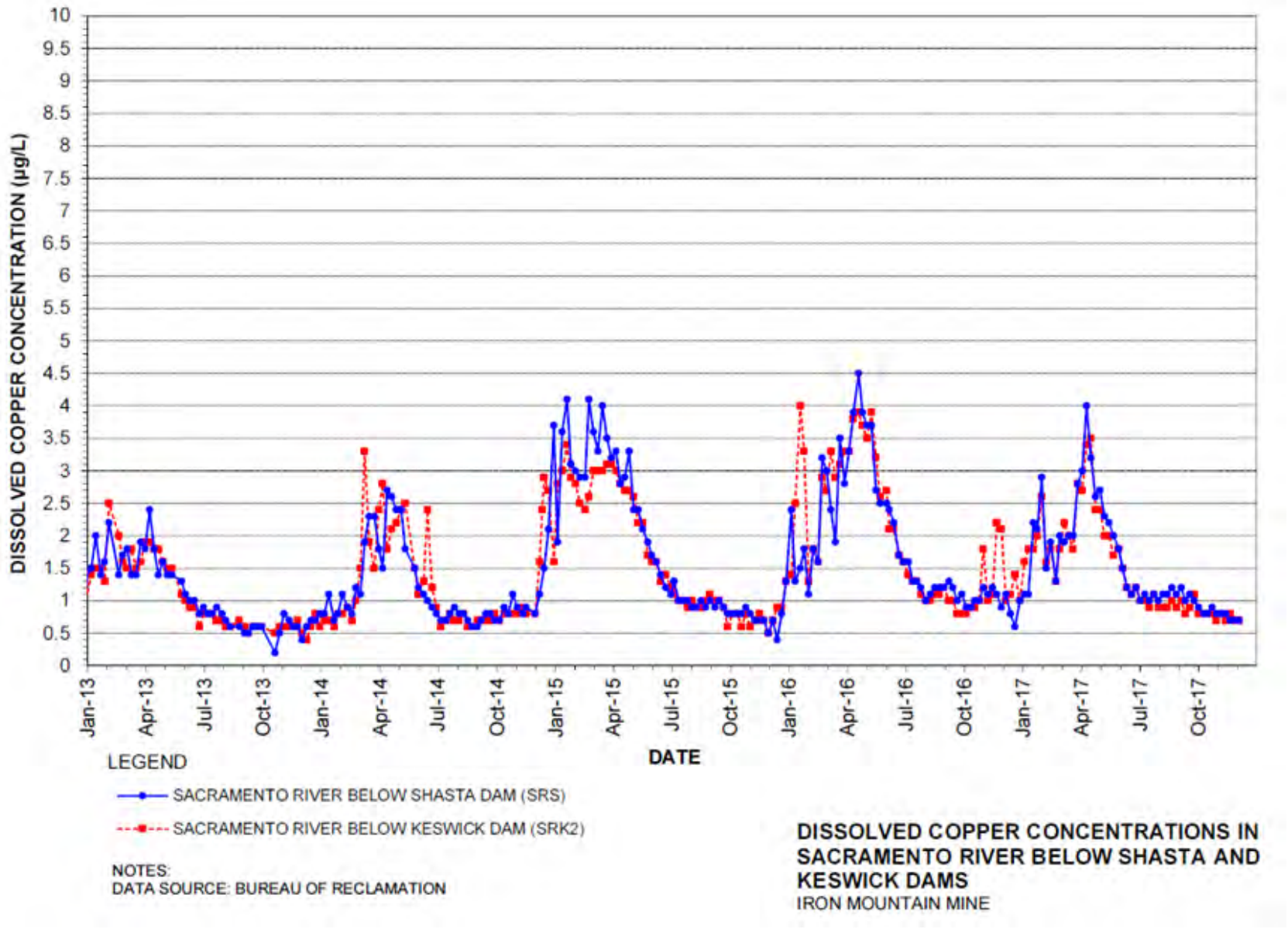

Figure C-11. Dissolved Copper Concentrations in Sacramento River below Shasta and Keswick Dams

