Attachment 5
Site Inspection Checklist

Site Inspection Checklist
Iron Mountain Mine Five-Year Review

I. SITE INFORMATION	
Site name: Iron Mountain Mine (IMM)	**Date of inspections:** Five-year review inspection on April 3, 2008, and 2007 scheduled annual inspections
Location and region: Redding, California, Region 9	**EPA ID:** CAD980498612
Agency, office, or company leading the five-year review: EPA and CH2M HILL	**Weather/temperature:** Sunny and warm (approximately 70 degrees Fahrenheit)

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 IV of the *IMM Fourth Five-Year Review* for specifics of remedial actions implemented under Record of Decisions (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/Iron Mountain Operation (IMO), Project Manager, 03/27/08, 04/03/08
Name/Title Date

Interviewed: ☑ at site ☐ at office ☐ by phone: 530/245-4477
Problems, suggestions; ☑ Report attached

Rudolph Carver provided a status update onsite maintenance and treatment plant audit recommendations from the *IMM Third Five-Year Review* (see Attachment 1 of the *IMM Fourth Five-Year Review*) and on recommendations from recent inspections (see Attachment 6). He also participated in the *IMM Fourth Five-Year Review* site inspection (see Attachment 6).

2. **O&M staff**

Wes Franks/IMO, Site Construction Manager 530/241-4599 04/03/08
Name/Title Phone number Date

Bob Lindskog/IMO, Minnesota Flats Treatment Plant (MFTP) Operator 530/245-4478 04/03/08
Name/Title Phone number Date

Interviewed: ☑ at site ☐ at office ☐ by phone
Problems, suggestions; ☑ Report attached

Wes Franks/IMO and Bob Lindskog/IMO participated in the April 3, 2008, site inspection. Observations and recommendations from the inspection are summarized in Attachment 6 of the *IMM Fourth Five-Year Review*.

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 number
Problems; suggestions; ☐ Report attached _____

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

Annette Rardin, a downgradient property owner, was interviewed on April 22, 2008, and her comments are incorporated into Attachment 6 of the *IMM Fourth-Five Year Review.*

Interviews of regulatory agency representatives were not performed during the *IMM Fourth Five-Year Review.* EPA determined that interviews were not necessary to provide additional information on site status. During the fourth five-year review performance period, EPA has been in regular contact with the IMM Technical Advisory Committee in support of the design of remedial actions selected in ROD 5 and the remedial investigation for Operable Unit 6.

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:

O&M Manuals:
IMO. 2001. *Operation and Maintenance Plan, Redding, Shasta County, California.* April.
EPA. 2000. *Statement of Work* (SOW) *Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California.* October. Modifications and clarifications to the SOW were recommended during the October 26, 2005, meeting between AIG Consultants, Inc. (AIG), EPA, IMO, and CH2M HILL. The *IMM Fourth Five-Year Review* recommends that EPA formally modify the SOW to incorporate appropriate changes.

As-built Drawings: IMO has the as-built drawings in the onsite trailers. The as-built drawings for Slickrock Creek Retention Reservoir (SCRR) were reviewed as an example.

Maintenance Logs: IMO describes maintenance in monthly reports submitted to AIG, the California Department of Toxic Substances Control (DTSC), the Central Valley Regional Water Quality Control Board (Water Board), EPA, and CH2M HILL.

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 contracted SHN Consulting Engineers to update the health and safety plan and the injury and illness prevention plan in September 2007. The October 2000 statement of work (SOW) specifies procedures for emergency response (see SOW, Section 10), response to extreme events (see SOW, Section 11), and routine and nonroutine operations and maintenance (O&M) (see SOW, Section 9). IMO updated emergency contact information in the *Emergency Response Plan and Contingency Procedures, Iron Mountain Operations, Redding, Shasta County, California* in April 2008.

3. **O&M and OSHA Training Records** ☑ Readily available ☑ Up to date ☐ N/A
Remarks: OSHA training records were reviewed for one new employee as an example. The employee also receives hands-on O&M training.

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: California Department of Water Resources, Division of Safety of Dams for SCRR and Brick Flat Pit

☑ Readily available ☑ Up to date

Remarks: IMO renews air discharge permits for the Minnesota Flats Treatment Plant (MFTP) (including lime storage silos, lime feed bins, associated baghouses, and lime slakers) and stand-by generators annually. IMO contracts GEI Consultants, Inc., to perform annual SCRR dam inspections, and DSOD performs annual inspections of SCRR and Brick Flat Pit to meet DSOD permit requirements. IMO maintains water usage permits with the State Water Resources Control Board. IMO does not obtain waste discharge permits; however, the October 2000 SOW specifies the Clean Water Act and best available technology (BAT) performance standards for the MFTP (see SOW, Sections 8 and 14). Modifications and clarifications to the SOW were recommended during the October 26, 2005, meeting between AIG, EPA, IMO, and CH2M HILL. The *IMM Fourth Five-Year Review* recommends that EPA formally modify the SOW to incorporate changes to the BAT standards (see Attachment 3).

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☑ N/A

Remarks_____

6. **Settlement Monument Records** ☑ Readily available ☑ Up to date ☐ N/A

Remarks:

Subsidence Areas: As part of ROD 1, EPA constructed partial caps in subsidence areas over the Richmond mineralized zone. IMO inspects, maintains, and repairs the capped subsidence areas. The annual survey of the subsidence areas and clay caps is documented in the applicable *Iron Mountain Operations Monthly Progress Report.*

Boulder Creek Landslide: Settlement monuments (21 total) are surveyed by Pace Civil, Inc., to determine surface movements within the slope failure complex. The data are reported annually in the *Boulder Creek Landslide Survey Data Report.* The Mines Group, Inc., evaluates the data annually in the *Boulder Creek Landslide Annual Inspection and Evaluation.*

Richmond Mine: Extensometer and multiple-point borehole extensometer (MPBX) readings are performed by IMO and reported annually in the *Richmond Mine Extensometer and MPBX Data Report.*

Lawson Mine: Survey data are obtained by Pace Civil, Inc., and reported annually in the *Lawson Adit Survey Data.* The Mines Group, Inc., evaluates the data annually in the *Lawson Mine Annual Inspection Report.*

SCRR: Data are obtained from vibrating wire piezometers, standpipe piezometers, spillway slope horizontal drains, load cells, seepage weir, dam crest settlement monuments, spillway excavation settlement monuments, and inclinometers. Evaluation is documented in the semiannual reports by GEI Consultants, Inc.

7. **Groundwater Monitoring Records** ☑ Readily available ☑ Up to date ☐ N/A

Remarks: Groundwater elevations are monitored at SCRR and Brick Flat Pit. SCRR data are documented in the semiannual reports by GEI Consultants, Inc. Brick Flat Pit groundwater elevations are included in the road operator monthly data sheets in the *IMO Monthly Progress Reports* and are reviewed by IMO staff. However, Brick Flat Pit groundwater elevations are not provided or maintained electronically. Groundwater quality data are not currently collected.

8. **Leachate Extraction Records** ☑ Readily available ☑ Up to date ☐ N/A

Remarks: Filtrate water quality analytical data are collected for Brick Flat Pit and the MFTP sludge drying beds. IMO reports the data monthly to AIG, DTSC, EPA, the Water Board, and CH2M HILL.

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, MFTP effluent, filtrate, and surface water analytical data and submits reports to AIG, DTSC, EPA, the Water Board, CH2M HILL monthly. An evaluation of MFTP effluent is provided as Attachment 3 of the *IMM Fourth Five-Year Review*.
10.	**Daily Access/Security Logs** ☑ Readily available ☑ Up to date ☐ N/A Remarks: A sign-in book is maintained in the IMO site trailer for all visitors as a permanent record of site access. A white board is used as a daily tracking tool for the time onsite and offsite for each visitor.

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: Not readily available. ☐ Breakdown attached Total Annual Cost by Year for Review Period (if available) From 12/01/06 to 11/30/0 $3,848,451 ☑ Breakdown attached (see Attachment 6) From 12/01/05 to 11/30/06 $5,640,711 ☑ Breakdown attached (see Attachment 6) From 12/01/04 to 11/30/05 $4,495,024 ☑ Breakdown attached (see Attachment 6) From 12/01/03 to 11/30/04 $4,875,511 ☑ Breakdown attached (see Attachment 6) From 12/01/02 to 11/30/03 $6,237,793 ☑ Breakdown attached (see Attachment 6) Date Date Total Cost

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3.	**Unanticipated or Unusually High O&M Costs during Review Period** Describe costs and reasons: The costs incurred over the IMM Fourth Five-Year Review period were not unusually high or unanticipated. The costs are highly dependent on the precipitation received during each water year and the subsequent amount of acid mine drainage (AMD) generated and requiring treatment, sludge requiring dewatering, handling and disposal, and muck formation in the mine workings.

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: A description of current access controls is included as Attachment 7 of the *IMM Fourth Five-Year Review*.

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.
   Frequency ____Monthly _____
   Responsible party/agency: IMO contact:

Wes Franks	Site Manager	04/03/08	(530) 241-4599
Name	Title	Date	Phone number

   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 (see Attachment 7)

   If significant trespassing or vandalism occurs, IMO notifies Rick Sugarek/EPA and John Spitzley/CH2M HILL.

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☑ N/A
   Remarks: An institutional control assessment is included as Attachment 7 of the *IMM Fourth Five-Year Review*. EPA has not yet implemented institutional controls at IMM in the five signed RODs. However, EPA has outlined IMM access controls in the October 2000 SOW; several interim actions, including fencing and security gates, have been implemented at IMM.

D. General

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

2. **Land use changes on site** ☑ N/A
   Remarks _____

3. **Land use changes off site** ☐ N/A
   Remarks: Nonmotorized trails have opened along portions of Keswick Reservoir and the Spring Creek Arm of Keswick Reservoir. These are discussed in Attachment 9 of the *IMM Fourth Five-Year Review*.

VI. GENERAL SITE CONDITIONS			
A. Roads	☑ Applicable	☐ N/A	
1.	**Roads damaged**	☐ Location shown on site map	☑ Roads adequate ☐ N/A
	Remarks: Road maintenance requirements are detailed in the October 2000 SOW. Road maintenance needs were noted during the April 3, 2008, sitewide inspection and are currently scheduled in the 2008 maintenance list, *March 2008 Churn Creek Construction Co. Inc., Iron Mountain Job List – Per Wes Franks* (2008 Maintenance List).		
B. Other Site Conditions			
	Remarks: Recommendations from the April 3, 2008, sitewide inspection and recent annual inspections are summarized in Attachment 6 of the *IMM Fourth Five-Year Review*.		
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: IMO identified a sinkhole between two of the filtrate riser pipes in Brick Flat Pit. No settlement areas were identified at the Matheson disposal cell. As part of ROD 1, EPA constructed partial caps in subsidence areas over the Richmond mineralized zone. IMO inspects, maintains, and repairs the capped subsidence areas. The annual survey of the subsidence areas and clay caps was completed on October 16, 2007. In the *October 2007 IMO Monthly Progress Report*, IMO reported that a comparison of the 2007 and 2006 surveys indicated minimal continuing vertical movement of the monitored areas.		
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: Not applicable.		
6.	**Alternative Cover (armored rock, concrete, etc.)**	☐ N/A	
	Remarks: The rock cover over the Matheson disposal cell is intact and no issues were identified.		
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: Wet areas or water damage were not observed at Brick Flat Pit or the Matheson disposal cell during the April 3, 2008, site inspection. If flow occurs from the Brick Flat Pit Seep 8L, Filtrate 8R, or the spillway, the water is collected for treatment at MFTP and monitored for pH, copper, and zinc. No water was collected from Brick Flat Pit Seep 8L during the 2007 or 2008 water years.		
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: Benches are present at Brick Flat Pit as a result of mining; they were not constructed for erosion control. Benches will be used for future roads as Brick Flat Pit continues to be filled with sludge from the high-density sludge treatment process.		
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: Letdown channels were not visually inspected by CH2M HILL during the April 3, 2008, site inspection; Wes Franks/IMO has not identified any issues in routine monthly inspections.		
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: IMO removes obstructions when they occur.		

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: IMO removes accumulated sediment and vegetation from the channels.

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: Piezometers are located at Brick Flat Pit, and water levels are recorded monthly. No water quality data is currently collected, and the monitoring wells were not inspected during the site visit.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☑ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☑ Needs Maintenance ☐ N/A
Remarks: If flow occurs from the Brick Flat Pit Seep 8L, Filtrate 8R, or the spillway, the water is collected for treatment at MFTP and is monitored for pH, copper, and zinc. The amount of filtrate has decreased significantly at Brick Flat Pit. No water was collected from Brick Flat Pit during the 2007 or 2008 water years. Two possible reasons for reduced filtrate flow have been identified: (1) the filtrate piping has malfunctioned, or (2) the amount of filtrate has decreased as a result of the thickness of the overlying sludge, and the water is exiting through the unlined sidewalls of the pit. The location of Brick Flat Pit was determined to be an effective sludge disposal location because drainage, if not captured, would re-enter the ore body and be captured by the AMD treatment system (see ROD 1) or would be discharged to the Slickrock Creek drainage, which is currently captured for treatment by SCRR. IMO should continue evaluations to identify the reason for the reduced filtrate at Brick Flat Pit. IMO has scheduled 4 filtrate riser pipes at Brick Flat Pit to be extended by 10 feet during the 2008 dry season.

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5. **Settlement Monuments** ☐ Located ☑ Routinely surveyed ☐ N/A
Remarks:

Brick Flat Pit: Section 6.4 of the SOW requires that "by November 30 of each year, the Site Operator shall provide to the Oversight Agency, for Oversight Agency review and approval, the Landfill Management Report and Plan". The report is required to contain an updated as-built drawing of the Brick Flat Pit landfill, with updated topography. The most recent landfill management report plan submitted was the *2003 Landfill Management Report and Plant*. IMO should continue to submit an annual landfill management report and plan that addresses the requirements in the SOW.

Subsidence Areas and Clay Caps: The SOW requires that the site operator have annual surveys of the subsidence areas conducted by a licensed surveyor, or more frequently if changes occur in the appearance of the caps, steam vents, roadways, or drainage structures, or if the survey data indicate an increase in the rate of settlement. The most recent survey was performed on October 16, 2007.

Boulder Creek Landslide: The SOW requires the site operator to conduct annual surveys of settlement monuments in the Boulder Creek Landslide, or more frequent surveys if movement of the landslide is observed. The most recent survey was performed on September 27, 2007.

Lawson Mine: The SOW requires that the site operator have a licensed surveyor monitor critical adit components on an annual basis, and that the survey be conducted under the direction of a qualified engineer with mining experience. The most recent survey was performed on October 27, 2007.

SCRR: Dam crest settlement monuments and spillway slope settlement monuments are surveyed a minimum of once in the winter months and once in the summer months. If settlement is occurring, more frequent survey intervals are warranted. Surveys were performed in February and October 2007.

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

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ 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: Sedimentation ponds are not located at Brick Flat Pit but are located at SCRR, and upstream from the Upper Spring Creek and Slickrock Creek clean water diversion intakes. Approximately 20 feet of material has accumulated in the SCRR main sedimentation basin. IMO constructed several upstream check dams that are effectively reducing the amount of sediment accumulating in the main sediment basin. Sediment and gravel has accumulated in the sedimentation basin at the Upper Spring Creek Diversion inlet and needs to be removed during the 2008 dry season. Sediment and gravel has accumulated upstream of the Slickrock Creek clean water diversion intake and should be removed during the 2008 dry season and routinely thereafter.

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: IMO performs routine monitoring and maintenance on perimeter ditches across the site in accordance with the SOW. Routine maintenance for several ditches was included in the 2008 Maintenance List provided by IMO during the April 3, 2008, site inspection. The 2008 Maintenance List includes O&M work to be completed during the 2008 dry season.	
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent_____ Type_____ Remarks: See discussion in Section VI-I-1 (Siltation).	
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent_____ Depth_____ Remarks: See discussion in Section VI-I-1 (Siltation). _____	
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: Attachment 6 of the *IMM Fourth Five-Year Review* details changes IMO has implemented to operation of Old/No. 8 Mine Seep pumping well PW3, including construction of a gravity drainage system. CH2M HILL recommends that IMO submit an as-built drawing of the Old/No. 8 gravity discharge system and a description of the intended operation for a formal review by CH2M HILL and EPA. CH2M HILL recommends using the Old/No. 8 gravity discharge only as an emergency backup system.	

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks: See discussion in Section IX-A-1 (Pumps, Wellhead Pumping, and Electrical)

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: Pumps include utility water, filtrate, lime slurry, and submerged thickener pumps. The hours and limits for each pump are checked weekly, and operation is frequently switched between redundant pumps. Sludge pumps submerged in TK-11 are switched daily and serviced annually.

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.

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: All pumps, monitoring equipment, and tanks, except the thickener, have redundancy. If the thickener is taken offline for maintenance, emergency storage can be used at SCRR, within the Old/No. 8 Mine, and the 1-million-gallon emergency storage tank (TK14). If necessary, the simple mix treatment process can be used to address AMD if the emergency storage tank fills.

C. Treatment System ☑ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☑ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters: Filters are used for the intake process water only. No filters are currently used for the MFTP high-density sludge treatment process.
☑ Additive (*e.g.*, chelation agent, flocculent): Lime
☑ Others
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional: Sampling ports are functional but labeling is needed to mark the ports
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☐ Quantity of groundwater treated annually: MFTP flow rates totaled under surface water.
☑ Quantity of surface water treated annually: During the five-year review period (2003 to 2007 water years), the annual treatment plant inflow ranged from 150 to 590 million gallons.