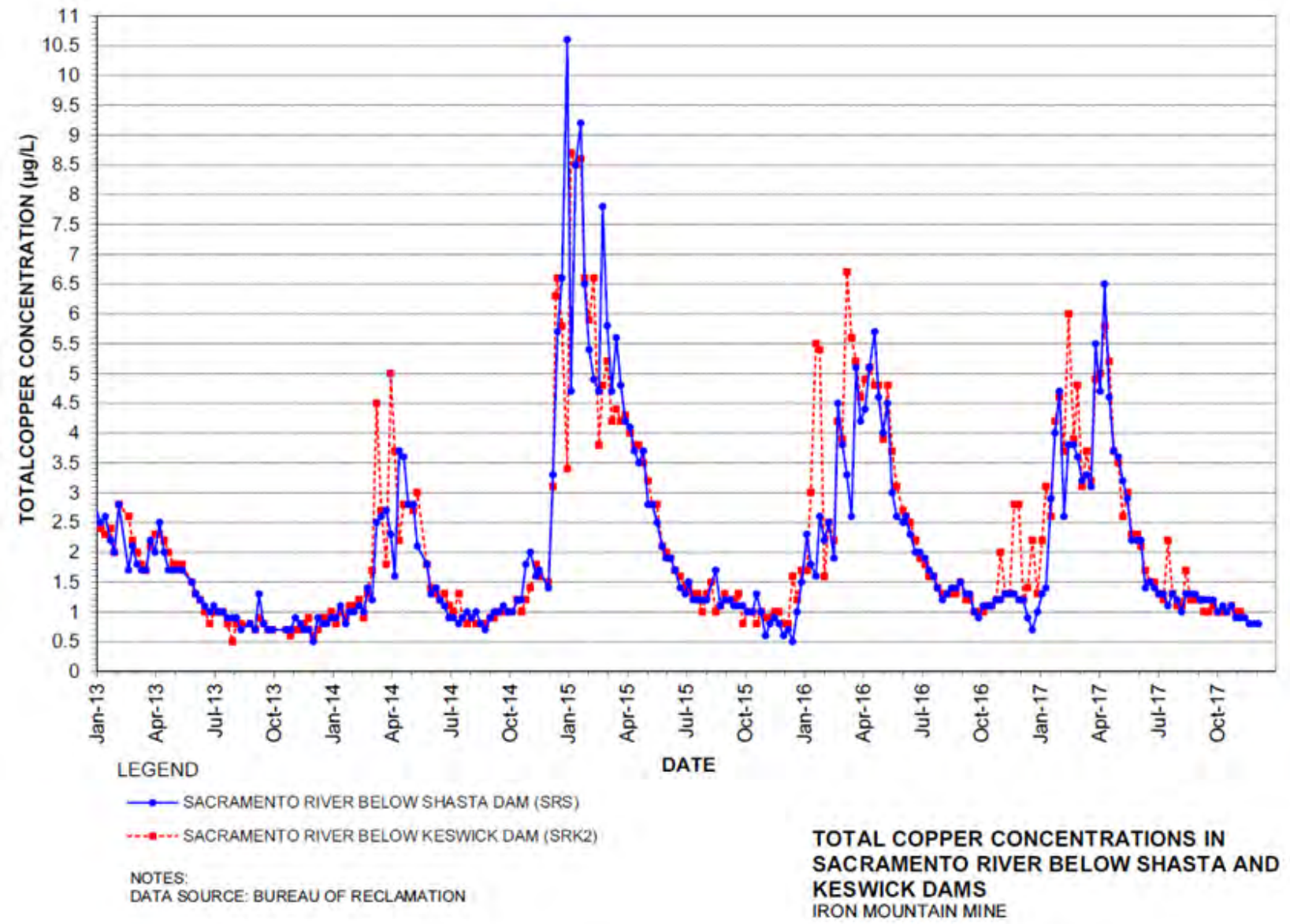

Figure C-12. Total Copper Concentrations in Sacramento River below Shasta and Keswick Dams

Appendix D: ARAR Assessment

Section 121 (d)(2)(A) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Changes (if any) in ARARs are evaluated to determine if the changes affect the protectiveness of the remedy. Each ARAR and any change to the applicable standard or criterion are discussed below.

Chemical-specific ARARs identified within the RODs at this Site and considered for this FYR are shown in Table D-1 and D-2. EPA selected the Clean Water Act effluent limitations for existing point sources at copper and zinc mines (40 CFR §§ 440.102(a) and 440.103(a); see Table D-1) as relevant and appropriate for the Minnesota Flats Treatment Plant (treatment plant; MFTP) in RODs 2, 3, and 4. These limitations were also included as performance criteria in ROD 5 for return water discharged from the confined disposal facility (CDF), however, the pH and total suspended solids effluent limitations were waived for the CDF. There have been no changes this ARAR and no impact on the protectiveness of the interim remedial actions.

Table D-1. Clean Water Act Effluent Limitations

Parameter	30-Day Average [a] (mg/L)	Daily Maximum [b] (mg/L)
Copper (total)	0.15	0.30
Cadmium (total)	0.05	0.10
Zinc (total)	0.75	1.5
Lead (total)	0.3	0.6
TSS [c,d]	20	30
pH [d]	6.0 to 9.0	6.0 to 9.0

[a] Average of daily concentration values for 30 consecutive days.
[b] Maximum allowable concentration measured for any one day.
[c] TSS = Total Suspended Solids
[d] Applicable for discharge to Flat Creek
Note: Effluent limitations are from 40 CFR §§ 440.102(a) and 440.103(a).

In ROD 5, EPA specified that discharges of sediment from Spring Creek Arm shall not cause exceedances of the chemical-specific ARARs at the compliance point. The applicable numeric standards are presented in Table D-2. There have been no changes to these ARARs and no impact on the protectiveness of the interim remedial actions.

Table D-2. Sacramento River Water Quality Criteria

Parameter	Basin Plan Maximum Concentration [a] (µg/L)	California Toxics Rule Continuous Concentration (4-day Average) [a] (µg/L)
Arsenic	10	150
Cadmium	0.22 [b]	1.1 [b]
Copper	5.6 [b]	4.1 [b]
Iron	300	No standard
Zinc	16 [b]	54 [b]

[a] Dissolved concentrations.
[b] Concentration is dependent on hardness; objectives presented assume a hardness of 40 mg/L.
Note:
Basin Plan = *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* (Central Valley Water Quality Control Board [Water Board], 1998)
California Toxics Rule = 40 CFR § 131.38

Federal and State laws and regulations other than the chemical-specific ARARs that have been promulgated or changed over the past five years are described in D-3. The table does not include those ARARs that are no longer pertinent. There have been no revisions to laws or regulations that affect the protectiveness of the remedy.