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☑ Good condition ☐ Needs Maintenance
Remarks: The MFTP programmable logic controller (PLC) system was updated to use Modicon Quantum controllers in 2007.

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☑ Good condition ☑ Proper secondary containment ☐ Needs Maintenance
Remarks: See Attachment 6 of *IMM Fourth Five-Year Review* regarding recent tank inspection and maintenance.

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 (see Attachment 3)
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_____
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. A site inspection summary of remedy components is provided in Attachment 6 of the *IMM Fourth Five-Year Review*.
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 (e.g., to contain contaminant plume, minimize infiltration and gas emission). No issues or observations were identified during the April 3, 2008, site visit that would be expected to impact the effectiveness of remedies implemented under RODs 1 through 4.
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. Issues and observations related to implementation and scope of the O&M procedures were identified during the April 3, 2008, site visit. These are detailed in Attachment 6, and significant issues and observations were carried forward as recommendations and follow-up actions in Section VI of the *IMM Fourth Five-Year Review*.

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 identified during the April 3, 2008, site visit that indicate the protectiveness of the remedies may be compromised.
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 April 3, 2008, site visit.

MORRISON KNUDSEN CORPORATION

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HORNET PORTAL
HORNET ROAD
LAWSON PORTAL
LAWSON ROAD
EXISTING UNDERGROUND 18" AMD PIPELINE
BYPASS ROAD
SPRING CREEK
DG BORROW AREA "D" SEE DWG 02-52-1-013
SPRING CREEK CROSSING (SCC)
SPRING CREEK DIVERSION OUTLET
FLAT CREEK
TO HWY 299
LOWER GATE
DIVERSION TUNNEL
RICHMOND PORTAL
RICHMOND MILL BUILDINGS
BOULDER CREEK
BOULDER CREEK CROSSING (BCC)
BOULDER CREEK CEMENTATION PLANT (BCCP)
DISPOSAL CELL
DG BORROW AREA "E" SEE DWG 02-52-1-013
EXISTING UNDERGROUND 18" & 24" AMD PIPELINES
MINNESOTA FLATS TREATMENT AREA
SLUDGE DRYING BED
MODUTANK AMD STORAGE
AMD STORAGE TANK
MINNESOTA FLATS TREATMENT PLANT
UPPER GATE
BRICK FLAT PIT
BRICK FLAT PIT CONTAINMENT DAM
IRON MOUNTAIN ROAD
EXISTING UNDERGROUND 18" AMD PIPELINE
STORAGE WAREHOUSE
27 ROAD
JEEP ROAD
TEMPORARY TREATMENT PLANT
CONSTRUCTION OFFICE AREA
HEMATITE PIT
SLUG GULCH ROAD
28 ROAD
OLD NO. 8 MINE WELLS AND SALT CHAMBERS
SLICKROCK CREEK
SCRR DAM, SEE DWG 02-52-1-020
CATFISH POND
SEDIMENT BASIN, SEE DWG 02-52-1-200
USBR INTAKE STRUCTURE
SPRING CREEK
SLICKROCK CREEK CLEAN WATER DIVERSION INLET STRUCTURE
SLICKROCK CREEK CLEAN WATER DIVERSION SEE DWG 02-52-1-250

NOTES

1. TOPOGRAPHY SHOWN WAS PROVIDED BY PACE CIVIL, REDDING, CA. BASED ON THE AERIAL SURVEYS CONDUCTED IN AUGUST 1998 AND SUPPLEMENTED BY THE APRIL 1994 SURVEY PROVIDED BY PACE AND THE 1998 SURVEY FROM CH2M HILL. MORRISON KNUDSEN CORPORATION ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.
2. IRON MOUNTAIN ROAD FROM MFTP TO BFP WILL BE UTILIZED FOR THE SLUDGE HAUL. CONTRACTOR MUST COORDINATE ACTIVITIES WITH SMC DURING THE SLUDGE HAUL.

REGISTERED PROFESSIONAL ENGINEER ALBERTO PINOL-RIUS No.37051 CIVIL STATE OF CALIFORNIA
Exp 06/30/04

REGISTERED PROFESSIONAL ENGINEER Robert F. Clavin No. 25318 CIVIL STATE OF CALIFORNIA
Exp 12/31/01

0ft 300 600 1200 1800 2400ft
SCALE

NO.	DATE	REVISIONS	BY	CHECKED	MGR APPROV.
A	8/25/00	ISSUED FOR CONSTRUCTION	AW	MFP	JKG

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL GROUP
353 SACRAMENTO STREET, SUITE 1500
SAN FRANCISCO, CA 94111

DRAWN/DATE Kevin Zhu 8/15/00 | DESIGN/DATE 8/16/00 | CHECKED/DATE 8/17/00
PROJ. MGR./DATE 8/16/00 | MGR APPROVED/DATE 8/17/00

STAUFFER MANAGEMENT CO.
IRON MOUNTAIN
SHASTA COUNTY CALIFORNIA

IRON MOUNTAIN MINE - SLICKROCK CREEK RETENTION RESERVOIR
IRON MOUNTAIN SITE PLAN

WORK ORDER NO. 4877-02 | DRAWING NO. 02-52-1-010 | REV. 0

Attachment 6

Site Inspection Summary

Site Inspection Summary
Iron Mountain Mine Five-Year Review

PREPARED FOR: Rick Sugarek/U.S. Environmental Protection Agency

PREPARED BY: John Spitzley/CH2M HILL
Sandra Shearer/CH2M HILL
Dave Bunte/CH2M HILL
Eric Halpenny/CH2M HILL

CC: Dave Sadoff/AIG
Rudy Carver/Iron Mountain Operations
Wes Franks/Iron Mountain Operations
Bob Lindskog/Iron Mountain Operations

DATE: May 9, 2008

PROJECT NUMBER: 367266.SI.01 and 338462.RO.01

This memorandum presents observations made during the April 3, 2008, sitewide inspection of Iron Mountain Mine (IMM) Superfund Site. The inspection was performed to provide oversight of Iron Mountain Operations (IMO) site activities and to fulfill site inspection requirements for the *IMM Fourth Five-Year Review.*

The following CH2M HILL staff participated in the April 3, 2008, site inspection:

- John Spitzley, IMM Project Manager
- Dave Bunte, Metallurgist
- Sandra Shearer, Environmental Engineer
- Eric Halpenny, Chemical Engineer

Rudy Carver, Wes Franks, and Bob Lindskog with IMO also participated in portions of the site inspection. Wes Franks provided the March 2008 *Churn Creek Construction Co., Inc., Iron Mountain Job List – Per Wes Franks* (2008 Maintenance List), a list of maintenance items to be completed during the 2008 dry season. Numerous other inspections were performed or contracted by IMO during the fourth five-year review period. Recent inspections are summarized in Table 1 (all tables are located at the end of this technical memorandum).

IMO continues to provide excellent maintenance of the site and is in general compliance with the requirements of the October 2, 2000, *Statement of Work for Site Operations and Maintenance* (SOW) (EPA, 2000). No issues or observations were identified during the April 3, 2008, site visit that would be expected to impact the effectiveness or protectiveness of remedies implemented at IMM. Issues and observations related to implementation and scope of the operation and maintenance (O&M) procedures were identified and are detailed in this technical memorandum. These were discussed with IMO and AIG Consultants, Inc. (AIG) during a meeting at the IMM Site on April 25, 2008. Significant recommendations and

follow-up actions from the site inspections are summarized in the *IMM Fourth Five-Year Review Report.*

The *Site Inspection Checklist, Iron Mountain Mine Five-Year Review* (Site Inspection Checklist) is included as Attachment 5 of the *IMM Fourth Five-Year Review Report.* Photographs are attached to this technical memorandum to illustrate the conditions described below. Table 2 summarizes annual IMO O&M costs. Table 3 summarizes the schedule of IMO primary operation, maintenance, and inspections performed in 2007 (IMO, 2008d).

1.0 General

1.1 Iron Mountain Operations Staff

Wes Franks/IMO discussed that he will be retiring relatively soon. IMO's subcontracted site workers with Churn Creek Construction are knowledgeable regarding site maintenance. However, there is concern that, without a transition plan, knowledge necessary to effectively maintain the IMM remedies may be lost.

As one method of decreasing the Minnesota Flats Treatment Plant (MFTP) facility's vulnerability to the loss of one or more personnel, the IMM Third Five-Year Review (EPA, 2003) recommended that a computerized maintenance system be installed that interfaces with the operations computer. The system could track run hours as well as maintenance completed on each piece of equipment and maintain a spare parts inventory. During discussions with Sandra Shearer on March 27, 2008, Rudy Carver said that IMO is using Excel spreadsheets to track MFTP maintenance and is evaluating other maintenance software that generates lists and schedules of maintenance items to complete.

1.1.1 Recommendation

CH2M HILL recommends that IMO and AIG continue to develop strategies to decrease the vulnerability to the loss of IMO personnel. During the April 25, 2008 meeting, Dave Sadoff/ AIG described that a high priority for AIG is updating the secession plan for IMO staff.

1.2 Spring Creek Arm Sediment Remedial Action

IMO suggested that the MFTP equipment could be used to generate a lime slurry for treatment of dredge discharge as part of the IMM Record of Decision 5 (ROD 5) (EPA, 2004) sediment removal remedial action. IMO would sell the lime slurry to EPA. The sediment remedial action is preliminarily scheduled to occur between mid-October and mid-December, which is generally a period of low acid mine drainage (AMD) generation and low treatment plant influent flows.

1.3 Onsite Documents and Records

Onsite documents and records were verified and found to be readily available, as documented in the Site Inspection Checklist. Onsite documents and records verified include O&M manuals (IMO, 2001; EPA, 2000), as-built drawings, maintenance logs, site-specific health and safety plan (SHN Consulting Engineers, 2007a and 2007b), emergency response plan (IMO, 2008e), training records, air discharge permits, and monitoring records.

Section 6.3 of the SOW (EPA, 2000) requires the following:

> By May 1 of each year, or other agreed-upon date, the Site Operator shall submit for Oversight Agency review and approval a draft Annual Operations Work Plan. This plan will provide a detailed plan for the operation, maintenance, and inspection activities planned for the twelve (12)-month period beginning on June 1 of that year ("next year"). The draft Annual Operations Work Plan shall address all activities related to O&M, Remedial Designs, Remedial Actions, modifications to the Site implemented during the previous plan year, modifications to the Site planned for the next year, and all other information necessary to enable the Oversight Agency to effectively evaluate whether the Performance Standards have been and will be met.

IMO has reduced the scope of the Annual Operations Work Plan during recent years, when no large remedial actions were being undertaken. In 2007, the Annual Operations Work Plan consisted of a letter report to EPA that provided a schedule for inspections and maintenance activities to be performed.

1.3.1 Recommendation

IMO should ensure that future Annual Operations Work Plans meet the requirements of Section 6.3 of the SOW (EPA, 2000). The Annual Operations Work Plan should make reference to the SOW when describing O&M requirements.

1.4 AMD Pipelines

On December 18, 2007, a leak of the AMD pipeline occurred near Road Marker 16.5 near the intersection of the AMD pipeline and the filtrate pipeline that extends from the Mine Waste Disposal Cell. The pipeline was immediately shut down, and temporary repairs were made with rubber couplings so that the pipeline could be returned to service to handle the high flows from SCRR caused by heavy rains (IMO, 2008d). On January 4, 2008, during heavy rainfall, the temporary rubber coupling repair failed where the Mine Waste Disposal Cell filtrate pipeline enters the AMD pipeline. Due to the 4 inches of rainfall that occurred on that date, the leak could not be stopped until January 5, 2008. Permanent repairs were competed on the pipeline on January 8, 2008, when stainless steel band clamps arrived (IMO, 2008b).

IMO staff performs inspections of the site throughout the day and night to quickly identify leaks when they occur. Notifications of the leaks were made to EPA, Central Valley Regional Water Quality Control Board, and the Bureau of Reclamation. A photograph of the repaired pipeline is included in the photo log.

Scale from the AMD pipelines was removed before SCRR went into service. Since the completion of scale removal, IMO has inspected the AMD conveyance pipelines by removing the lids on the service saddles. A portion of the AMD conveyance pipelines is inspected annually, and a more thorough inspection of the entire AMD conveyance pipeline system is performed on a less frequent basis. IMO performed a thorough inspection of the entire AMD conveyance pipeline system using all service saddles in April 2008, and the inspection will be documented in the Field Activity Daily Logs in the April 2008 IMO Monthly Progress Report.

1.4.1 Recommendation

The pipeline route continues to erode. Erosion protection should be placed on top of the pipeline to prevent further erosion of the pipeline trench near Road Marker 16.5.

The SOW (EPA, 2000) states the following: "The Site Operator shall maintain a minimum 90 percent flow capacity in all conveyance piping. The Site Operator shall conduct annual inspections of the AMD piping and shall certify the pipe capacity." IMO should perform AMD pipeline inspections and have an engineer calculate capacity estimates annually. These should be certified in an annual letter to EPA.

1.5 Adjacent Property Residents

John Lyons of EPA facilitated a meeting in the Iron Mountain conference room in November 2007 with downgradient property owners, Bob and Annette Rardin, and representatives from Stauffer, AIG, and BLM to address access agreement concerns related to long term maintenance of the Flat Creek Drainage Area (IMO, 2007b). During the April 3, 2008, site inspection, IMO stated that they have maintained a good relationship with the Rardins through close communication and response to requests.

Sandra Shearer/CH2M HILL talked with Annette Rardin on April 22, 2008, regarding maintenance of erosion controls on her property, downgradient from IMM. Mrs. Rardin stated that her property is being adequately maintained, and that she feels confident that Wes Franks/IMO is performing thorough inspections. The Flat Creek channel does continue to shift and deepen due to ongoing erosion. Mrs. Rardin does not think further maintenance is required now, but further maintenance of the Flat Creek channel might be required in the future.

1.5.1 Recommendation

Mrs. Rardin stated that she was very happy with the November 2007 meeting facilitation and felt that a lot was accomplished during the meeting. However, she commented that there were action items identified during the meeting that have not been completed. Mrs. Rardin stated that Stauffer agreed to pay the Rardins' attorney fees, and late fees have accumulated on the outstanding balance. The Rardins had also identified changes required to the draft easement, and the easement has not been resubmitted for their review or their attorney's review.

2.0 Upper Spring Creek Diversion

2.1 Current Pipeline Condition

The Upper Spring Creek Diversion pipeline lining continues to deteriorate with use, and as the lining is removed, the underlying concrete erodes (IMO, 2008a). The 2007 inspection report for the Upper Spring Creek Clean Water Diversion concluded that the extent and depth of erosion is not a structural concern at this time, however, the eroded concrete and liner should be monitored on an annual basis (IMO, 2008a).

CH2M HILL participated in the 2007 annual site inspection and concluded that 22 percent of the pipe sections were in somewhat worse condition than the previous year. Worsening

condition was characterized by continuing deterioration of the polyurethane lining, with a corresponding increase in the amount of erosion on exposed concrete surfaces (CH2M HILL, 2007a).

Deterioration of the lining is occurring through two mechanisms: erosion or wear of the lining by solids in the flowing water; and disbondment or peeling of the lining in some areas as it is pulled from the concrete pipe by the flowing water. In areas where the protective lining has been removed, the exposed concrete progressively deteriorates from minor surface erosion, resulting in exposed aggregate, followed by aggregate removal and loss of section in the concrete (CH2M HILL, 2007a).

Deterioration continues to occur mainly on the pipeline invert and especially at the joints. The number of affected areas and the progress of damage are generally increasing over time. However, repairs that were made in 2004 at eroded locations in the joints of pipeline have generally performed well (CH2M HILL, 2007a).

2.2 Statement of Work Requirements

Section 9.10.2.3 (Non-routine O&M Requirements for the Upper Spring Creek Diversion) of the SOW requires the following:

"Over the next 3 years, the Site Operator shall perform necessary studies and implement a satisfactory repair program to restore the RCCP lining system or, as necessary, replace the RCCP lining system by December 2003."

Studies and evaluations performed by the Site Operator indicated that it would be costly to restore or replace the pipeline liner system. Achieving adequate and long-term bonding of a pipeline lining to concrete pipeline material is technical challenging. For these reasons, the comprehensive liner repair program, as described in the SOW, has not been conducted. As discussed in the following section, IMO's current approach is an annual pipeline inspection and pipeline repair process to maintain the structural integrity of the pipeline.

2.3 Pipeline Monitoring and Repair Approach

The Site Operator performed upstream improvements (moving gravel out of the channel above the Iron Mountain Road Spring Creek crossing and deepening the sediment basin upstream of the diversion) that has minimized the gravel carried into the Upper Spring Creek diversion pipeline.

An Abrasion Test Program was performed in 1999, which evaluated 6 concrete coatings to determine the abrasion resistant effectiveness (Schwein/Christensen Laboratories, Inc. 1999). The Site Operator also performed an in-place suitability study of different repair products.

In the Proposed Scope of Work and Contract Award for *Spring Creek Diversion RCCP Pipe Inspection and Repair Project* (IMO, 2003a, 2003b), IMO proposed and has implemented a pipeline inspection and repair program. The program includes annual inspection of the pipeline, preparation of a pipeline inspection report for EPA review, evaluating and selecting the appropriate pipeline repair methods and materials, and implementing the repairs with appropriate quality assurance and quality control inspection and documentation (IMO, 2003b).