The following ARARs have not changed since the last Five-Year Review; and therefore, do not affect protectiveness:

- Safe Drinking Water Act; National Primary Drinking Water Standards (MCLs) (40 CFR §141.62)
- Maximum Contaminant Levels (CA); Title 22, Division 4, Chapter 15, Article 4.1 (22 § CCR 64435) and Article 5.5 (22 § CCR 64444.5)
- Requirements for Land Use Covenants; Title 22, Division 4.5, Chapter 39 (22 CCR § 67391.1(a), (b), (d), (i))
- Groups of Mining Waste; Title 27, Division 2, Subdivision 1, Chapter 7, Subchapter 1, Article 1 (27 CCR § 22480)
- State Water Resources Control Board Resolution 68-16
- State Water Resources Control Board Resolution 92-49 (Status Note: Applicable, but waived.)
- Fish and Wildlife Coordination Act; 16 USC § 661 et seq. and 40 CFR § 6.302(g)
- Endangered Species Act (16 USC § 1531 et seq., and 40 CFR § 6.302(h)
- Fish and Game Code Sections 1600, 1603, 2070, 2080, 2081, 3005, 5650, 5651 (Status Note: Section 5650 is applicable, but waived.)
- Resource Conservation and Recovery Act Bevell Exclusion – Resource Conservation and Recovery Act 3001(b)(3)(A)(ii); 42 USC § 6921(a)(3)(A)(ii); and 40 CFR § 261.4(b)(7)
- Shasta County Air Quality Management District Rules 3-2 and 3-16.
- Land Use Covenants Regulations: California Civil Code, Section 1471(a) and (b); California Health and Safety Code, Section 25222.1
- Water Code 13172 and regulations promulgated thereunder (27 CCR § 22480(b))
- Mining closure requirements under Water Code 13172; 27 CCR § 21900 (a), (b), and (c); 27 CCR § 21400 (a) and (b)1
- TPCA, California Health and Safety Code § 25208, et seq.

Table D-3. Summary of ARAR Changes for Site

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
National Primary Drinking Water Standards (MCLs) 40 CFR §§ 141.61 and 141.62 Safe Drinking Water Act	RODs 2, 3,4, and 5	Establishes national primary drinking water standards to protect the quality of water in public water systems. MCLs represent the maximum concentrations of contaminants permissible in a water system delivered to the public. MCLs are generally relevant and appropriate when determining acceptable exposure limits for current or potential sources of drinking water.	The change to this regulation does not affect protectiveness.	Approval of testing methods	May 31, 2013
National Toxics Rule and California Toxics Rule (40 CFR Part 131)	ROD 5	Establishes numeric aquatic life criteria and human health criteria for priority toxic pollutants. This regulation is applicable to inland surface waters, bays, and estuaries in California.	The change to this regulation does not affect protectiveness. Status Note: Applicable, but waived.	Changes did not affect criteria for the Site COCs.	August 21, 2015
Basin Plan *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* (Central Valley Water Quality Control Board)	RODS 1, 2, 3, 4, and 5	The Basin Plan establishes beneficial uses for groundwater and surface water, water quality objectives designed to protect those beneficial uses, and implementation plans to achieve water quality objectives.	The change to this regulation does not affect protectiveness. Status Note: Applicable, but waived.	Amendments did not change criteria for Site COCs.	October 2017
Fish and Game Code Section 1505	RODs 2, 3, 4, and 5	Requirements for the management, control, and protection of spawning areas on state lands to protect fish life in these areas	The change to this regulation does not affect protectiveness.	Minor non-substantive change	January 1, 2016

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Endangered Species Act (50 CFR Part 402)	RODs 1, 2, 3, 4, and 5	Protects endangered or threatened species and their habitat. If endangered or threatened species are in the vicinity of remediation work, the U.S. Fish and Wildlife Service must be consulted. Remediation activities must be designed to conserve endangered or threatened species and habitats.	The change to this regulation does not affect protectiveness.	• 50 CFR Part 402: Revision of regulatory definition • 50 CFR Part 402: incidental take statement provisions	• March 14, 2016 • June 10, 2015
Clean Water Act (Section 404) – Dredge or Fill Requirements (33 USC § 1251-1376 and 40 CFR Part 230)	RODs 2, 3, 4, and 5	Establishes requirements that limit the discharge of dredged or fill material into Waters of the United States. EPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specifies the consideration of alternatives that have fewer adverse impacts and prohibits discharges that would exceed surface water quality standards, exceed toxic effluent standards, or jeopardize threatened or endangered species. Special consideration is required for special aquatic sites, including wetlands.	The change to this regulation does not affect protectiveness.	• 40 CFR Part 230: Clarified the definition of ``waters of the United States" • 33 USC § 1267: Added provision for a survey of the Chesapeake Bay • 33 USC § 1268: Revised provision for Long Island Sound • 33 USC § 1274: Clarifications and revisions to requirements for Watershed Pilot Projects • 33 USC § 1292: Revisions to language related to land acquisition • 33 USC § 1321: Revised language to remove “tribal”; added the word “and” • 33 USC § 1330: Added language related to awards. Removed outdated budget information • 33 USC § 1342: Added permit information for silvicultural activities • 33 USC § 1362: Defined treatment works	• August 28, 2015 • December 16, 2016 • December 16, 2016 • June 10, 2014 • June 10, 2014 • December 18, 2014; December 12, 2017 • May 20, 2016 • February 7, 2014 • June 12, 2014

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
NPDES (40 CFR Part 122)	RODs 2, 3, 4, and 5	The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into Waters of the United States.	The change to this regulation does not affect protectiveness.	• Removal of language added by the pesticides rule • Requirement of electronic reporting • Establishment of requirements for cooling water intake structures at existing facilities and amendment of requirements at Phase I facilities • Use of sufficiently sensitive test methods for permit applications and reporting (Correction) • Municipal Separate Storm Sewer System General Permit Remand Rule	• June 27, 2013 • December 21, 2015 • October 14, 2014 • September 18, 2014 • December 9, 2016
The National Dam Safety Program Act (33 USC §467(f)	ROD 4	Substantive provisions of the act encourage acceptable engineering policies and procedures to be used for dam site investigations, design, construction, operation and maintenance, and emergency preparedness.	The change to this regulation does not affect protectiveness.	Minor non-substantive change	June 2014

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Water Code 6000 through 6501 and regulations promulgated thereunder (23 CCR §§ 301-333)	ROD 4 and 5	Establishes authority of the State of California to require that a dam shall be designed, constructed, operated, and maintained so that it does not constitute a danger to life or property.	The change to this regulation does not affect protectiveness.	• 6002.5: Definition of critical appurtenant structure • 6009: Definition: state jurisdictional dam • 6025.6, 6032: Revision to dam ownership and operation responsibilities • 6160, 6161, 6162: Revision related to inundation mapping requirements • 6307: Clarification of fees, revenue, and energy costs • 6428-6432: Revisions to offenses and punishments related to negligent dam operation	• June 27, 2017 • June 27, 2017 • June 27, 2017 • June 27, 2017 • June 27, 2017 • June 27, 2017

Appendix E: Press Notice

Published in *Record Searchlight* (Redding.Com) on April 21, 2018.

U.S. EPA BEGINS SIXTH FIVE-YEAR REVIEW OF CLEANUP AT IRON MOUNTAIN MINE SUPERFUND SITE

Every five years, the U.S. Environmental Protection Agency (EPA) conducts a review of cleanup actions at the Iron Mountain Mine Superfund site near Redding, California. These are called Five-Year Reviews (FYRs). FYRs help EPA understand how cleanup actions are working to protect human health and the environment. This is the sixth FYR at the Iron Mountain Mine.

The Iron Mountain Mine site was periodically mined for iron, silver, gold, copper, zinc and pyrite. Though mining operations were discontinued, underground mine workings, waste rock dumps, piles of mine tailings and an open mine pit remain. This creates issues with acid mine drainage, which is when highly acidic water, rich in metals, moves out of a mined area into the environment. Prior to EPA cleanup activities, acidic mine drainage impacted the Spring Creek Reservoir and Sacramento River. EPA has implemented a series of actions to capture and treat acid mine drainage, consolidate waste rock pile, and to remove contaminated sediments from the Spring Creek Arm of Keswick Reservoir.

During the FYR, EPA will inspect the site; review site documents and data; identify any new information; and seek input from partner agencies and interested community stakeholders. The last FYR, conducted in 2013, found that cleanup continued to be protective of human health and the environment.

EPA expects to complete the FYR and issue the findings in a FYR Report by September 30, 2018. A copy of the final report will be posted on EPA's website and placed in the information repositories listed below shortly after this date.

EPA invites the community to learn more about this review process and provide input to the Agency. You may contact Lily Tavassoli, Project Manager, with any questions or observations regarding cleanup at the Iron Mountain Mine site: (415) 972-3146 or tavassoli.lily@epa.gov. For more site information, please visit EPA's website at: http://www.epa.gov/superfund/ironmountainmine.

In addition, you can visit the local information repository at Redding Library, 1100 Parkview Ave., Redding, CA 96001, (530) 245-7252 or EPA's Superfund Records Center, 75 Hawthorne St., 3rd floor, San Francisco, CA 94105, (415) 947-8717.

CNS-3117120#

Appendix F: Interview Forms

Five-Year Review Interview Record			
Site:	Iron Mountain Mine (IMM)	**EPA ID No:**	CAD980498612

Interview Type: Phone Interview
Location of Visit: N/A
Date: November 8, 2017
Time: 1400

Interviewers

Name	Title	Organization
Benino P. McKenna	Geologist/Hydrologist	USACE

Interviewees

Name	Organization	Title	Telephone	Email
Kate Burger	CRWQCB	Senior Engineering Geologist	(530) 224-4845	Kate.burger@waterboards.ca.gov

Summary of Conversation

1) What is your overall impression of the project?

I consider the remedies of OUs 1 through 4 to be a great success. The remedies have successfully stopped uncontrolled discharges at the site, limited discharges to the Sacramento River and minimized fish kills. Active treatment is crucial to the continued success of the remedies.

2) Is the remedy functioning as expected? How well is the remedy performing?

The remedy is performing as expected. Perhaps even better than expected. Having reduced 97% of the discharge of COCs to the Sacramento River I would say it is performing excellently.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Concentrations of copper below Keswick Dam from January 2013 to present are less than 2 micrograms per liter. There have been no exceedances. Graphs of concentration data below Keswick Dam going back to 2005 do not show any discernable trends. The consistently low concentrations are a positive sign.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

N/A

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

No changes noted during this five-year period.

6) What are the annual operating costs for your organization's involvement with the site?

As a support agency the oversight budget is approximately $10,000 per year.

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.

High flows, high volumes and high sludge volumes have been a concern. Long term viability of the long-term storage is a big concern for RWQCB. We would like to potentially evaluate the lifetime capacity of Brick Flat Pit and the option of raising Brick Flat Pit Dam to Phase 2.5.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

N/A

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

Like the last Five-Year Review, the current compliance points are concentrations of Copper, Zinc and Cadmium below the Keswick Dam as per the Basin Plan. The compliance point may not stay below Keswick as it reflects multiple sources and not just Iron Mountain Mine. The final remedy plan will need to evaluate these items.

10) Do you have any comments, suggestions, or recommendations regarding the project?

The Boards' opinion is that it's never too early to start working on final remedy plans. The Site is going to lose some of the ARAR waivers when final remedy is adopted. It would be prudent to look to more sustainable approaches for treatment plant operations. Looking ahead to the 2030 deadline we will need to ensure that infrastructure is in the best possible shape during the transfer. The 2030 transfer is 13 years out and the equipment will be 13 years older. The balloon payment could be quickly eaten up by costly equipment repairs. Balloon payment costs associated with the remedy should be made to last as long as possible and are currently forecasted for 100 years. The transfer of the institutional knowledge from the existing staff would be a paramount objective during the transfer. Sludge disposal capacity could be a limiting factor moving forward. Hauling the sludge off site to landfills is not economically sustainable for the future. Something for consideration is the EPAs level of funding so that we can keep remedy going. The Boards' opinion is that it is a good idea to have semiannual stakeholder meetings to ensure the success of the remedy. It would be good to have all parties (BLM, EPA, Board, and DTSC) know what new information has come to light and why there are new reservoir levels needed. It would be good to have current dissemination of the information to help finalize the updated MOU.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	Iron Mountain Mine (IMM)	**EPA ID No:**	CAD980498612

Interview Type: Phone Interview
Location of Visit: N/A
Date: November 20, 2017
Time: 1300

Interviewers

Name	Title	Organization
Benino P. McKenna	Geologist/Hydrologist	USACE

Interviewees

Name	Organization	Title	Telephone	Email
McKinley Lewis	DTSC	Project Manager	(916) 255-3625	Mckinley.lewis@dtsc.ca.gov

Summary of Conversation

1) What is your overall impression of the project?