Two concrete repair materials are currently being used, which have been tested and shown to be effective: Rezi-Weld epoxy with sand and the Emaco S88 repair mortar. Both materials require surface preparation, removal of standing water, and a temporary dam to prevent the area to be repaired from becoming wet. Rezi-Weld contains solvents and tends to sag when placed, so ample ventilation, respirators, and forms for placement are essential. Emaco requires sawing or chipping out concrete to allow placement in a thick section and avoid feathering the product over the surface. As noted during the 2007 pipeline inspection, repairs that were made in 2004 at eroded locations in the joints of pipeline have generally performed well.

2.4 Other Components of the Spring Creek Diversion Structure

No issues with the Upper Spring Creek Diversion impact structure were noticed during the April 3, 2008, inspection. The impact structure was covered with stainless steel during the 2004 maintenance inspection (IMO, 2008a). Stainless steel plates that were recently installed on the impact structure appear to be in good condition.

Sediment and gravel have accumulated in the sedimentation basin at the Upper Spring Creek Diversion inlet.

2.5 Recommendations

Sediment and gravel that has accumulated in the sedimentation basin at the Upper Spring Creek Diversion inlet needs to be removed during the 2008 dry season. This was identified on the 2008 Maintenance List provided by Wes Franks.

During the April 25, 2008, meeting, IMO stated that the annual Upper Spring Creek and Slickrock Creek Diversion inspections are scheduled for July 28, 2008. IMO, in consultation with their materials expert, should develop a work plan for review by EPA that details the long-term inspection and repair approach to mitigate future deterioration and maintain the pipeline to meet the requirements of the SOW. The following are considerations for improvements to the existing inspection and repair program:

- The pipeline condition rating system used by IMO is subjective and ranges from 'Very Good' to 'Very Poor'. The subjective rating system is not fully documenting changes in pipeline condition from year to year. For example, although approximately 20 percent of the pipeline section appeared to be in worse condition in 2007 compared to 2006, the overall condition rating of the pipeline did not change from 2007 to 2006 (CH2M HILL, 2007a). More detailed pipeline inspection documentation would provide the information needed to quantify the rate of deterioration and help determine the point in time when rehabilitation or complete replacement of the lining is warranted. Following the 2007 Upper Spring Creek Diversion Inspection, CH2M HILL recommended that IMO consider adding video recording of the pipeline to the inspection regime, and a comparison of video records over a period of years, as one method of documenting pipeline deterioration (CH2M HILL, 2007a).
- The level of deterioration that triggers a pipeline repair has not been defined. Conditions that will result in a pipeline repair should be well defined to allow consistent action over the years and ensure adequate maintenance of the pipeline.

- The existing liner should be preserved to the extent feasible to prevent further erosion of the concrete pipeline. IMO should evaluate the feasibility of removing and repairing loose liner sections, to prevent the disbondment or peeling of the lining in adjacent areas.
- AIG and IMO could consider the feasibility of a partial-relining/repair alternative to preserve as much of the existing intact lining as possible while repairing the various types of damage that the pipeline exhibits. That approach might reduce construction costs and be a more practical solution to maintaining the pipeline in good condition.

3.0 Minnesota Flats Treatment Plant

An inspection of the MFTP was performed to satisfy requirements of the five-year review and to provide information for the Site Inspection Checklist.

The MFTP programmable logic controller (PLC) system was updated to use Modicon Quantum controllers. The plant was returned to full operation on September 17 using the upgraded plant control system (IMO, 2007c). IMO is also proposing additional upgrades, including ethernet connections and additional telemetry.

IMO plans to repair significant areas of corrosion on the coating for the thickener rake arms, center well, and center column during the 2008 inspection and maintenance for TK-11.

3.1 Recommendations

1. The Site Inspection Checklist includes an assessment of whether sampling ports are properly marked and functional. Sampling ports, including the treatment plant influent, thickener overflow, and sludge sampling stations, are not marked. During the April 25, 2008, meeting, IMO stated that labels would be added to these locations.
2. Attachment 3 of the *IMM Fourth Five-Year Review* includes an assessment of the MFTP effluent discharge. The recommendation is made that EPA should formally revise the SOW to modify BAT effluent limits based on metal removal level currently achieved at the MFTP.
3. Attachment 3 of the *IMM Fourth Five-Year Review* includes a statistical analysis of paired CH2M HILL and IMO datasets. Both datasets result in similar conclusions of MFTP performance and compliance with CWA standards and BAT limits. However, the correlation between the CH2M HILL and IMO datasets could be improved. The following recommendations are presented to help reconcile differences between the datasets, and to provide data for further comparison:
   - The effluent composite sample should be well mixed by IMO and by CH2M HILL prior to collecting sample. This will help to ensure that solids are distributed uniformly throughout the composite sample and possibly reduce the differences in total metals concentrations. Section 6.1.1 of the IMO O&M manual (IMO, 2001) should be modified to specify that the composite sample is well mixed.
   - As sample volume allows, split sample analyses could be performed during the 2008-2009 wet seasons to help identify potential differences in laboratory

methodology. CH2M HILL recommends that split samples be collected by IMO and analyzed at the EPA Region 9 laboratory.

- As sample volume allows, additional duplicate effluent samples could be collected during the 2008-2009 wet season to provide additional data for statistical analysis and to quantify variability resulting from sampling or analytical methodology. CH2M HILL will plan to collect duplicate effluent samples for analysis at the EPA Region 9 laboratory.
- IMO should be provided a copy of CH2M HILL's annual IMM Surface Water Sampling Summary Report.

4. The 2000 SOW (EPA, 2000), IMO's O&M Plan (IMO, 2001), and IMO's Emergency Response Plan and Contingency Procedures (IMO, 2008e) specify procedures for emergency response and routine and non-routine O&M. IMO should look for opportunities to improve their emergency preparedness, including annual updates to the Emergency Response Plan and Contingency Procedures, posting emergency contact numbers in a prominent location, and ensuring that IMO staff are familiar with emergency procedures. During the April 25, 2008, meeting, AIG stated that the Emergency Response Plan and Contingency Procedures would be reviewed annually.
5. IMO submits sitewide data monthly to CH2M HILL and EPA in a Microsoft Access database that was initiated by IT Corporation, the previous site operator, and finalized in 2002 by Shaw Environmental Corporation. While this database has sufficient functionality for reporting requirements, over the longer term, IMO may want to consider a new database for running extended queries and data evaluation by the site operator. During the April 25, 2008, meeting, IMO stated they are currently considering upgrades to the database.

4.0 Sludge Drying Beds

No sludge was hauled from the sludge drying beds to Brick Flat Pit during the 2007 dry season because of the low volume of sludge generated during the 2007 water year. IMO has recommended to AIG that a sludge haul be performed during the 2008 dry season.

MFTP sludge drying bed Number 4 is almost full, and is projected to be full at the end of the 2008 Water Year, for a total sludge volume of 18,000 cubic yards. Sludge drying bed Number 3 is one third full, with a sludge volume of approximately 4,000 cubic yards. MFTP sludge drying beds 1 and 2 are empty, and IMO estimates that approximately 50,000 cubic yards of sludge storage capacity would be available during the 2009 water year if sludge is not transported to Brick Flat Pit.

Gullying continues to occur on the sludge drying bed bank below Drying Bed Number 4. Most of the gullying appears to be minor, but some gullies are deeper. Wes Franks/IMO said that he continues to monitor this area, and the gullying has not increased over the last 5 to 6 years.

4.1 Recommendation

During the April 25, 2008, meeting, AIG indicated that a sludge haul will be performed during the 2008 dry season to ensure adequate sludge storage capacity is available for the 2009 wet season.

Gullying on the sludge drying bed bank below sludge drying bed Number 4 should continue to be monitored, and if gullying worsens, drainage should be redirected or the area should be vegetated.

5.0 Boulder Creek Mouth

Sediment that accumulated behind the weir at Boulder Creek Mouth (BCMO) sampling location was dredged in mid-March, and additional cleanout is scheduled for the fall.

An ISCO sampler collects BCMO 24-hour composite water samples. IMO staff collects the composite samples daily.

5.1 Observations

The area surrounding the IMO BCMO sampling point and transducer contained leaves and vegetative debris during the site inspection. During the April 25, 2008, meeting, IMO stated that leaves and debris are frequently removed from the sampling location. The ISCO sampling bottles appeared to have a residue on the side of the bottles during the site inspection. During the April 25, 2008, meeting, IMO stated that the sample bottles are rinsed daily with deionized water, and weekly rinseate samples are analyzed and have no detectable concentrations of metals.

6.0 Boulder Creek Tailings Dam

Approximately 25,000 cubic yards of tailings are located in this area. Improvements to the Boulder Creek tailings dam were completed in 2004, as documented in the *Final Construction Report for Spillway Improvements at the Boulder Creek Tailings Area* (TRC, 2005). Improvements included raising the dam, building a spillway, adding gabions, and improving Boulder Creek upstream of the tailings dam. The improvements were in good condition, and no issues were identified during the April 3, 2008, site inspection.

7.0 Iron Mountain Mines, Inc., Tanks

Three 6,500-gallon poly tanks are located adjacent to the east-side of the metal shed that is across the road from the cementation plant. An additional poly tank of similar volume is located within the metal shed, along with equipment. Many 55-gallon plastic drums are stored on the north side of the metal shed, and most appeared to be empty. One 55-gallon plastic drum was labeled "Kwik 'N Kleen". The label stated that the product contained potassium hydroxide (caustic potash), was listed as corrosive, and had a health hazard ranking of 2 or "Hazardous". The tanks, equipment, and drums in this area are property of Mr. T. W. Arman, Iron Mountain Mines, Inc.

Rudy Carver/IMO discussed the contents of the tanks with Mr. Arman. The tanks contain raw AMD, sodium silicate, and Mr. Arman's Ag-Gel fertilizer product. The tanks are not labeled, and it is unknown which tank contains which contents. The three tanks located outside of the metal shed contained a total volume of approximately 8,600 gallons of fluid during the April 3, 2008, inspection. The tank located closest to the road contained 1,200 gallons of fluid. The middle tank contained 4,400 gallons of fluid. The tank located furthest from the road contained 3,000 gallons of fluid. There is no secondary containment for any of the tanks or drums. Precipitates had formed on the pipe connection for the middle poly tank, indicating a leak. Sand between the poly tanks and the shed was wet, but fluid was not visibly leaking from the tanks during the inspection.

7.1 Recommendation

The IMM Third Five-Year Review (EPA, 2003) recommended the contents of the fluid in these chemical storage tanks be determined and proper containment should be provided, if required, or the contents should be properly disposed. This recommendation should be addressed by Mr. Arman.

8.0 Boulder Creek Landslide Area

8.1 Boulder Creek Landslide

Minimal movement of the Boulder Creek Landslide has occurred over the 2007 or 2008 wet seasons. Precipitation during the 2007 and 2008 water years was below average. The *2007 Boulder Creek Landslide Annual Inspection and Evaluation Report* (The Mines Group, 2007c) plotted observed displacement during each water year from 1998 to the present against the observed precipitation for that water year. The results show a moderately strong correlation between precipitation and displacement magnitude.

The 2007 Boulder Creek Landslide inspection report states "clearly water is a major factor in the observed displacements within the slope failure complex, and the control of water would help control future displacements" (The Mines Group, 2007c). Various measures have been implemented to address the continued displacement of the Boulder Creek Landslide, and the landslide effects on the Lawson Mine (IMO, 2008f). These measures include:

1. Grading of the slopes above the Lawson Mine and at the top of the landslide to maintain effective drainage.
2. Installation of an 18-inch drain pipe to divert surface drainage to areas outside of the landslide.
3. Installation of 4 "fan drains" into the Lawson Mine.
4. Installation of 4 additional horizontal drains on the slope immediately above the Lawson Mine.
5. Mechanical cleaning of all horizontal and fan drains in the area to maintain efficient function.
6. Annual maintenance of the pipelines and surface water drainage to minimize infiltration.

The IMM Third Five-Year Review (EPA, 2003) recommended that the exposed PVC pipe at the ends of the horizontal drains be replaced with non-UV sensitive pipe. This has not yet been performed.

8.2 Boulder Creek Channel

The Boulder Creek channel was originally designed to convey peak flow during the 100-year storm. Around 1997, a culvert was constructed to convey Boulder Creek under a temporary access road to the horizontal drains. Gravel and rocks have accumulated on the upstream end of the culvert. The culvert will not convey peak flow from the 100-year storm. CH2M HILL expressed concern that the culvert will back up flow, and that the access road will be washed out, or structures between the access road and the portal might be damaged.

8.3 Lawson Access Road

The Lawson Road from Iron Mountain Road to the Lawson portal is defined by the SOW as an all-weather, critical access road. The roadway and culverts are in relatively poor condition, particularly between the Lawson Gate and the Lawson Laydown Area. This condition was identified on the 2008 Maintenance List provided by Wes Franks.

8.4 Recommendations

The Lawson Road from Iron Mountain Road to the Lawson portal requires additional maintenance. IMO should consider replacement and improvement of the culverts and improvement of the drainage ditch. During the April 25, 2008, meeting, IMO stated that the Lawson Road culverts will be repaired this year, and IMO is considering widening the road by up to 2 or 3 feet.

The effectiveness of recent drainage improvements at the Boulder Creek landslide area should be monitored, and further control measures should be considered and implemented, as necessary, to help to control future displacement of the landslide. During the April 25, 2008, meeting, IMO stated that the annual Richmond Mine, Lawson Portal, and Boulder Creek Landslide inspections are scheduled for May 14 and 15, 2008.

IMO should have an engineer determine the capacity of the culvert under the temporary access road and determine the risks associated with leaving the culvert in place. If the engineering evaluation indicates there is a significant risk to upstream or downstream structures during the 100-year peak flow event, IMO should remove the temporary access road and culvert during the wet seasons, or IMO should prepare a design for a culvert with the capacity to convey the peak flow in Boulder Creek from the 100-year storm.

Exposed PVC portions of the horizontal drains on top of and surrounding the Boulder Creek Landslide should be replaced with UV-resistant piping or covered with a UV-resistant coating. One option would be to paint the PVC pipe with a light (e.g., white or tan) water-based acrylic latex paint. The pipe would need to be repainted at an appropriate frequency to maintain the coating. Another option would be to replace exposed PVC pipe with Yelomine, a UV-resistant PVC pipe material.

9.0 Richmond Mine

The Richmond Adit was inspected on June 11, 2007, by The Mines Group, Inc (2007a). This was a visual inspection and no testing or measurements were conducted. The inspection included the Richmond Adit, Bypass, and A, B, C, and D drifts to the last muck dam in each drift. In addition to this inspection, extensometer and multiple-point borehole extensometer (MPBX) readings were performed by IMO. The results of these readings are presented separately (IMO, 2008f).

Conditions at the Richmond portal and adit showed no significant deterioration. Routine inspections need to be continued to identify conditions if they change. The Bypass had additional rock bolts installed at the muck bay nose and these appeared to be working adequately.

No failed shotcrete was observed at the five-way intersection. Routine inspections in this area are needed to determine if the structural integrity of the shotcrete and other support (rock bolts) are maintained.

The inspection report (The Mines Group, Inc., 2007a) states that there was no failed shotcrete in the B drift; however, during five-year inspection on April 3, 2008, sections of deteriorated and fallen shotcrete were observed in the B and C drifts. During follow up discussion with IMO staff, it was clarified that the inspection report should state that no failed structural shotcrete was observed. The shotcrete that had failed in the B and C drifts was installed as temporary support. However, the areas with failed shotcrete need to be monitored over the long term to determine if these drifts will require additional support to remain functional. In the short term, fallen and deteriorated shotcrete needs to be removed from drifts to maintain access and to assist in monitoring additional changes in shotcrete conditions. The inspection report states that failed shotcrete will be replaced. However, it is understood that this should refer to only failed structural shotcrete.

The 2007 Richmond Adit Inspection Report in the tabulated component summary (Serial No. 47; The Mines Group, Inc., 2007a) states that the rock bolts in the five way could not be inspected visually and should be tested. IMO should specify how and when the rock bolts will be tested.

For several locations (e.g., Mattie, five way, bypass drift) the 2007 inspection report (The Mines Group, Inc., 2007a) states that "no failed sections of shotcrete were observed", but no other description of the shotcrete was provided. A more detailed description of the observed condition of all areas of structural shotcrete inspected should be provided in future inspection reports so that changing conditions can be determined.

Regular (annual) removal of muck that accumulates behind the muck dams and the AMD dams is critical to continue operation of the AMD collection and conveyance system. This is a routine maintenance item that is being conducted and it is specified in the SOW. The SOW Section 9.9.2.1 (EPA, 2000) states that, at a minimum, muck shall be removed annually from the designated maintenance areas if more than 30 cubic yards accumulate.

The concrete plugs in the ore chutes continue to deteriorate. This is a long-term issue that should be addressed with routine chute plug inspection. The conditions of each chute that was plugged (those between the furthest muck dam and the five way) should be inspected

and recorded. Currently, not all chutes are inspected each year. In the 2007 Richmond Inspection Report (The Mines Group, Inc., 2007a), it appears that none of the chute plugs in the B and C drifts were inspected.

The concern with the chute plugs is that a plug could fail and release large quantities of muck and AMD. Depending on the size and location of the plug failure, the muck and AMD management system behind the five way may or may not be able to handle the release. There are three observed problems with the chutes. First, the drainage pipes installed in many of the chutes have become plugged and it is not known if the head above these chutes is rising to an unacceptable level. Second, there are several plugs that have developed leakage between the concrete plug and the chute wall. With low pH AMD flowing around the plug, the concrete will deteriorate relatively quickly compared to the condition of AMD pooled on top of the plug. Third, the potential for falling shotcrete or concrete from the chutes should continue to be recognized and addressed as a health and safety concern. It is uncertain when these leaking plugs will fail. IMO should begin to develop a strategy to address the failing chute plugs.

9.1 Recommendations

Routine inspections of the Richmond Mine need to be continued to identify changes in conditions, including the following:

- Routine inspections in the five way to determine if the structural integrity of the shotcrete and other support (rock bolts) are maintained. IMO should specify how and when the rock bolts in the five way will be tested.
- Monitoring of the areas with failed shotcrete in the B and C drifts to determine if these drifts will require additional support to remain functional.
- A more detailed description of the observed condition of all areas of structural shotcrete inspected should be provided in future inspection reports so that changing conditions can be determined.
- Routine chute plug inspection to document the conditions of each chute plugged between the furthest muck dam and the five way. During the April 25, 2008, meeting, IMO stated that a standardized checklist for chute inspection would be developed to track changing conditions.

During the April 25, 2008, meeting, IMO stated that the annual Richmond Mine, Lawson Portal, and Boulder Creek Landslide inspections are scheduled for May 14 and 15, 2008. IMO said they would provide The Mines Group, Inc. the recommendations for incorporation in the annual inspection.

The following maintenance items were identified:

- Ponded water was observed at several locations in the Richmond Adit. Gravel in the adit should be graded after annual maintenance activities to minimize ponding.
- Fallen and deteriorated shotcrete needs to be removed from drifts to maintain access and to assist in monitoring additional changes in shotcrete conditions. At the April 25, 2008, meeting, IMO stated this work had been completed for the 2008 dry season.

- Failed structural shotcrete should be replaced, when identified. During the April 25, 2008, meeting, IMO stated that no structural concrete has failed.
- Regular (annual) removal of muck that accumulates behind the muck dams and the AMD dams should continue in accordance with the SOW.
- The concrete plugs in the ore chutes continue to deteriorate. IMO needs to develop a strategy to address the failing chute plugs and the associated risks to worker safety, mine access, and the AMD conveyance and treatment system.
- During the April 25, 2008, meeting, IMO stated that the AMD dams would be improved during the 2008 dry season. CH2M HILL requested the opportunity to review the plans for the AMD dam modifications, and stated that IMO should confirm the volume of muck behind the C Drift AMD dam during the construction. The muck behind this AMD dam is currently submerged.
- During the April 25, 2008, meeting, IMO also stated that the five way inlet is deteriorating, and should be replaced with a stainless steel insert. A schedule for this action should be developed by IMO.

10.0 Lawson Mine

The Lawson Adit was inspected on June 11, 2007, by The Mines Group, Inc. (2007b). This was a visual inspection and no testing or measurements were conducted. The inspection included the Lawson Adit from the portal to station 5+80.

The primary issue with the Lawson is that the portal is located within the Boulder Creek landslide. This has caused movement of the portal over time. The movement of the portal is being tracked with routine surveying of specified locations. Mine supports were realigned in May 2007 to maintain their integrity. The steel supports from the portal to station 0+65 were straightened prior to the inspection. There is the potential that a significant landslide movement could result in a large displacement of the portal supports. A key issue with a collapse or partial collapse of the portal would be potential damage to the AMD conveyance system.

Two actions were taken to reduce the potential for failure of the AMD conveyance system.

- The AMD conveyance pipeline was encased in concrete from the portal to the AMD collection dam.
- A well was drilled from the ground surface into the Lawson behind the AMD collection dam to allow for pumping AMD if the collection pipeline were damaged. Mark Suden Mine Construction raised the elevation of the AMD dam at station 600 in August 2007 (IMO, 2007d). Diamond Core Drilling drilled and constructed the well in September 2007 (IMO, 2007c), and installed the pump and associated stainless steel well pipe in October 2007 (IMO, 2007a).

These actions improve the reliability of the AMD collection and conveyance system for the Lawson. CH2M HILL's understanding is that during non-emergency conditions, AMD will

be conveyed through the auxiliary AMD collection pipeline, and the auxiliary pipeline is located only 4 to 6 inches higher than the original AMD collection pipeline.

In the Lawson component summary table (Serial No. 5; The Mines Group, Inc., 2007b), it is stated that the displacements in the portal area were modest in 2006-2007. CH2M HILL commented that it was not clear in the 2007 annual inspection report how this conclusion was reached. The only survey data for 2007 presented in the 2007 Lawson Adit Survey Data were for 10/16/2007. For sets 12 and 22, substantial displacements were noted between the 11/02/06 and 10/16/07 surveys. During the April 25, 2008, meeting, IMO stated that the survey was performed after the sets were straightened in May 2007. IMO stated the conclusion that modest displacement occurred between 2006 and 2007 was based on survey data collected at the Boulder Creek Landslide. The Boulder Creek Landslide monitoring point 6 exhibited no elevation change and 0.05 feet of horizontal displacement between 2006 and 2007. IMO also used a level and inspected the sets prior to straightening to support the conclusion that additional displacement was observed since 2006.

10.1 Recommendations

CH2M HILL recommends that IMO submit an as-built drawing of the Lawson backup pumping system and a brief description of its intended operation for a final review by CH2M HILL and EPA.

CH2M HILL recommends that future annual inspection reports include adequate detail to understand conclusions made using the data presented.

If the sets are straightened in the future, survey data should be obtained before and after the straightening to allow comparison with previous and future survey data.

11.0 Brick Flat Pit

The amount of filtrate has decreased significantly at Brick Flat Pit. Throughout 2005, IMO noted in the Monthly Progress Reports that minimal flow was occurring at Filtrate Monitoring Sump 8R and low to minimal flow was observed from the Brick Flat Pit Spillway System. Minimal filtrate flow rates have continued to occur. During the October 26, 2005, meeting with AIG, EPA, IMO, and CH2M HILL (CH2M HILL, 2005), two possible reasons for reduced filtrate flow were discussed: (1) the filtrate piping has malfunctioned, or (2) the amount of filtrate has decreased as a result of the thickness of the overlying sludge, and the water is exiting the pit through the unlined sidewalls of the pit. The Brick Flat Pit liner extends 10 feet from the bottom of the pit. The sludge is currently about 80-feet thick.

IMO has conducted monitoring, but has not identified seeps around Brick Flat Pit. IMO has performed phosfluorescent dye studies on the drainage system in an attempt to trace the pathway of seepage from Brick Flat Pit. The phosfluorescent dye was a dye that is typically used in sewer tracer studies. The dye has not been detected at potential exit points, including AMD collected from the Richmond Mine. The dye might be diluted to below detectable limits by other flows in the Richmond Mine or degraded during contact with low-pH waters. IMO has monitored the water level in the filtrate riser pipe, and no standing water has been detected. IMO has poured water into the filtrate riser pipes, and the water

has been observed to flow over the weir, indicating that the filtrate pipelines are not broken. IMO thinks, but has not been able to verify, that drainage from Brick Flat Pit is entering stopes of the Richmond Mine, through the highly fractured north slope of Brick Flat Pit (Carver, 2008).

Brick Flat Pit is considered a dry landfill (EPA, 2000). The location of Brick Flat Pit was determined to be an effective sludge disposal location because drainage, if not captured, would reenter the ore body and be captured by the AMD treatment system (EPA, 1986), or would be discharged to the Slickrock Creek drainage, which is currently captured for treatment by SCRR.

Section 6.4 (Landfill Management Report and Plan) of the SOW (EPA, 2000) requires that "by November 30 of each year, the Site Operator shall provide to the Oversight Agency, for Oversight Agency review and approval, the Landfill Management Report and Plan". As described in the SOW, The Landfill Management Report and Plan is an annual report that enables the Oversight Agency to effectively evaluate whether the Brick Flat Pit landfill was properly managed, consistent with the concept design for a dry landfill, over the preceding twelve (12)-month period, and that the landfill will be properly managed as a dry landfill over the upcoming twelve (12)-month period. The Operations and Maintenance Submittal Register of the *IMO February 2008 Monthly Progress Report* (Table 10 of IMO, 2008g) indicates that the most recent Landfill Management Report and Plan was submitted in January 2004 (IMO, 2004).

11.1 Recommendations

IMO should submit an annual Landfill Management Report and Plan that addresses the requirements in the SOW (EPA, 2000).

Reasons for the reduced filtrate at Brick Flat Pit should continue to be evaluated. During the April 25, 2008, meeting, CH2M HILL and IMO discussed that other types of dye, such as lithium or a radioactive tracer, be considered for additional studies.

Groundwater elevation data collected at Brick Flat Pit are included in the road operator monthly data sheets in the IMO Monthly Progress Reports and are reviewed by IMO staff. CH2M HILL recommends that IMO also include Brick Flat Pit groundwater elevation data in the Microsoft Access database for potential future use in evaluation of filtrate pathways.

The 2008 Maintenance List includes a 10-foot extension of 4 filtrate riser pipes at Brick Flat Pit.

12.0 Old/No. 8 Mine Seep

12.1 CH2M HILL April 2008 Assessment

IMO described that operation of the Old/No. 8 Mine Seep was modified in 2005 to curtail pumping during the wet season and allow water levels in the Old/No. 8 Mine Seep to rise to between 50 and 30 feet below ground surface. When a seep was observed at the ground surface, IMO initiated pumping of PW3 to bring the water level within Old/No. 8 Mine back down, and PW3 was operated during the dry season (Carver, 2008).

On January 4, 2008, the power line crossing Boulder Creek Canyon and supplying power to SCRR and Old/No. 8 Mine Seep was disabled by high winds and inaccessible for repairs due to heavy snows in January and early February. The power line was repaired and restored to service on February 20, 2008 (IMO, 2008g). The emergency generators were used to operate SCRR, but no emergency power was available to PW3 at the Old/No. 8 Mine Seep. IMO described that during this period, the water level within Old/No. 8 Mine rose and encountered a fracture system, and a substantial seep was observed at the ground surface. IMO used this opportunity to construct a gravity drain system for the Old/No. 8 Mine Seep in February and March 2008. The gravity drain system provides a backup collection system if PW3 is inoperable and provides an alternative to the current pumping system during wet weather conditions (Carver, 2008).

Wes Franks/IMO stated that construction of the gravity drainage system was completed the week of March 24, 2008. CH2M HILL's understanding of the system is that an HDPE pipeline was installed as a gravity drain and collects AMD at a depth of 33 feet below ground surface. For comparison, Pump PW3 is located approximately 134 feet below the ground surface (EPA, 2000), and pumping is used to maintain the water level in the Old/No. 8 seep between 50 and 70 feet below ground surface (Carver, 2008). The gravity drain discharges into a small grit chamber (Tank TK9). The discharge from the gravity drain grit chamber is conveyed by a separate pipeline that is witched into the 18-inch HDPE pipeline near the bottom of the Slickrock Creek sedimentation basin. The discharge from the gravity drain grit chamber is then conveyed to the MFTP for treatment. The gravity drainage system can accept 125 gpm before the grit chamber/tank is overtopped, after which AMD from the Old/No. 8 Mine Seep would discharge into SCRR.

Pump PW3 was not operating during the April 3, 2008, site inspection. IMO began pumping PW3 in April after the site inspection, to bring the water level back down in Old/No. 8 Mine. This will provide storage for the planned 6 to 8 week period during the 2008 dry season when IMO plans to take the thickener offline and perform maintenance. The 1 million gallon emergency storage tank (TK14), and if necessary, the simple mix treatment process will be used to address AMD from the Richmond and Lawson Mines during the 6- to 8-week maintenance period (Carver, 2008).

CH2M HILL has the following concerns regarding the use the Old/No. 8 gravity drainage system:

1. Use of the gravity drainage system depletes the emergency storage reservoir within the Old/No. 8 Mine.
2. The AMD collection system is put at risk by not continuously or regularly operating PW3. There is a concern that the pump may not be operational when needed in an emergency situation.
3. The SCRR grout curtain and outlet works encasement contain cement hydration products that are susceptible to acid attack. They were not designed to resist the more highly acidic water from the Old/No. 8 Mine Seep.
4. IMO did not submit a design for the gravity drainage system to EPA or CH2M HILL for approval prior to construction and operation.

Table 4 presents monthly average pH and flow data for the Old/No. 8 Mine Seep and SCRR. Tables 5, 6, and 7 present a monthly summary of operational data for PW3.

12.2 October 26, 2005. Meeting: Old/No. 8 Mine/PW3

AIG, EPA, IMO, and CH2M HILL met on Wednesday, October 26, 2005, to discuss the SOW, proposed clarifications and modifications to the SOW, and other miscellaneous items. CH2M HILL prepared a meeting summary to document the issues discussed at the meeting and their proposed resolution (CH2M HILL, 2005). EPA requested that IMO review this memorandum and provide any comments to EPA to ensure that the meeting agreements are reflected accurately. The following is the documented resolution regarding the Old/No. 8 Mine/PW3:

a. IMO requested consideration of modifying the collection of Old/No. 8 Mine Seep by stopping pumping from PW3 and either allowing the seep to flow into the SCRR or by collecting it in a pipe at the surface seep location.

b. EPA noted that there will be no change in the requirement to ensure the capability to operate PW3 for selective treatment using PW3. The option to allow seepage to directly enter the SCRR for collection is not acceptable because of the low pH of the Old/No. 8 Mine water. EPA will consider allowing collection at the ground surface.

c. Because of the potential for significant low-pH underflow, it will be necessary to determine the effectiveness of collection at the ground surface and the impact on the pH of the SCRR dead pool.

12.3 GEI Consultants 2007 Annual Dam Safety Inspection Report

GEI Consultants (GEI) performed the 2007 Annual Dam Safety Inspection (GEI, 2008). The GEI inspection report discussed that IMO changed operation of Old/No. 8 Mine Seep in 2005, and GEI expressed concerns regarding potential impacts to the SCRR facility. The following is an excerpt of the GEI inspection report regarding the Old/No. 8 Mine Seep (GEI, 2008).

> In 2005, IMO modified operation of the Old/No. 8 Mine Seep. The original design of SCRR assumed that the Old/No. 8 Mine Seep would continue to be pumped and conveyed separately from the SCRR (i.e., not discharged into the reservoir), since the water quality data indicated that the Old/No. 8 Mine Seep water was significantly more acidic than the reservoir water. Data collected by IMO indicated that there may not be as significant of a difference between these two water sources as was assumed during the design. IMO therefore proposed to shut off the Old/No. 8 Mine Seep pumps allowing the Old/No. 8 Mine Seep water to build up in the buried mine workings and seep into the reservoir. IMO discussed the issue with EPA and received preliminary approval to shut off the pumps in the winter, when the presumably higher-acidity water from the mine workings would be diluted by Slickrock Creek's higher winter flows, but will maintain pumping in the summer months when the creek flow shuts down.

GEI's review of IMO's pH data for Slickrock Creek and Old/No.8 Mine Seep waters suggests that on average the latter remains more acidic (by about 0.5 pH units) than the former. The grout curtain and outlet works encasement contain cement hydration products and therefore are susceptible to acid attack. They were not designed to resist the more highly acidic water from the Old/No. 8 Mine Seep water. Reservoir water with high acidity could eventually dissolve the grout curtain and/or attack the outlet works concrete. Such detrimental effects likely would be indicated by a trend of gradually decreasing pH of the seepage water at the dam's down-stream toe and potentially a trend of increasing seepage flows. Such trends could lead to the need to regrout the dam foundation and/or repair the outlet works.

The cost of such repair measures would most certainly negate and overwhelm any savings derived from reductions in pumping of Old/No. 8 Mine Seep water. Therefore, recommends extreme caution in the use of gravity discharge of Old/No. 8 Mine Seep water to SCRR. This should only be allowed when the acidity of the two waters is similar, and the Slickrock Creek flow is high enough to effectively dilute the Old/No. 8 Mine Seep water. When the acidity of the Old/No. 8 Mine Seep is higher (i.e., of a lower pH) and the Slickrock Creek flow rate is relatively low, GEI recommends that the Old/No. 8 Mine Seep water be pumped and discharged to its dedicated pipeline.

12.4 Recommendation

CH2M HILL recommends that IMO submit an as-built drawing of the Old/No. 8 gravity discharge system and a description of the intended operation for a formal review by CH2M HILL and EPA.

CH2M HILL recommends that IMO actively pump the Old/No. 8 Mine Seep for AMD collection, and IMO should use the gravity discharge system only as an emergency backup system.

During the April 25, 2008, meeting, IMO stated that Old/No. 8 is currently being pumped but would not be pumped during the 6 to 8 week period of treatment plant maintenance. IMO plans to review the variation in pH during periods of no pumping.

13.0 Slickrock Creek Retention Reservoir

13.1 Sedimentation Basin and Rock Check Dams

In 2007, IMO constructed several new rock check dams upstream of the sedimentation basin to supplement the existing upstream check dams constructed by IMO over the last four years (GEI, 2008). Sediment that accumulates behind the rock check dams is dredged each year. These upstream rock check dams are effectively reducing the amount of sediment accumulation in the main sediment basin. GEI (2008) reported that storage space for sediment removed from the rock check dams is running out, and IMO will need to develop a new disposal plan following cleaning in 2008.

Approximately 8,500 cy of material was removed from the sedimentation basin in November 2006 (GEI, 2008). Approximately 20 feet of material has accumulated in the sedimentation basin since the removal in 2006.