We are entering the fourth year of O&M for OU-5. The frequency of monitoring and inspections haven't shown any surprises. The objectives for OU-5 are being met. At this time DTSC has no concerns for the remedy or performance.

2) Is the remedy functioning as expected? How well is the remedy performing?

The objectives of the OU for preventing the migration of contaminated sediment from Spring Creek into the Sacramento River are being met. DTSC consistently sees low concentrations for COCs. The remedy is performing as well as designed.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

The DTSC has consistently seen low concentrations of COCs below Keswick Dam since the site was declared an OU in 2013 and began operating in 2013. The data shows that COCs and suspended solids are either on a steady decline or consistently lower than MCLs or non-detect. The average pH level is 7.9 which is approximately that of seawater.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Yes there is a continuous O&M presence. DTSC became responsible for the OU in 2012 and initiated activities that include monitoring the filtrate from the 12-inch pipe, storm water monitoring, cap filtrate and cap cover inspections. Site security is performed as well. The addition of video surveillance signage at the cap has contributed to the limiting of trespassing.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

No. No significant changes.

6) What are the annual operating costs for your organization's involvement with the site?

Approximately $50,000 per year.

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.

The only concerns for DTSC were the unauthorized access to the site and trespassers driving across the cap. Repair work that is part of regular cap maintenance was performed and video surveillance signage has been added to mitigate this.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

For the most part no. Things are progressing smoothly and as far as optimization goes the best example would be the signage example.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

Not that I know of.

10) Do you have any comments, suggestions, or recommendations regarding the project?

The remedy is doing what it is supposed to be doing. There are not anticipated problems. No cost issues and no functioning issues. Everyone on the team is genuinely engaged in the success and protection of the site. The team's performance during the winter storms of 2017 was outstanding and deserves recognition for their efforts.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	Iron Mountain Mine (IMM)	**EPA ID No:**	CAD980498612

Interview Type: In Person Group Interview
Location of Visit: Iron Mountain Mine
Date: October 25, 2017
Time: 1200

Interviewers

Name	Title	Organization
Benino P. McKenna	Geologist/Hydrologist	USACE

Interviewees

Name	Organization	Title	Telephone	Email
Tom Wallis	CH2MHILL (consultant to EPA)	Project Manager	(530) 229-3236	Tom.Wallis@ch2m.com
Rudy Carver	Iron Mountain Operations	Site Manager	(530) 245-4477	Rudycarver.imo@gmail.com
Julie Diebenow	AIG	Technical Services Manager	(208) 343-0303	Julie.Diebenow@aig.com

Summary of Conversation

1) What is your overall impression of the project?

- Tom Wallis: Very good and very well run. There are still challenges ahead but I'm confident that those challenges can be met.
- Julie Diebenow: Things are running very well. We have a super-experienced crew running the system and they are very engaged which has made for a good PM experience.
- Rudy Carver: I love it. Mother Nature is constantly throwing us problems and doing problem solving is something I enjoy. We have great funding through AIG and technical support through GEI consultants. It has been a very rewarding experience.

2) Is the remedy functioning as expected? How well is the remedy performing?

- Tom Wallis: Yes. The remedy is performing better than expected. Due to diligent ongoing maintenance this last winter the Minnesota Flats Treatment Plant outperformed specifications.
- Julie Diebenow: Yes. Running very well. As technology evolves there will be opportunities to improve but as of now it is achieving its goals.
- Rudy Carver: The remedy is performing exactly as expected. We have made some adjustments but the plant is performing very well.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

- Tom Wallis: The monitoring data shows we are not having any surprises. Things appear stable. We have not noticed a significant decrease overall. Boulder Creek has shown a slight decrease but overall no decreases from point sources. This shows that the plant is doing its job.
- Julie Diebenow: Concur with Tom's answer.
- Rudy Carver: The monitoring data shows and ore body with a 1,000 to 2,000 year deterioration life and we've only seen 20 years. Overall, I look at the concentrations and see miniscule declines but largely a stable environment.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

- Rudy Carver: Yes, there is a continuous O&M presence. We have a twenty-four hour a day capacity. During the winter onset we have a nighttime person as well. There are at least 2 people here on site most if not all hours of the day. All staff are on call to do extended shifts during the critical winter months.
- Tom Wallis: Concur with Rudy's answer.
- Julie Diebenow: Concur with Rudy's answer.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

- Tom Wallis: The Scope of Work (SOW) has been rewritten which is significant. The gist of the update was to have a more reality-based focus. And to align the SOW with what is achievable and what can and cannot be done.
- Julie Diebenow: Concur with Tom's answer.
- Rudy Carver: Concur with Tom's answer.

6) What are the annual operating costs for your organization's involvement with the site?

- Tom Wallis: The ballpark range is between 5 to 6.5 million on the low side and over 10 million on the high side. These higher costs are largely due to repairs, winter sludge haul and the higher lime usage from the 2017 winter storm effects.
- Julie Diebenow: Concur with Tom's answer.
- Rudy Carver: Concur with Tom's answer.

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.