13.2 Clean Water Diversion

Sand and gravel have accumulated upstream of the SCRR clean water diversion intake and needs to be removed during the 2008 dry season. This basin is cleaned out every 5 years, and cleanout was identified on the 2008 Maintenance List provided by Wes Franks.

Rocks have accumulated in the concrete-lined ditch that conveys storm water along the south side of SCRR. The storm water is discharged into the energy dissipater at the upstream end of the dam spillway. Rocks have been transported under the bars of the metal grate and into the spillway. CH2M HILL expressed concern that the capacity of the concrete-lined ditch is reduced by the rocks, and the ditch may not be able to convey the peak runoff from a 100-year, 24-hour storm.

13.3 Right Abutment and Stabilized Slide Area

No significant cracks were identified in the shotcrete above the anchors in the stabilized slide area.

Dirt has accumulated around the piezometer casings. This dirt should be cleaned out and a small amount of concrete placed around the casing to prevent dirt from entering the casing.

13.4 27 Road and 28 Road Drop Inlet Structures

The inlet of the 27 Road and 28 Road drop inlet structures has been propped up with 4 x 4 pieces of wood. This is not an acceptable long-term solution because of the potential for plugging these structures.

13.5 Recommendations

GEI (2008) reported that storage space for sediment removed from the rock check dams is running out, and IMO will need to develop a new disposal plan. During the April 25, 2008, meeting, IMO stated that approximately 10,000 cubic yards of sediment disposal volume remains. IMO will submit a design for additional sediment disposal areas for EPA review; however, the additional disposal area will not be required for several years.

Sand and gravel has accumulated upstream of the SCRR clean water diversion intake and should be removed routinely to maintain capacity at all times of the diversion structures and clean water diversion. This is required under SOW Section 9.10.4.2. This was included on the 2008 Maintenance List provided by Wes Franks/IMO.

The concrete-lined ditch that conveys storm water along the south side of SCRR needs to be cleaned out more frequently to remove rocks. Cleanout of the ditch was included on the 2008 Maintenance List provided by Wes Franks/IMO. The metal bars should be extended downward on the grate over the discharge to the energy dissipater. The accumulated debris in the spillway catch basin should be cleared at an opportune time.

Dirt has accumulated around the piezometer casings. This dirt should be cleaned out and a small amount of concrete placed around the casing to allow easier clean out and prevent dirt from entering the casing.

IMO should work with design engineers for the 27 Road and 28 Road drop inlet structures to provide a more reliable long-term solution. During the April 25, 2008, meeting, IMO and CH2M HILL discussed that catch basins should be constructed to capture upgradient flows and prevent material from entering the structures.

14.0 Consolidated Hematite Pile Toe Berm

No issues were identified for the toe berm for the hematite pile.

A white precipitate (potentially aluminum hydroxide) was observed in the filtrate from the eastern hematite drain.

15.0 Jeep Road

Four of the down comers from the culverts along the Jeep Road were broken or were missing sections of pipeline. The pipelines that were observed during the April 3, 2008, inspection were located on the east and west side of Road Marker 2 ½ along the Jeep Road.

15.1 Recommendation

The damaged down comers along the Jeep Road should be repaired. The reason for failure of the storm water pipelines should be determined and conditions corrected, if possible. CH2M HILL suggests inspecting other downdrain piping at the site to determine if similar deterioration has occurred.

During the April 25, 2008, meeting, IMO stated that the damaged down comers along the Jeep Road were repaired, and the pipelines are inspected monthly.

16.0 Matheson Disposal Cell

Monthly visual inspections of the Matheson disposal cell are performed by Wes Franks/IMO, and no issues have been identified.

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TABLE 1
Summary of Iron Mountain Mine Recent Site Inspections
Site Inspection Summary, IMM Five-Year Review

Inspection Area	Most Recent Inspection Start Date	Most Recent Inspection Finish Date	Document Source[a]	Persons Conducting or Attending Inspection	Inspection Activities Conducted	Inspection Observations and Issues
2007 Richmond Mine Annual Inspection	06/11/07	06/12/07	The Mines Group, Inc., 2007a	Robert Spengler, The Mines Group, Inc. Kenneth Myers, PE, The Mines Group, Inc. IMO – Richmond Mine Extensometer and MPBX readings	Annual visual inspection of rehabilitated portions of the Richmond Mine and associated components (portal, mine support, ventilation, AMD collection system).	Inspection issues and observations are documented in this memorandum.
2007 Lawson Mine Annual Inspection	06/11/07	06/12/07	The Mines Group, Inc., 2007b	Robert Spengler, The Mines Group, Inc. Kenneth Myers, PE, The Mines Group, Inc. Pace Civil, Inc. – Surveys	Annual visual inspection of the Lawson adit and associated components (portal, mine support, pipelines, water check dams). The most recent survey was performed on October 27, 2007.	Inspection issues and observations are documented in this memorandum.
Upper Spring Creek Clean Water Diversion Including Impact Structure Inspection	07/24/07	07/26/07	IMO, 2008a CH2M HILL, 2007a	Joe Benoit, Extech, LLC Rod Jackson, CH2M HILL Rudolph Carver, IMO	Inspected the Spring Creek clean water diversion structure to identify and document any change in the condition of the internal lining and concrete condition in the pipeline.	Pipeline lining continues to deteriorate with use, and as the lining is removed, the underlying concrete erodes. Extent and depth of erosion is not a concern at this time. The eroded concrete and liner should be monitored on an annual basis. The impact structure is in good condition. Repair of some coating failure noted on the inlet structure gate will be scheduled for 2008. Either Rezi-Weld epoxy with sand or Emaco S88 repair mortar should be used for future concrete pipeline repairs.
Thickener TK-11 Coating Inspection	07/23/07	08/08/07	IMO, 2008a CH2M HILL, 2007b	Joe Benoit, Extech, LLC Rod Jackson, CH2M HILL Rudolph Carver, IMO	1. Quality assurance inspection of IMO's recoating of the thickener tank launder. 2. Scheduled maintenance inspection of the coal tar epoxy internal lining (thickener shell). 3. Scheduled maintenance inspection of the coal tar epoxy coating on the thickener mechanism (i.e., rake arms, center well, and center column).	1. The present condition of the tank launder should allow many years of service without major repairs required. 2. Areas identified with pinpoint corrosion and mechanical damage for Thickener Tank TK-11 tank shell were repaired by IMO. The thickener coating is in very good condition and performing well. 3. Areas of corrosion on the coating for the rake arms, center well, and center column will be scheduled for 2008 maintenance of TK-11. None of the identified areas will affect the structural integrity of the mechanism.
Slickrock Creek Clean Water Diversion Including Impact Structure and Spillway Inspection	07/26/07	07/27/07	IMO, 2008a CH2M HILL, 2007c	Joe Benoit, Extech, LLC Rod Jackson, CH2M HILL Rudolph Carver, IMO Wes Franks, IMO	Inspected the Slickrock Creek diversion pipeline, impact structure, and spillway to identify and document abnormalities in condition of reinforced concrete pipeline and concrete structure due to normal wear, or failures of previously repaired portions of the pipeline.	No repair recommendations were identified for Slickrock Creek diversion and impact structure or the Slickrock Creek spillway. There were areas of the pipeline that should be watched for further deterioration during future inspection.
Sludge Conditioning Tank TK-13 Cleaning and Inspection	08/07/07	08/09/07	IMO, 2008a	Joe Benoit, Extech, LLC	Quality assurance inspection of IMO's recoating of the Tank TK-13.	The present condition of Tank TK-13 should allow many years of service without major repairs required.
Minnesota Flats Treatment Plant (MFTP) Effluent Discharge Compliance Oversight and Review	08/01/03	01/31/08	CH2M HILL, 2008 CH2M HILL, 2007d	CH2M HILL	1. Weekly wet season surface water sampling. 2. Fourth IMM Five-Year Review evaluation of the operational performance of MFTP in meeting the performance standards for treatment plant effluent discharge.	The SOW should be modified to modify BAT effluent limits based on metal removal level currently achieved at the MFTP. This was previously discussed in October 25, 2005, meeting with AIG, EPA, IMO, and CH2M HILL (CH2M HILL, 2005).

TABLE 1
Summary of Iron Mountain Mine Recent Site Inspections
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Inspection Area	Most Recent Inspection Start Date	Most Recent Inspection Finish Date	Document Source[a]	Persons Conducting or Attending Inspection	Inspection Activities Conducted	Inspection Observations and Issues
Slickrock Creek Retention Reservoir, Semi-Annual Geotechnical Data Evaluation	December 2006	08/01/07	GEI, 2007	Dan Wanket, GEI Project Manager Alberto Pujol, P.E., GEI Dam Engineer Pace Civil, Inc. – Surveys	Evaluation of specific geotechnical data for SCRR for December 2006 through June 2007 Brief site reconnaissance on 08/01/07.	Recommended that EPA/CH2M HILL provide action levels and response actions for data from the load cells on the slope anchors on the right abutment of the dam. This was completed by CH2M HILL (2007e).
2007 Boulder Creek Landslide Annual Inspection	9/27/07	9/27/07	The Mines Group, Inc., 2007c	Kenneth Myers, PE, The Mines Group, Inc. Pace Civil, Inc. – Surveys	Settlement monuments (21 total) are surveyed to determine surface movements within the slope failure complex. Report evaluates data through May 17, 2007.	Minimal movement of the Boulder Creek Landslide occurred over the 2007 or 2008 wet seasons. Data show a moderately strong correlation between precipitation and displacement magnitude. The report concludes that water is a major factor in the observed displacements within the slope failure complex, and the control of water would help control future displacements.
Subsidence Areas and Clay Caps Survey	10/16/07	10/16/07	IMO, 2007a	Pace Civil, Inc. – Surveys	Annual survey of subsidence areas	Comparing the 2007 versus 2006 surveys indicates minimal continuing vertical movement of the monitored areas. The differences measured between 2007 and 2006 are similar to the measured displacements over previous years. For the period between November 14, 2006 and October 16, 2007, the vertical changes ranged from +0.00 to -0.06 feet. The total movement since survey markers were set on June 26, 1995, shows vertical change ranging from -0.01 feet to -1.54 feet.
Slickrock Creek Dam, 2007 Annual Dam Safety Inspection	12/20/07	12/20/07	GEI, 2008	Dan Wanket, GEI Project Manager Alberto Pujol, P.E., GEI Dam Engineer Pace Civil, Inc. – Surveys	1. Reviewed geotechnical data collected by IMO from the previous year (through December 2007) 2. Annual dam inspection on December 20, 2007, including the dam and appurtenances.	Slickrock Creek Dam is performing well, is well maintained, and is in satisfactory condition. Dam performance and operation appear consistent with design expectations. The slide over the right abutment does not appear to have undergone significant movement since it was stabilized during construction. No safety deficiencies or significant issues requiring immediate actions were identified. Maintenance-level actions were identified, and significant observations are documented in this memorandum.
Iron Mountain Operations Monthly Progress Reports	Monthly	N/A	IMO, 2008b	Iron Mountain Operations	Monthly reports include a summary of operation and maintenance activities, tables with analyses and operational data, cost reports, project schedule, health and safety, inspection reports, and an electronic database.	Varies by month. Significant current issues are summarized in this memorandum.
Iron Mountain Operations SCRR Monthly Reports	Monthly	N/A	IMO, 2008c	Iron Mountain Operations	Monthly reports include a summary of activities, summary of inspections, work planned for the next reporting period, issues of concern, and monitoring data.	Varies by month. Significant current issues are summarized in this memorandum.
Fourth IMM Five-Year Review Site Inspection	04/03/08	04/03/08	Inspection issues and observations are documented in this memorandum.	John Spitzley/CH2M HILL Sandra Shearer/CH2M HILL Dave Bunte/CH2M HILL Eric Halpenny/CH2M HILL	Inspection included onsite documents and records; AMD pipelines; the Upper Spring Creek diversion; Minnesota Flats Treatment Plant and sludge drying beds; Boulder Creek mouth, tailings dam, landslide, and channel; Richmond Mine; Lawson Portal; Brick Flat Pit; Old/No. 8 Mine Seep; SCRR; Matheson Disposal Cell; and site roads, slopes, and tanks.	Inspection issues and observations are documented in this memorandum.

[a]Full citations for each document are provided in the Works Cited.

Note:
P.E. = Professional Engineer

TABLE 2
Iron Mountain Project Costs
Site Inspection Summary, IMM Five-Year Review

Line	Costcode	Description	AIG 2003 ($)	AIG 2004 ($)	AIG 2005 ($)	AIG 2006 ($)	AIG 2007 ($)
1	06-00-00	Miscellaneous Work Plans					
2	06-04-00	Landfill Management Report and Plan					
3	06-05-00	SCRR Startup/Shakedown Work Plan		7,737			
4	06-06-00	Site Health and Safety Plans		985	2,901	7,283	17,897
5	06-08-00	Quality Assurance Project Plan					
6	07-00-00	Site Staff Including Payroll and Benefits	1,015,355	1,126,657	1,239,922	1,266,736	1,299,779
7	09-00-00	Treatment Plant – Routine	383,449	291,406	212,994	290,633	296,343
8	09-00-01	Insurance (e.g., property, liability, auto)	n/a	206,981	184,854	318,949	262,642
9	09-01-00	Lime	1,018,019	862,403	919,163	1,376,078	514,628
10	09-02-00	Electricity	594,887	520,625	424,621	453,326	397,348
11	09-03-00	Sludge Haul	649,214	679,384	410,727	1,141,559	45,260
12	09-03-03	Treatment Plant – Nonroutine	240,521	205,950	516,553	129,461	385,966
13	09-04-02	Ancillary Facilities – Routine	5,341	6,404	9,630	18,207	5,705
14	09-04-03	Ancillary Facilities – Nonroutine		70,085	12,417	2,448	109,765
15	09-05-03	Roads – Routine	40,000	56,602	31,651	80,419	54,905
16	09-05-04	Roads – Nonroutine	213,706	117,392	48,970	109,021	18,422
17	09-05-10	Electrical Support (e.g., power poles)		13,831	5,547		
18	09-06-02	AMD Conveyance Systems – Routine		5,428		1,588	
19	09-06-03	AMD Conveyance Systems – Nonroutine	140,776	30,505	1,925	7,699	5,635
20	09-07-02	Brick Flat Pit – Routine	13,000	28,993	28,945	34,854	11,454
21	09-07-03	Brick Flat Pit – Nonroutine	41,000	31,053	4,792		
22	09-08-02	Subsidence Areas – Routine	3,000	3,385	6,335	3,506	11,139
23	09-08-03	Subsidence Areas – Nonroutine					
24	09-09-21	Richmond Adit – Routine		7,944	38,116	66,626	11,784
25	09-09-22	Richmond Adit – Nonroutine	1,635,069	273,020	64,185	4,172	8,844
26	09-09-23	Lawson Adit – Routine	3,000	1,755	10,430	28,733	10,380
27	09-09-24	Lawson Adit – Nonroutine			2,425	33,061	181,484
28	09-09-25	Mine Workings/Old/No. 8 – Routine	8,488	4,064	765		
29	09-09-26	Mine Workings/Old/No. 8 – Nonroutine			1,315		
30	09-10-22	Upper Spring Creek Diversion – Routine	43,406	8,271	2,250	7,187	370

TABLE 2
Iron Mountain Project Costs
Site Inspection Summary, IMM Five-Year Review

Line	Costcode	Description	AIG 2003 ($)	AIG 2004 ($)	AIG 2005 ($)	AIG 2006 ($)	AIG 2007 ($)
31	09-10-23	Upper Spring Creek Diversion – Nonroutine	15,583	35,483			
32	09-10-42	Upper Slickrock Creek Diversion-Routine		4,181	3,065	2,125	
33	09-10-43	Upper Slickrock Creek Diversion – Nonroutine					
34	09-10-52	Left-Side Clean Diversions – Routine					
35	09-10-53	Left-Side Clean Diversions – Nonroutine					
36	09-11-02	Boulder Creek Tailings Dam – Routine		1,100			
37	09-11-03	Boulder Creek Tailings Dam – Nonroutine	24,156	90,477	47,505		
38	09-12-02	Slickrock Creek Basin – Routine		24,469	45,284	166,834	53,081
39	09-12-03	Slickrock Creek Basin – Nonroutine		15,048	77,363		56,613
40	09-13-02	Boulder Creek Landslide Area – Routine	3,000	4,168	11,489	8,033	1,473
41	09-13-03	Boulder Creek Landslide Area – Nonroutine			27,772	3,126	10,351
42	09-14-00	Sampling Program – Laboratory Analysis	104,269	80,281	68,332	61,415	59,264
43	09-14-01	Sampling Program – Laboratory Supplies	5,000	10,114	12,292	10,275	7,724
44	09-14-02	BCMO Weir Maintenance/Sediment	10,000	2,537	6,462	3,081	
45	09-15-00	Boulder Creek Cementation Plant					
46	09-16-00	Security Systems		1,838			10,196
47	09-17-00	Downgradient Property		11,084	2,494	4,275	
48	09-18-00	Waste Disposal Facilities	27,554	33,873	11,534		
49	10-00-00	Emergency Response					
50	11-00-00	Response to Extreme Events					
Totals			**6,237,793**	**4,875,511**	**4,495,024**	**5,640,711**	**3,848,451**

Notes:

Fiscal years extend from December 1st through November 31st.

Source: Iron Mountain Operations (IMO). December 2007 Monthly Progress Report. January 18, 2008.