- Tom Wallis: The 2017 winter storms presented significant challenges to the system operations in terms of road maintenance, system repairs and lime usage as stated above.
- Julie Diebenow: Concur with Tom's answer.
- Rudy Carver: Concur with Tom's answer.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

- Rudy Carver: We are always optimizing O&M at the site. We are always replacing pipes and parts to be more effective and increase the lifespan of the equipment. An example would be the repair to the Boulder Creek Landslide Piping.
- Julie Diebenow: We have implemented in the revised 2013 SOW the acid management system, and included how to foresee maintenance opportunities and schedules. These were developed by comparing to emergency planning methods. We have updated the SCADA systems to prevent duplicity and streamline systems. We continue to look for ways to optimize using the acid management plan.
- Tom Wallis: Concur with Rudy and Julie's answers.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

- Tom Wallis: Not at this time.
- Julie Diebenow: Not at this time.
- Rudy Carver: No

10) Do you have any comments, suggestions, or recommendations regarding the project?

- Tom Wallis: No, not at this time.
- Julie Diebenow: I think its running well and we look to improve. The staff is always looking to improve and increase efficiency. I think the crews are doing a great job.
- Rudy Carver: We want to do a good job and we have a crew that takes great pride in the work they do at this facility.

Additional Site-Specific Questions

Appendix G: Site Inspection and Photographs from Site Inspection Visit

I. SITE INFORMATION	
Site name: Iron Mountain Mine	**Date of inspection: October 24-25, 2017**
Location: Redding, California, Region 9	**EPA ID: CAD980498612**
Agency, office, or company leading the five-year review: EPA and USACE	**Weather/temperature: Clear/Sunny, light winds, approximately 85° F**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☒ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: See Section 4 of the Sixth Five-Year Review Report for specifics of remedial actions implemented under Records of Decision (ROD) 1 through 4.

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager**: Rudolph Carver (Name) IMO Site Manager (Title) 10/25/2017 (Date)

   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (530) 245-4477

   Problems, suggestions; ☐ Report attached Interview Included in Appendix E

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency: California Regional Water Quality Control Board
Contact: Kate Burger (Name) Senior Engineering Geologist (Title) 11/8/2017 (Date) (530) 224-4845 (Phone no.)
Problems; suggestions; ☐ Report attached Interview Included in Appendix E

Agency: California Department of Toxic Substances Control
Contact: McKinley Lewis (Name) Project Manager (Title) 11/20/2017 (Date) (916) 255-3625 (Phone no.)
Problems; suggestions; ☐ Report attached Interview Included in Appendix E

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☒ Report attached.

Julie Diebenow, Technical Services Manager-Environmental Specialty Claims Consultants, AIG

Tom Wallis, Project Manager, CH2MHill (consultant to EPA)

Interview Records are included in Appendix E

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
Remarks: IMO is currently updating the Site Specific Health & Safety Plan with CIH subcontractors and will be receiving draft plans before the end of the year.

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks: Plant employees largely receive hands on, person-to-person O&M training. Plant management is developing a training record that will document training topics covered.

4.	**Permits and Service Agreements**	
	☒ Air discharge permit	☒ Readily available ☒ Up to date ☐ N/A
	☒ Effluent discharge	☒ Readily available ☒ Up to date ☐ N/A
	☐ Waste disposal, POTW	☐ Readily available ☐ Up to date ☒ N/A
	☒ Other permits: DWR-DSOD for SCCRR & BFP	☒ Readily available ☒ Up to date ☐ N/A
	Remarks_____	
5.	**Gas Generation Records**	☐ Readily available ☐ Up to date ☒ N/A
	Remarks_____	
6.	**Settlement Monument Records**	☒ Readily available ☒ Up to date ☐ N/A
	Remarks_____	
7.	**Groundwater Monitoring Records**	☒ Readily available ☒ Up to date ☐N/A
	Remarks_____	
8.	**Leachate Extraction Records**	☒ Readily available ☒ Up to date ☐ N/A
	Remarks_____	
9.	**Discharge Compliance Records**	
	☐ Air	☐ Readily available ☐ Up to date ☒ N/A
	☒ Water (effluent)	☒ Readily available ☒ Up to date ☐ N/A
	Remarks: IMO collects MFTP influent, effluent, filtrate and surface water analytical data and submits reports to EPA and other regulatory agencies monthly. An evaluation of MFTP effluent is provided in Appendix C of the IMM Sixth Five-Year Review Report.	
10.	**Daily Access/Security Logs**	☒Readily available ☒ Up to date ☐ N/A
	Remarks: A sign-in book is maintained in the IMO office for all visitors as a permanent record of site access going back to the 1990s.	

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ Contractor for State
   - ☐ PRP in-house
   - ☐ Contractor for PRP
   - ☐ Federal Facility in-house
   - ☐ Contractor for Federal Facility
   - ☒ Other: A PRP-funded settlement is being used by AIG to fulfill the requirements of the 2000 SOW.

2. **O&M Cost Records**
   - ☒ Readily available ☒ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate_____ ☐ Breakdown attached

   Total annual cost by year for review period if available

From: December 2012 (Date)	To: November 2013 (Date)	$5,166,922 (Total cost)	☐ Breakdown attached
From: December 2013 (Date)	To: November 2014 (Date)	$5,175,523 (Total cost)	☐ Breakdown attached
From: December 2014 (Date)	To: November 2015 (Date)	$7,343,569 (Total cost)	☐ Breakdown attached
From: December 2015 (Date)	To: November 2016 (Date)	$7,741,135 (Total cost)	☐ Breakdown attached
From: December 2016 (Date)	To: November 2017 (Date)	$11,173,149 (Total cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons:

   The winter storms of 2016 resulted in historic rain levels at the site and required MFTP to operate at full utilization for an extended period of time. As a result of increased acid mine drainage (AMD) discharge levels the plant incurred increased lime costs to maintain treatment standards. Additionally, the increased plant utilization resulted in accelerated deposition of the High-Density Sludge to the sludge drying beds and required IMO to initiate a winter sludge haul to empty beds #3 and #4 to allow for the operational balance of 2017. Road maintenance for sludge hauling activities was also initiated ahead of schedule for 2017. The heavy rainfall also resulted in slight movement of the Boulder Creek Landslide which prompted repairs of the AMD pipeline associated with it. The pipeline was repaired and retrofitted to now be able to accommodate future movement of the slide without losing containment.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks: Any potential access roads to the Site are blocked by "Tank Traps" and boulders. An occasional hiker, horseback rider, ATV or dirt bike rider may inadvertently gain access but overall there are no issues.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by Inspections conducted by staff.

Frequency Five days a week during the dry season but less frequently during wet season

Responsible party/agency IMO

Contact Rudy Carver (Name) Site Manager (Title) 10/25/2017 (Date) (530) 245-4477 (Phone no.)

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: Any potential access roads to the Site are blocked by "Tank Traps" and boulders. An occasional hiker, horseback rider, ATV or dirtbike rider may inadvertently gain access but overall there are no issues.

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Site operations included annual road repair as part of normal maintenance. Repairs are expected to be on going into future operations.

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks N/A_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks None_____
   _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

C. Letdown Channels ☒ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☒No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☒ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☒ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☒ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition G Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☒ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☒ Erosion not evident
   Remarks_____

3. **Outlet Works** ☒ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☒ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☒ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks: All Vegetation is annually controlled and monitored.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☒ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks: Pump in PW3 was replaced at the Old/No. 8 location.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☒ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks: The AMD collection and conveyance system is used to monitor, capture, and convey AMD to the MFTP. The system includes high-density polyethylene pipelines, grit chambers, check dams, risers, air relief valves, pumps, electrical systems, process control systems, telemetry systems, leak detection systems and backup systems. The AMD collection and conveyance system is inspected daily.

3. **Spare Parts and Equipment**
☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☒ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☒ Additive (*e.g.*, chelation agent, flocculent) Lime
   ☒ Others: High-Density sludge treatment technology
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☒ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☒ Quantity of surface water treated annually_____
   Remarks: During the 2013 to 2018 water years the annual treatment plant inflow ranged from 4 million to 1.6 billion gallons.

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☒ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A
Remarks_____
_____

3.X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The interim remedies for the site consist of a combination of source control, acid mine drainage collection and treatment, and water management components including water diversions. No issues were identified during the October 2017 site visit that would be expected to affect the protectiveness of remedies implemented under RODs 1 through 4. A preexisting issue identified from the 2013 Five-Year Review has carried over to this review and remains an issue that if not addressed, has the potential to affect the future protectiveness of the ROD 5 interim remedial action.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The site controls for the management of AMD are working very well and have been tested to a high degree during the reporting period due to historic rainfall levels. Lime usage and sludge drying bed storage capacity were shown to be significantly affected by unusually heavy rains contributing to increased AMD but were effectively mitigated by the O&M procedures at the treatment plant. This bodes well for continued long-term protectiveness during heavy rainfall seasons resulting from potential climate change.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues or observations relating to the implementation and scope of O&M were noted that would affect the future protectiveness of the remedies established in RODs 1 through 4.

4.D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No significant opportunities for optimization were identified during the October 2017 Site Visit.

I. SITE INFORMATION	
Site name: Iron Mountain Mine Confined Disposal Facility	**Date of inspection: 10/25/2017**
Location: Redding, CA, Region 9	**EPA ID: CAD980498612**
Agency, office, or company leading the five-year review: USEPA and USACE	**Weather/temperature: Sunny and Clear, slight breeze, approximately 90°F**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: See Section 4 of the IMM Sixth Five-Year Review Report for specifics of the remedial actions implemented under Record of Decision (ROD) 5.

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Lewis McKinley (Name) DTSC Project Manager (Title) 11/20/2017 (Date)
   Interviewed ☐ at site ☐ at office ☒ by phone Phone no. (916) 255-3625
   Problems, suggestions; ☐ Report attached Interview included in Appendix C

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency:
Contact: _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks_____
_____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
G Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
Remarks_____
_____

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks_____
_____

4.	**Permits and Service Agreements**				
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Other permits_____	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: CDF effluent compliance standards are specified in the *Closure and Post Closure Maintenance Plan*. Onsite CERCLA actions do not require a permit.				
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks_____				
6.	**Settlement Monument Records**	☒ Readily available	☒ Up to date	☐ N/A	
	Remarks_____				
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: Groundwater Monitoring was discontinued at the CDF as per the criteria set forth in the 2012 O&M Plan by CH2M HILL where if after 1 year elevated metals concentrations are not detected groundwater monitoring can be discontinued at the discretion of DTSC.				
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks_____				
9.	**Discharge Compliance Records**				
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A	
	☒ Water (effluent)	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks_____				
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A	
	Remarks: Monthly Site Security Checks were changed to Quarterly as per the *Work Plan for Implementation of the Post-Closure Operations and Maintenance Plan for the Spring Creek Sediment Confined Disposal Facility* (2013 Work Plan) by Remedy Engineering.				