TABLE 3

Iron Mountain Operations, Primary Operation, Maintenance, and Inspections Performed in 2007

Site Inspection Summary, IMM Five-Year Review

Start	Finish	Activity	Duration (days)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
02/05/07	02/23/07	Lawson & Richmond Mine Maintenance	15		--										
06/11/07	06/12/07	Inspect Richmond & Lawson Mines	3						--						
05/07/07	05/25/07	Maintenance at Lawson Mine	20					-----							
08/06/07	12/30/07	Back-Up AMD collection system for Lawson	30								----------				
04/01/07	12/30/07	2007 Plant Maintenance Program	180				----------								
06/01/07	08/31/07	Shop-Test Modicon Quantum Boards @ ArcSine	90						----------						
09/06/07	09/30/07	ArcSine to install Quantum Boards at IMO	21									-----			
07/30/07	07/31/07	Clean & Inspect TK13	2							-					
08/03/07	08/10/07	TK13 Recoating by Redwood Painting	0								--				
07/18/07	08/17/07	Thickener TK11 Outage	30							----------					
07/23/07	08/10/07	Thickener Overflow Trough Recoating by Redwood	21							----------					
07/24/07	07/24/07	Inspect Spring Creek Diversion RCCP	1							-					
07/25/07	07/25/07	Inspect Thickener TK11 Coating	1							-					
07/26/07	07/26/07	Inspect SCRR Diversion Pipeline	1							-					
07/27/07	07/27/07	Inspect SCRR Spillway Pipe	1							-					
07/23/07	08/10/07	Extech Inspection Services	21							------					

TABLE 3

Iron Mountain Operations, Primary Operation, Maintenance, and Inspections Performed in 2007

Site Inspection Summary, IMM Five-Year Review

Start	Finish	Activity	Duration (days)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12/10/07	12/10/07	SCRR Slide Gate Maintenance	1												-
		Sludge Haul - Not Necessary For 2007													
		Extend Brick Flat Pit Vents - Not Necessary For 2007													
06/18/07	07/18/07	Expand Rock Creek Dam at SCRR	10						------						
04/09/07	05/25/07	Rebuild French Drains at SDB-4 and SDB-2	15				--	--							
09/01/07	09/14/07	Close-in Old Treatment Plant for additional storage	10									---			
11/01/07	11/30/07	New gate at property line	15										Deferred to 2008		

Source: Iron Mountain Operations (IMO). *December 2007 Monthly Progress Report.* January 18, 2008.

TABLE 4
Iron Mountain Operations Monthly Average Data for the Period Between August 27, 2004, and March 19, 2008
Site Inspection Summary, IMM Five-Year Review

Month	Old/No. 8 PW3 Flow (gpm)	SCRR Flow (gpm)	Old/No. 8 PW3 pH	SCRR pH
January	78	1,034	2.19	2.50
February	97	854	2.17	2.48
March	101	1,308	2.15	2.47
April	185	1,402	2.02	2.51
May	163	746	2.11	2.46
June	109	246	2.10	2.41
July	40	110	2.04	2.27
August	48	191	2.18	2.33
September	34	101	2.14	2.50
October	43	82	2.20	2.38
November	47	126	2.28	2.43
December	41	584	2.25	2.48

Note:
Flow data is an average of parameters "Flow (GPM)-PMCS" and "Flow (GPM)-Local" in the IMO database.

TABLE 5

Old/No. 8 PW3 Operational Data - Average Water Level Measurements Using a Tape

Site Inspection Summary, IMM Five-Year Review

Year	Units	Annual Average	January	February	March	April	May	June	July	August	September	October	November	December
2001	ft	86	87	84	83	88	89		90	85	81	87	89	86
2002	ft	87	82	90	91	90	91	90	83	71				90
2003	ft	89	90	90	90	89	89		89		82			
2004	ft	89												89
2005	ft	70	90	91	84	91	89	92	89	58	36	34	36	29
2006	ft	53	29	52	63	43	44	49	26	43	51	56	75	93
2007	ft	54	82	75	38	27	52	82	83	60	44	34	28	32
2008	ft	25	22	24	31	--	--	--	--	--	--	--	--	--

TABLE 6

Old/No. 8 PW3 IMO Operational Data – Number of Days with Zero Total Flow

Site Inspection Summary, IMM Five-Year Review

Year	Units	Total Number of Days	January	February	March	April	May	June	July	August	September	October	November	December
2001	Days	44	8	1					16	9	8	2		
2002	Days	38	3					18	17					
2003	Days	31					1	13	4	2		8	3	
2004	Days	20						15	5					
2005	Days	121			2			9	24	30	10	22	24	6
2006	Days	29					8	19		2				
2007	Days	222	10	16	27	14		14	19	30	31	30	31	31
2008	Days	50	31	19		--	--	--	--	--	--	--	--	--

TABLE 7

Old/No. 8 PW3 IMO Operational Data - Total Annual and Monthly Flow (Million Gallons)

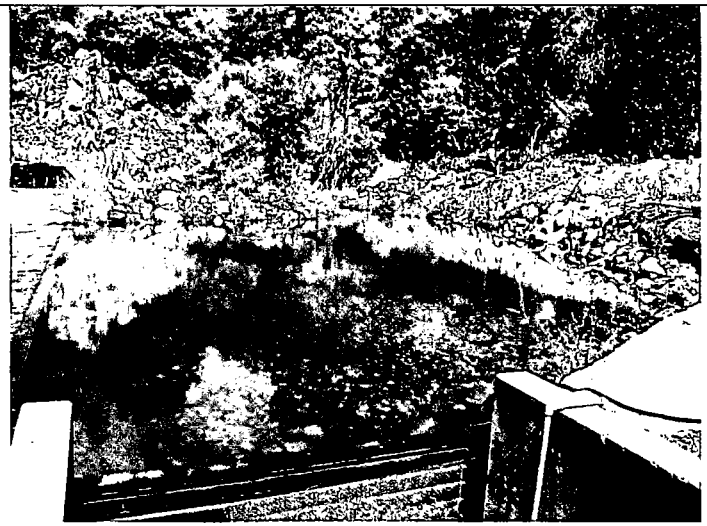
Site Inspection Summary, IMM Five-Year Review

Year	Units	Total Annual Flow	January	February	March	April	May	June	July	August	September	October	November	December
2001	MG	48	1.8	4.2	10.4	5.2	3.8	3.1	3.0	1.5	2.5	2.5	3.1	6.7
2002	MG	47	9.4	5.6	5.0	3.9	3.4	3.2	1.7	1.4	2.5	3.6	2.4	4.6
2003	MG	61	11.2	6.4	5.2	5.5	8.7	4.8	2.4	3.4	3.9	2.4	2.1	4.9
2004	MG	58	9.0	8.0	11.3	5.9	4.3	3.3	1.4	3.6	3.1	2.5	2.4	2.8
2005	MG	43	5.7	4.9	5.5	8.7	6.4	5.8	3.1	0	0	2.4	0.37	0.34
2006	MG	64	6.1	8.0	8.5	9.7	9.7	3.5	0.67	5.0	2.5	2.8	4.5	3.4
2007	MG	16	1.9	0.95	0.01	1.6	5.1	4.5	1.4	0.49	0	0	0	0
2008	MG	--	0	1.2	2.8	--	--	--	--	--	--	--	--	--

EPA REGION 9 WORK ASSIGNMENT 212

Iron Mountain Mine Sitewide Inspection, April 3, 2008

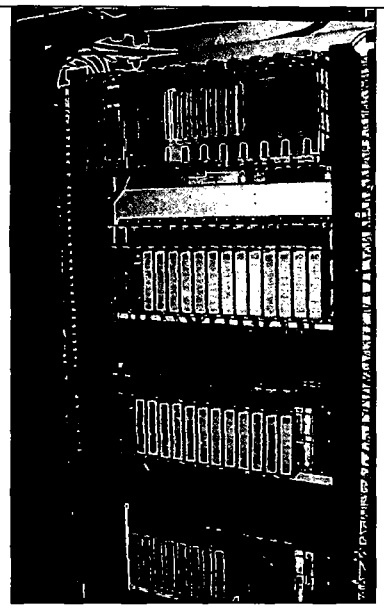
Upper Spring Creek Diversion Impact Structure. Stainless steel plates were installed during the 2004 annual maintenance event.



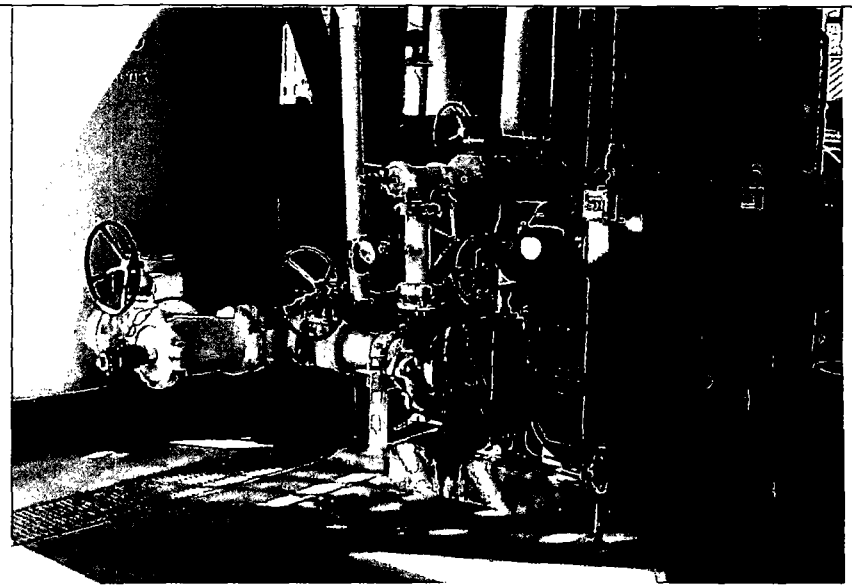
Upper Spring Creek Diversion Inlet Structure. Sand and gravel in sedimentation basin needs to be removed.

Upper Spring Creek Diversion Inlet Structure. Sand and gravel in sedimentation basin needs to be removed.

Minnesota Flats Treatment Plant (MFTP) Control Center.

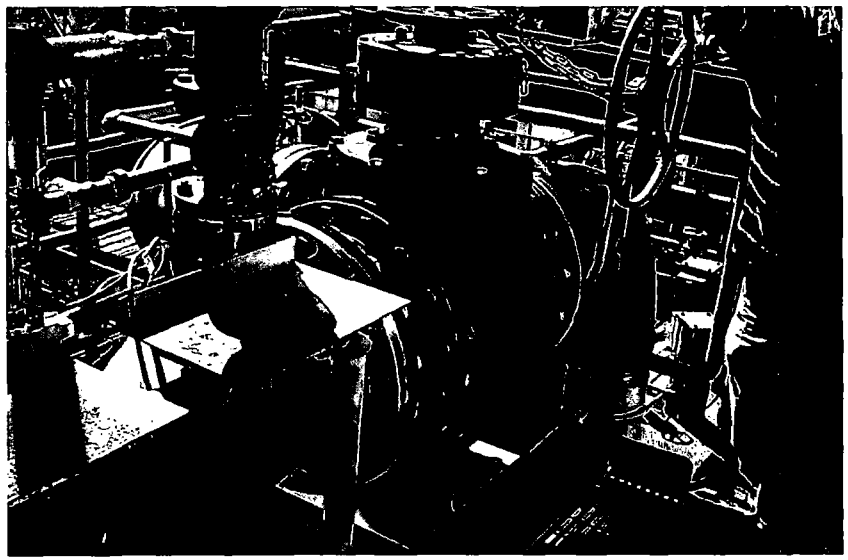


MFTP Control Center. Programmable logic controller (PLC) system updated in September 2007.

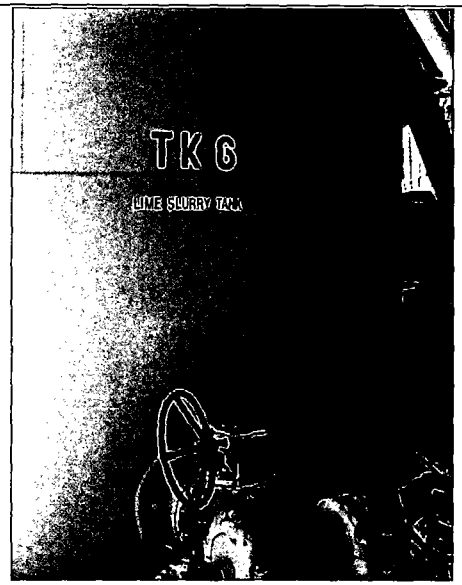


MFTP lime slurry pumps. All pumps and tanks, except the thickener, have redundancy.

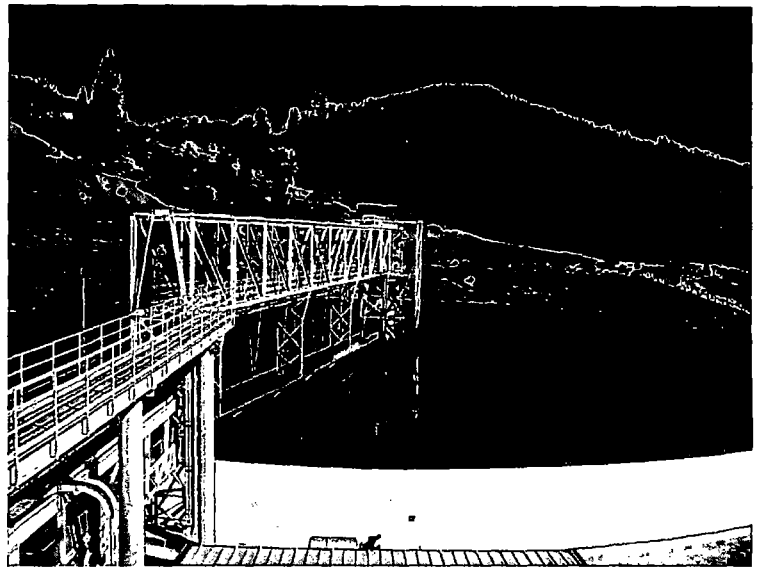
MFTP acid mine drainage (AMD) influent sample location. Sample ports should be labeled.



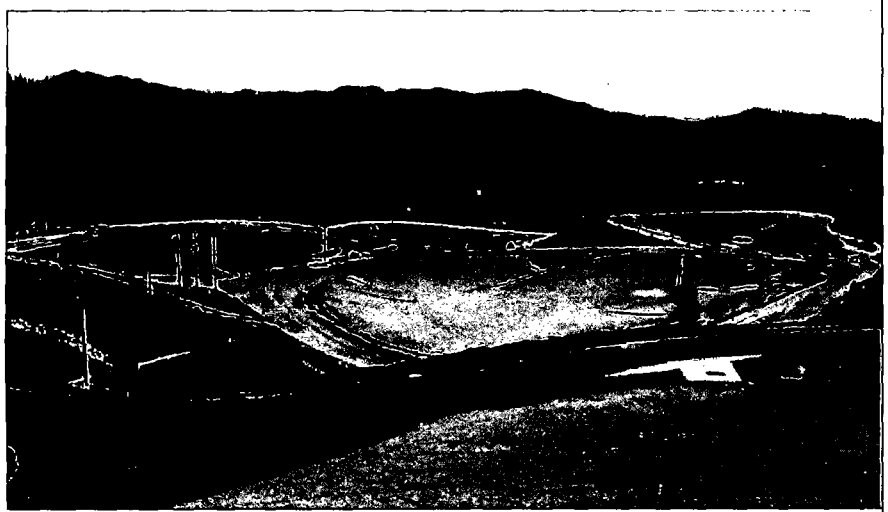
MFTP manual 3-way valve for AMD influent.



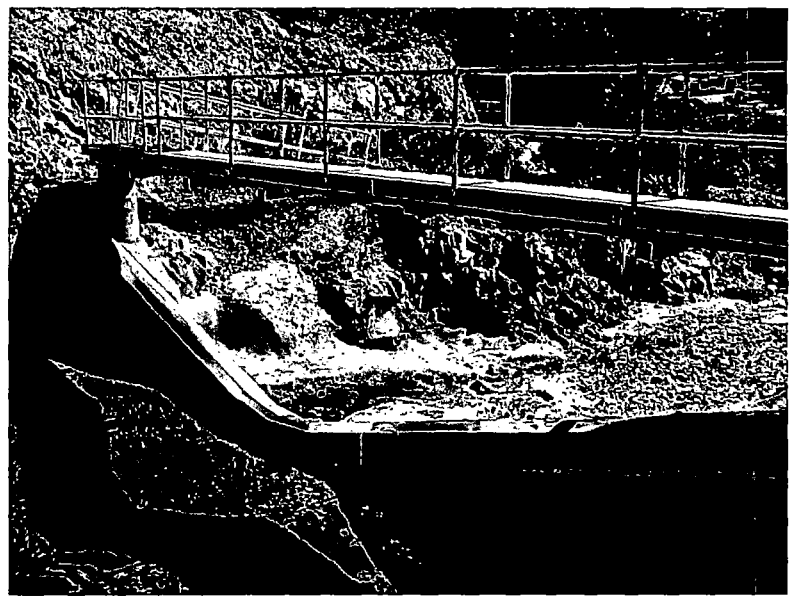
MFTP lime slurry tanks. The treatment plant has two lime slurry tanks for redundancy.



MFTP thickener. The thickener tank launder was recoated in 2007.