IV. O&M COSTS

1. **O&M Organization**

☒ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☒ Readily available ☒ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: October 2012 (Date) To: September 2013 (Date) $50,000 (Total cost) ☐ Breakdown attached
From: October 2013 (Date) To: September 2014 (Date) $50,000 (Total cost) ☐ Breakdown attached
From: October 2014 (Date) To: September 2015 (Date) $50,000 (Total cost) ☐ Breakdown attached
From: October 2015 (Date) To: September 2016 (Date) $50,000 (Total cost) ☐ Breakdown attached
From: October 2016 (Date) To: September 2017 (Date) $50,000 (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: All access roads to the CDF are locked and controlled by Bureau of Reclamation access gates. Signage indicating access is limited to authorized personnel and ongoing video surveillance at the CDF location are posted and visible.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Bureau of Reclamation performs visual inspections

Frequency: Quarterly

Responsible party/agency: DTSC is the responsible agency, Reclamation performs security inspections

Contact McKinley Lewis (Name) Project Manager (Title) 12/1/2017 (Date) (916) 255-3625 (Phone no.)

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident

Remarks: Evidence of vehicle trespassing has been evident during the reporting period but the addition of video surveillance signage has contributed to limiting trespassing.

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks: Minor sloughing noted from adjacent hillsides over-topping silt fences installed in October 2015 for the access road south of the primary cell (see photo log in Appendix E).

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks: Quarterly inspections have noted localized settlement areas on the primary cell cover. Repairs to localized settlement areas are documented in the annual O&M Reports for the CDF. Annual survey results of the 5 monuments show vertical settlements from 0.08 to 0.32 feet which is within the allowable range of 1 foot per 20-year period.

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks: Erosion was noted on February 2016 on the access road near the effluent discharge pipe and was repaired on May of 2016.

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: A sprayable erosion control hydroseed was applied to the cut slope above the access road south of the primary cell and to the areas of localized settlement in the primary cell.

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☒ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☒ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks: Roots and other vegetation were observed and removed from in and around the effluent filtrate pipes in May 2016.

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☒ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A
Remarks: Annual survey results of the 5 monuments show vertical settlements from 0.08 to 0.32 feet which is within the allowable range of 1 foot per 20-year period.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition G Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☒ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____
_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____
_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____
_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____
_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Discharge Structure** ☐ Functioning ☒ N/A
Remarks_____
_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☒ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks: The only system is the CDF filtrate underdrain system, with an effluent discharge pipe located east of the CDF effluent pipeline.

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks___N/A_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☒ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks____N/A_____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
   - ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   - ☐ Air stripping ☐ Carbon adsorbers
   - ☐ Filters_____
   - ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   - ☐ Others_____
   - ☐ Good condition ☐ Needs Maintenance
   - ☐ Sampling ports properly marked and functional
   - ☐ Sampling/maintenance log displayed and up to date
   - ☐ Equipment properly identified
   - ☐ Quantity of groundwater treated annually_____
   - ☐ Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - ☐N/A ☐ Good condition G Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   - ☐N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   - ☐ N/A ☐ Good condition ☐ Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   - ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   - ☐ Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   - ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐Good condition
   - ☐ All required wells located ☐ Needs Maintenance ☐ N/A

   Remarks_____

D. Monitoring Data

5. Monitoring Data
   - ☒ Is routinely submitted on time ☒ Is of acceptable quality

6. Monitoring data suggests:
   - ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining ☒ N/A

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   - ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   - ☐All required wells located ☐Needs Maintenance ☒N/A

   Remarks_____

7.X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). No issues or observations were made during the October 2017 CDF inspections that would appear to affect the protectiveness of the remedy implemented under ROD 5. Regular inspections and maintenance have been implemented at the CDF by DTSC to ensure timely repairs are completed before becoming larger issues.	
B.	**Adequacy of O&M**
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. The State of California DTSC took over operations of the CDF in 2012 from USEPA and has implemented regular quarterly inspections for the CDF and scheduled periodic maintenance for any issues reported from the quarterly inspections. DTSC will be providing oversight for a 30 year period from the date of the transfer and will be continuing regularly scheduled O&M work based on the *Work Plan for Implementation of the Post-Closure Operations and Maintenance Plan for the Spring Creek Sediment Confined Disposal Facility* by Remedy Engineering in 2013.	
C.	**Early Indicators of Potential Remedy Problems**
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No issues or observations were made during the October 2017 CDF inspections that would appear to affect the protectiveness of the remedy implemented under ROD 5.	
8.D.	**Opportunities for Optimization**
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. In the Final 2016 Annual Spring Creek Confined Disposal Facility Operations and Maintenance Report for the Iron Mountain Mine Superfund Site from ARCADIS dated June 30, 2016 the recommendation was made to discontinue the annual settlement surveys as the annual requirement for the first five years of O&M has been fulfilled. Settlement surveys will continue every five years throughout the remainder of the O&M period with the next survey occurring in 2021.	

Minnesota Flats Treatment Plant (MFTP)	MFTP: Lime Silos
	

MFTP: Lime Slakers

MFTP: Lime Slurry Tank

MFTP: Reactor Tanks TK-1 and TK-2

MFTP: Thickener Tank

MFTP: Sludge Drying Beds 1 through 4

MFTP: Emergency Storage Tank (TK-14), 1-Million gal Capacity

Boulder Creek Discharge Weir

Boulder Creek Landslide

AMD Pipeline at Richmond and Lawson Junction

Boulder Creek Shotcrete Protection

Lawson Portal

Richmond Portal

AMD 18-inch HDPE Pipeline at the top of Boulder Creek Landslide

3 8-inch AMD HDPE Piplines Continuing down Boulder Creek Landslide

Brick Flat Pit

Muck Disposal Cell

Slickrock Creek Drainage Basin

Slickrock Creek Drainage Basin (2)

Slickrock Creek Retention Reservoir (SCRR)

SCRR Spillway and Clean Water Diversion Outlet Structure

Confined Disposal Facility (CDF) Primary Cell with Signage

CDF Access Road with Silt Fencing

CDF: Secondary Cell

CDF Drainage Pipeline and Effluent Sample Point

CDF Former Borrow Area Drainage Outlet

CDF Effluent Sample Point

Spring Creek Debris Dam Spillway and Power Plant

Keswick Dam on the Sacramento River