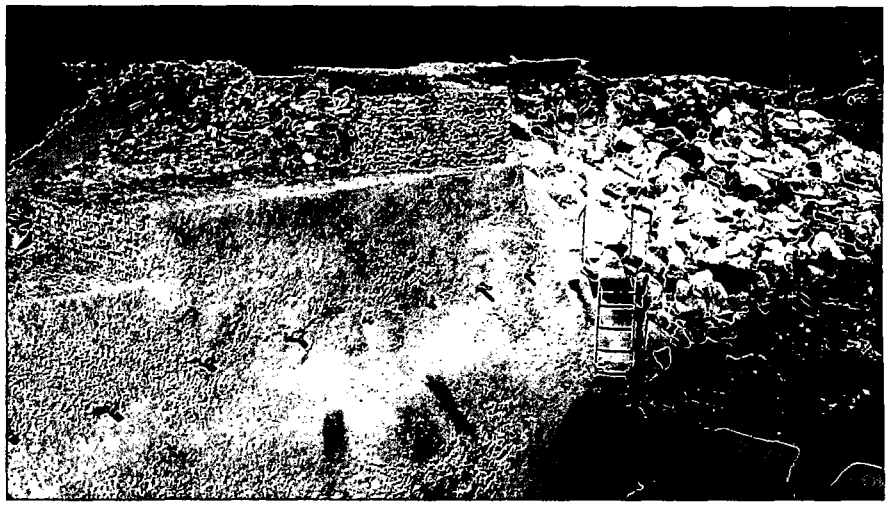


MFTP sludge drying beds. Pond # 4 was almost full and Pond # 3 was one third full, for a total sludge volume of about 20,000 yd^3.



Boulder Creek Mouth (BCMO) weir and sampling location.

IMO's sampling and monitoring equipment at BCMO. Sticks and leaves were located adjacent to the sampler upon arrival.

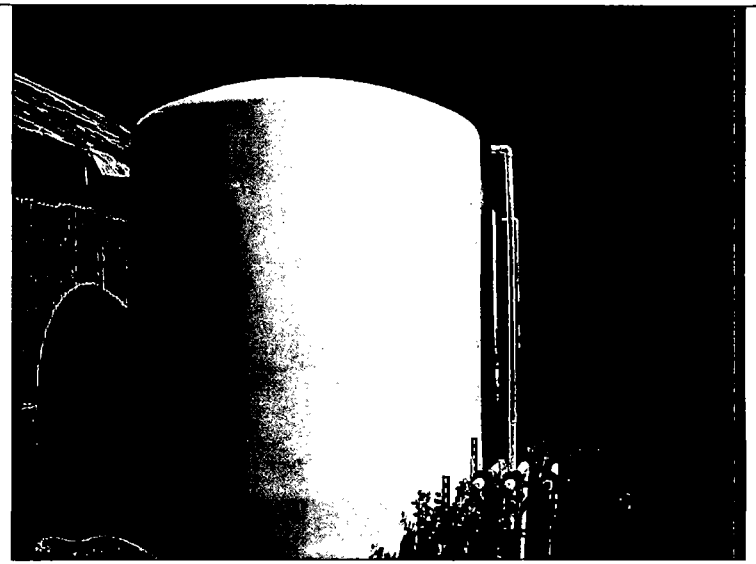


Boulder Creek Tailings Dam. Improvements were completed in 2005 to raise the dam, build the spillway, and improve Boulder Creek upstream.

Boulder Creek adjacent to Tailings Dam.

Boulder Creek upstream of Tailings Dam.

Ted Arman maintains tanks within the metal shed and on the east side of the shed.

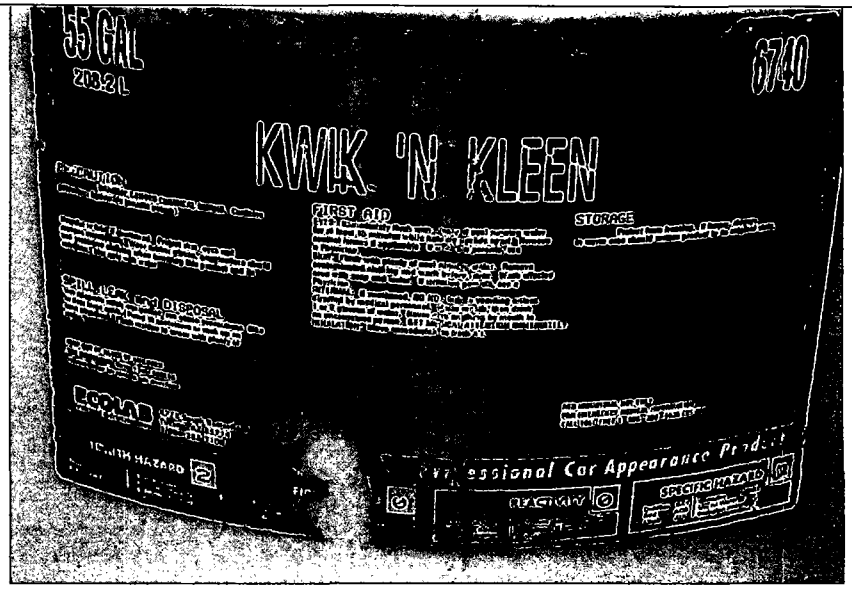


Three 6,500-gallon poly tanks are on the east side of the shed. Per IMO discussion with Ted Arman, the tanks contain raw Acid Mine Drainage, Sodium Silicate, and Ag-Gel fertilizer product.

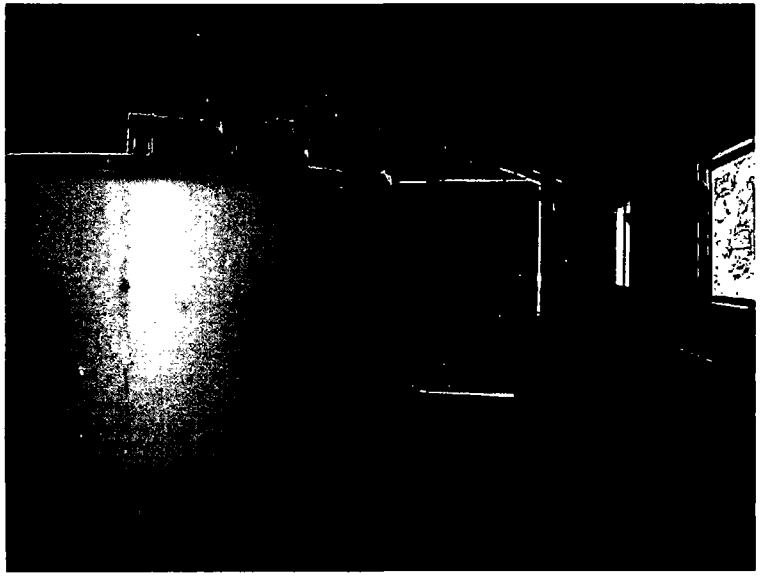
Precipitates on the pipe connection for the middle poly tank, located east of the shed, indicates a leak. There is no secondary containment.

Sand between the poly tanks and the shed was wet, but fluid was not visibly leaking from the tanks during the inspection.

55-gallon drums stored on north side of warehouse. Many of the drums were empty.



Label on one 55-gallon drum. Contains potassium hydroxide (caustic potash), which is listed as a corrosive health hazard.



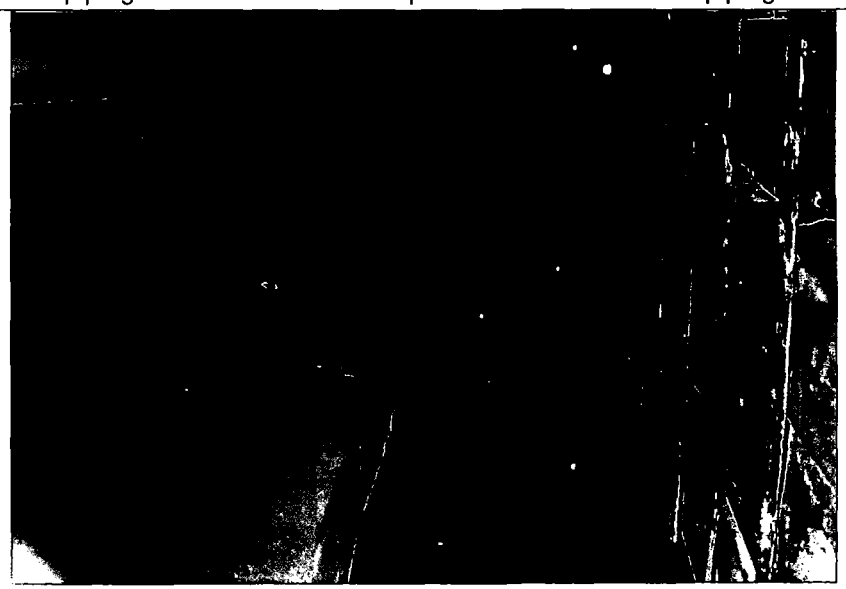
Tanks maintained by Ted Arman and located within the metal shed. Photo was taken from window on north side of shed.

Boulder Creek Landslide Area. The culvert was constructed to convey Boulder Creek under a temporary access road to horizontal drains.

Boulder Creek landslide area. Downstream end of culvert under temporary access road.

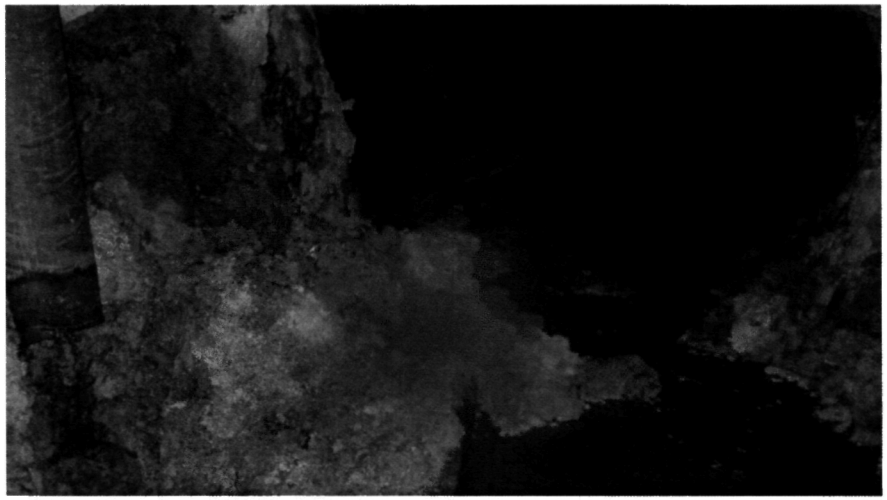
PVC horizontal drains in Boulder Creek landslide area. The exposed PVC piping should be coated or replaced with UV-resistant piping.

Lawson Portal. AMD pipeline was encased in concrete to protect the pipeline from falling rocks.

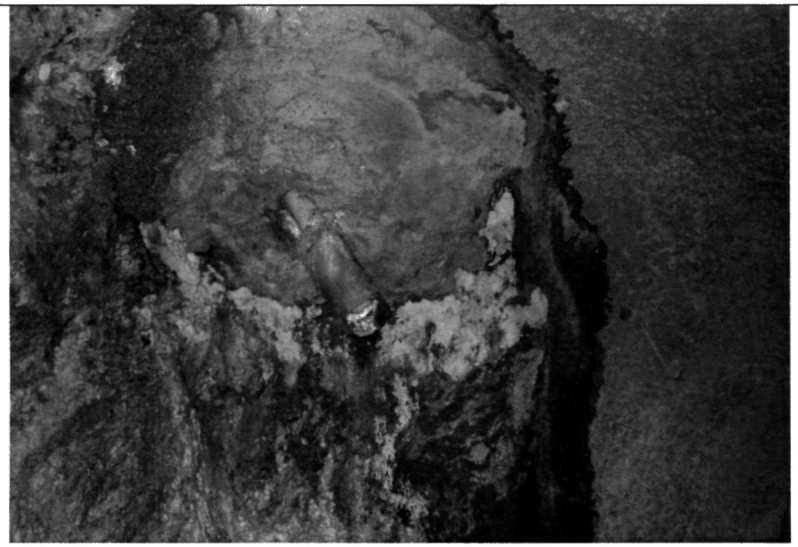


Lawson Portal. AMD pipeline was encased in concrete to protect the pipeline from falling rocks.

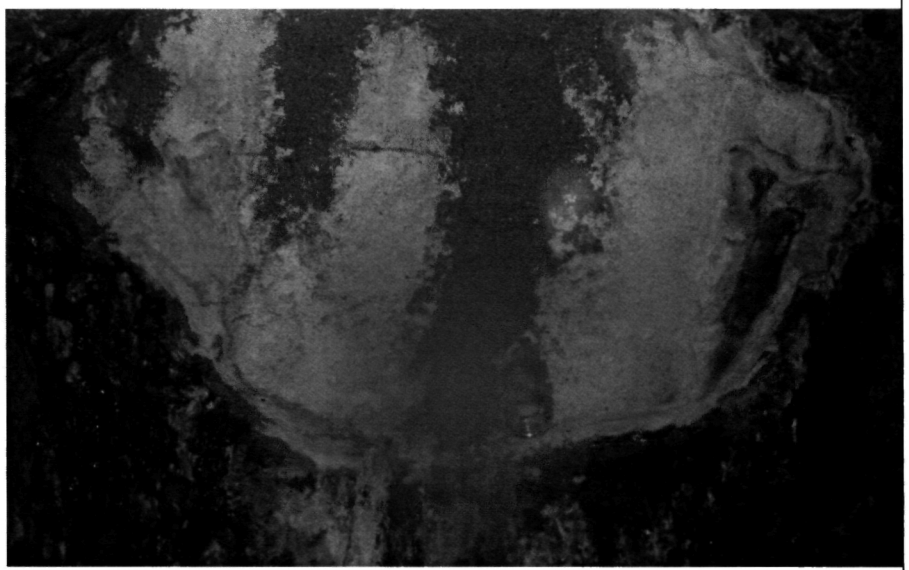
On 12/18/07, a leak of the AMD pipeline occurred near Road Marker 16.5 near the intersection of the AMD pipeline and the filtrate pipeline that extends from the Mine Waste Disposal Cell. Pipeline was repaired.



Richmond Mine. Wes Franks commented this was a pile of the shotcrete form that had fallen from the wall (the "back").

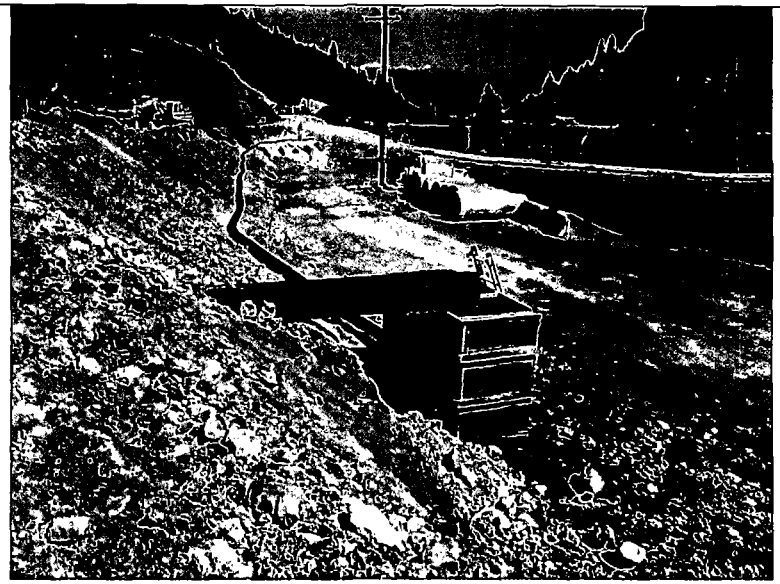


Richmond Mine. Shotcrete form has fallen off a portion of the plug. The pipe drain shown in the photo is blocked, and seepage is occurring around the edge of the chute plug.

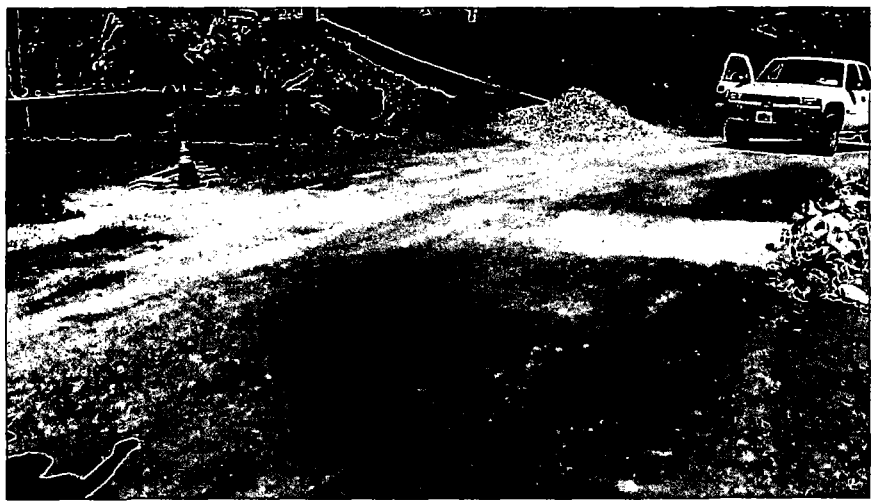


Richmond Mine. Seepage is occurring around the edge of the chute plug.

Brick Flat Pit, looking NE. IMO will raise 4 filtrate riser pipes by 10 feet in 2008. Filtrate has decreased significantly and needs to be investigated.



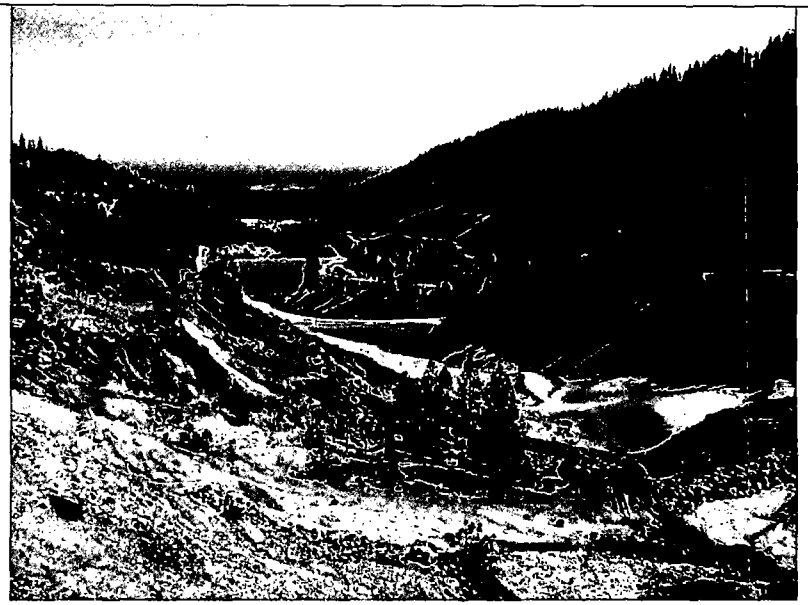
Old No. 8 gravity drain pipeline installed in March 2008. PW-3 was not being pumped at the time of the inspection.



Old No. 8 PW-3 Grit Chamber shown in background. New gravity drain pipeline alignment evident in foreground, adjacent to orange cone.

SCRR, looking south.

SCRR sedimentation basin, looking southwest.



SCRR sedimentation basin and rock check dams, looking east. The rock check dams are performing well.

Upstream of SCRR clean water diversion intake. Sand and gravel need to be removed from basin.

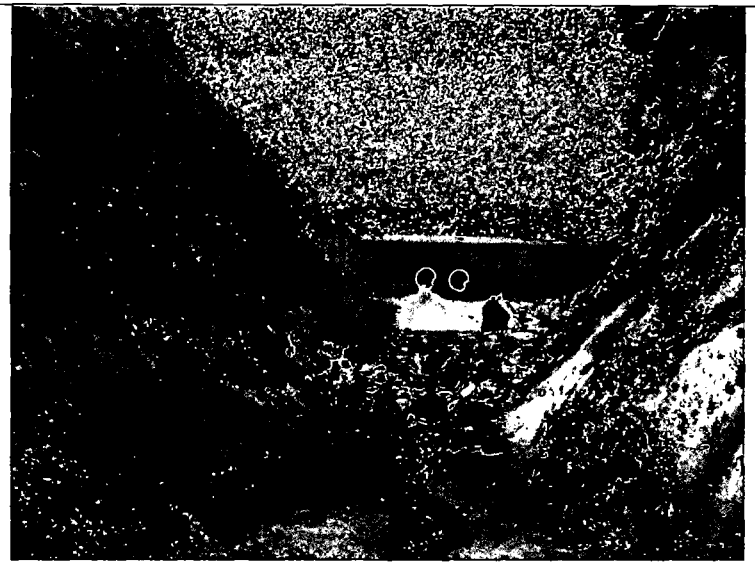
SCRR storm water channel. Rocks have accumulated in channel and need to be removed more frequently.

SCRR storm water channel. Rocks have accumulated in channel and need to be removed more frequently.

SCRR storm water channel. Gap between channel bottom and metal grate has allowed some rocks to enter spillway. Bars should be extended.

SCRR Spillway. Rocks and gravel have entered the spillway from the storm water channel.

SCRR intake structure and dam. The water level this wet season came up to the second gate.



Toe berm for upper consolidated hematite pile. No issues were identified. A white precipitate (potentially aluminum hydroxide) was observed in the filtrate from the eastern hematite drain.

Matheson disposal cell. No issues were identified.

Four down comers from culverts along the Jeep Road have broken and need to be replaced. This pipeline is near mile marker 2 ½.

Four down comers from culverts along the Jeep Road have broken and need to be replaced. This pipeline is near mile marker 2 ½.

Attachment 7
Institutional Control Assessment

Institutional Control Assessment Iron Mountain Mine Five-Year Review

TO: Rick Sugarek/U.S. Environmental Protection Agency

FROM: Sandra Shearer/CH2M HILL
Caroline Ziegler/CH2M HILL

DATE: July 8, 2008

PROJECT NUMBER: 367266.SR.04

This memorandum provides an institutional control (IC) assessment in accordance with June 2001 OSWER Directive 9355.7-03B-P, "Comprehensive Five-Year Review Guidance." The U.S. Environmental Projection Agency (EPA) has not yet implemented ICs at the Iron Mountain Mine (IMM) Superfund Site in the five signed Records of Decision (EPA, 1986 [ROD 1]; EPA, 1992 [ROD, 2]; EPA, 1993 [ROD 3]; EPA, 1997 [ROD 4]; EPA, 2004 [ROD 5]). However, EPA has outlined IMM access controls in the October 2000 *Statement of Work Site Operations and Maintenance, Iron Mountain Mine, Shasta County, California* (SOW) (EPA, 2000a), and several interim actions, including fencing and security gates, have been taken at IMM. ICs will be implemented in a final remedy for IMM. This memorandum discusses the interim access controls and procedures that have been implemented.

Interim Access Controls and Procedures

The SOW (EPA, 2000a) includes the principal steps necessary to operate and maintain the CERCLA remedies selected under RODs 1 through 4 at IMM (EPA, 2000a). The Site Operator, Iron Mountain Operations (IMO), is responsible for implementing the SOW and controlling access to the Site. The SOW was included in the December 2000 settlement of cost recovery litigation between the United States and the State of California with Aventis CropScience USA. The settlement provides funding that ensures proper operation and maintenance of the remedies implemented pursuant to RODs 1 though 4.

This section reproduces details from the SOW pertaining to IMM site access and security measures. This section also summarizes a conversation with the IMM Site Operator regarding the effectiveness of current access controls. Finally, this section summarizes Bureau of Reclamation (Reclamation) security measures for Spring Creek Debris Dam (SCDD).

Iron Mountain Mine Site Access Requirements

The SOW (EPA, 2000a) details requirements for site access, summarized as follows:

1. The Site Operator shall provide the Oversight Agency, the Support Agency, and their representatives with access at all reasonable times to the Site, or such other property, to conduct any activity related to the SOW

2. The Site Operator shall refrain from using the Site, or such other property, in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial measures to be implemented pursuant to the Consent Decree and SOW.

3. If the Site Operator acquires any ownership or other property interest in the Site, or any other property where access and/or land/water use restrictions are needed to implement the Consent Decree, the Site Operator shall:

   a. Upon acquiring such interest, provide the Oversight Agency, the Support Agency and their authorized representatives with access at all reasonable times to the Site, or such other property, for the purpose of conducting any activity related to the SOW and the Consent Decree; and

   b. In coordination with the Oversight Agency and the Support Agency, take appropriate steps to ensure the long-term enforceability of access and ICs with respect to such property, including, but not limited to, appropriate deed notices and other actions.

4. The Oversight Agency will secure permission for the Site Operator to enter and perform Work at the property owned by Iron Mountain Mines, Inc., T.W. Arman, the United States, or the State (if any), including the facilities, plant and equipment located thereon (and necessary to carry out the actions of the SOW and Consent Decree) for the sole purpose of permitting the Site Operator to carry out the Work under the SOW and Consent Decree.

5. To the extent that access and/or land/water use restrictions at property not owned by the Site Operator and not at the property referenced in Number 4 above are needed to implement the Consent Decree or the SOW, the Site Operator shall use its best efforts to secure from persons who own such property, to the extent determined by the Oversight Agency to be necessary, as applicable:

   a. An agreement to provide access thereto for the Site Operator, as well as for the United States and the State, and their representatives (including contractors), for the purpose of conducting any activity related to the Consent Decree;

   b. An agreement, enforceable by the Site Operator, the United States, and the State to abide by the obligations and restrictions established by Number 3(b) above, or that are otherwise necessary to implement, ensure non-interference with, or ensure the protectiveness of the activities to be performed pursuant to the Consent Decree;

   c. The execution and recordation in the Recorder's Office of Shasta County, California, of an easement, running with the land, that (i) grants a right of access for the purpose of conducting any activity related to the SOW and the Consent Decree, and (ii) grants the right to enforce the land/water use restrictions that the Oversight Agency and the Support Agency, as appropriate, determine are necessary to implement, ensure non-interference with, or ensure the protectiveness of the activities to be performed pursuant to the Consent Decree or the SOW;

   d. The access rights and/or rights to enforce land/water use restrictions shall be granted to (i) the United States, on behalf of its representatives, (ii) the State and its

representatives, and (iii) other appropriate grantees, as determined by the Oversight Agency; and

e. If the Oversight Agency so requests, within sixty (60) days of notice from the Oversight Agency that access is required, the Site Operator shall submit to the Oversight Agency and the Support Agency, as appropriate, for review and approval with respect to such property:

   i. A draft easement that is enforceable under the laws of the State of California, free and clear of all prior liens and encumbrances (except as approved by the Oversight Agency), and acceptable under the Attorney General's Title Regulations promulgated pursuant to 40 U.S.C. Section 255; and

   ii. A current title commitment or report prepared in accordance with the U.S. Department of Justice Standards for the Preparation of Title Evidence in Land Acquisitions by the United States (1970) (the "Standards"). Within fifteen (15) days of approval by the Oversight Agency and the Support Agency, as appropriate, and acceptance of the easement, the Site Operator shall update the title search and, if it is determined that nothing has occurred since the effective date of the commitment or report to affect the title adversely, the easement shall be recorded with the Recorder's Office of Shasta County. Within thirty (30) days of the recording of the easement, the Site Operator shall provide the Oversight Agency and the Support Agency, as appropriate, with final title evidence acceptable under the Standards and a certified copy of the original recorded easement showing the clerk's recording stamps.

6. Notwithstanding any provision of the SOW, the United States and the State retain all of their access authorities and rights, as well as all of their rights to require land/water use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable federal or State law, statutes, or regulations.

Iron Mountain Mine Property Security Measures

The October 2000 SOW (EPA, 2000a) details the existing IMM security measures and associated operation and maintenance requirements. Text included in the SOW relating to the security measures is reproduced below (EPA, 2000a).

In addition to the security measures described below, the property owner has posted the property to discourage trespassers. The Site Operator performs monthly inspections of potential points of entry to the site to look for evidence of and deter trespassers. Also, the *ROD 4 Remedial Action Report, Slickrock Creek Retention Reservoir* (CH2M HILL, 2004) describes the interim access control that was implemented as part of the ROD 4 remedial action, which was completed in 2004. This is included as Number 5 in the Security Systems Unit Description below.

Security Systems Unit Description

1. The security systems include, but are not limited to, two electronic, locally and remotely controlled gates on Iron Mountain Road. The Site entry gate provides primary access to

the Site, sludge drying beds, and Minnesota Flats Treatment Plant (MFTP), and is located on Iron Mountain Road near the Flat Creek crossing. The entry gate system includes overhead lighting, a keypad entry control panel, an intercom that allows communication with the MFTP operation room, remote operations capability, a pressure pad embedded in the roadway that triggers the gate motor, a gate motor, and a gate.

2. The secondary Site electronic gate, located just above the MFTP, controls access on Iron Mountain Road above the MFTP and includes a magnetic key entry pad, remote operations capability, a pressure pad embedded in the roadway that triggers the gate motor, and a gate.

3. The security systems include, but are not limited to, seven locked gates consisting of posts, chain link, angle iron, and other materials positioned across roadways that lead offsite in the Upper Slickrock Creek Basin, Upper Boulder Creek (north of Brick Flat Pit), and Spring Creek watersheds.

4. The security systems include locked gates at the Richmond and Lawson portals and locked fence.

5. A locked electrical control room was constructed at the Slickrock Creek Retention Reservoir project site.

O&M Requirements for the Security Systems

1. The Site Operator shall control access to the Site and shall prevent unauthorized individuals from entering the Site. The Site entry gate shall remain closed, except during emergencies and during those periods that the Site Operator or the Oversight Agency retains direct control of the entry.

2. The Site Operator shall maintain a list of individuals and companies that possess the keypad entry codes to the primary gate, magnetic keys that allow entry to the secondary Site gate, and keys to all gates and facilities.

3. The Site Operator shall operate and maintain the electronically operated and heavy-duty steel gates, including all parts, components, and directional signs.

Effectiveness of Iron Mountain Mine Access Controls

CH2M HILL met with the Site Operator to discuss the effectiveness of Iron Mountain Mine access requirements and security measures. Sandra Shearer/CH2M HILL met with Rudolph Carver, IMO Project Manager, on March 27, 2008, at the IMM Site. CH2M HILL staff (Sandra Shearer, John Spitzley, Dave Bunte, and Eric Halpenny) met with IMO staff (Rudolph Carver and Wes Franks) during the IMM Five-Year Review sitewide inspection. Details of the meeting and inspection are provided in Attachments 5 and 6 of the *IMM Fourth Five-Year Review* (CH2M HILL, 2008a and 2008b).

No vandalism has recently occurred on the site. The property is located between two heavily used national forests. The Site Operator performs monthly inspections of potential points of entry to the site to look for evidence of and deter trespassers. There is evidence that dirt bikes or motorcycles have accessed the site from adjacent federal lands. In

response, IMO has placed additional signage, barriers (e.g., boulders or trees), or trenches across these points of entry to discourage future access.

IMO identified that copper electrical cables (replacement value $14,000) stored at the Richmond Mill Buildings were missing on March 21, 2007. IMO notified the Shasta County Sheriff, and the missing cable was identified at Northstate Recycling. The cable was delivered to Northstate Recycling by individuals working for Mr. T.W. Arman, current owner of the Iron Mountain property (IMO, 2007).

Spring Creek Debris Dam Security Measures

Acid mine drainage discharged from IMM is transported via Spring Creek through the Spring Creek Reservoir (the impoundment created by SCDD), into the Spring Creek Arm. SCDD was constructed in 1963 to regulate the discharge flow rate of metal-rich contaminated water in Spring Creek into the Sacramento River and to reduce or prevent sediment in the Spring Creek Basin from entering the Spring Creek Arm.

Access to Spring Debris Dam, and subsequently Spring Creek Reservoir, is restricted by Bureau of Reclamation. A pad-locked gate and fence restricts vehicular access to SCDD. The area is regularly patrolled by Bureau of Reclamation Northern California Area Office security guards as part of the overall Shasta and Keswick area security measures. As described below, the Iron Mountain Mine Site, including Spring Creek Reservoir, is located between two heavily used national forests, so direct exposure is possible for trespassers.

EPA's remedial actions implemented under RODs 1 through 4 have resulted in more than 97 percent reduction in metal loading discharges from the IMM Site. Because of remedies implemented under RODs 1 through 4, EPA anticipates that discharges from SCDD will not result in exceedances of State and Federal drinking water standards at the point of withdrawal for the Redding Municipal and Bella Vista Water Districts (EPA, 1997; EPA, 2003).

Bureau of Reclamation initiated a Spring Creek Debris Dam Emergency Exercise on August 15, 2007. The purpose of the exercise was to test the emergency preparedness in the event that metal-laden sediment was released from the Spring Creek Arm in amounts that could adversely impact downstream drinking water sources. As part of the Emergency Exercise, the SCDD Emergency Action Plan was successfully used to make downstream notifications in a timely manner to prevent impacted water from entering domestic water supplies (U.S. Bureau of Reclamation, 2008). The Regional Water Quality Control Board also coordinates with the City of Redding during SCDD spill and emergency release periods so that groundwater can be used if appropriate, thereby providing additional protection to human health.

Conclusions

EPA has not yet implemented ICs at the IMM Superfund Site in the five signed RODs (EPA, 1986; EPA, 1992; EPA, 1993; EPA, 1997; EPA, 2004). However, EPA has outlined IMM access controls in the SOW (EPA, 2000a) and several interim actions, including fencing and security gates, have been taken at IMM. The IMM interim access controls and SCDD security measures are controlling potential human exposures and preventing adverse

impacts to the integrity or protectiveness of the remedial measures. A layered IC strategy will be implemented in the final IMM ROD.

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Attachment 8
Applicable or Relevant and Appropriate Requirement Analysis

Applicable or Relevant and Appropriate Requirement Analysis, Iron Mountain Mine Five-Year Review

PREPARED FOR: Rick Sugarek/U.S. Environmental Protection Agency

PREPARED BY: Sandra Shearer/CH2M HILL
John Blasco/CH2M HILL

DATE: July 8, 2008

PROJECT NUMBER: 367266.SR.01

This technical memorandum provides an analysis of updates to the applicable or relevant and appropriate requirements (ARAR) and guidance to be considered since the fifth Iron Mountain Mine Record of Decision (ROD 5) (U.S. Environmental Protection Agency [EPA], 2004). The following changes in ARARs and TBCs have occurred since ROD 5 was issued in September 2004:

- EPA promulgated acute and chronic copper criteria under the EPA National Recommended Ambient Water Quality Criteria (AWQC) for Freshwater Aquatic Life Protection that are calculated using a bioavailability model, the Biotic Ligand Model (EPA, 2007).
- The California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), revised the Public Health Goal (PHG) for copper in drinking water.
- Revisions are recommended to the best available technology (BAT) economically achievable effluent controls for the high density sludge (HDS) acid mine drainage (AMD) neutralization facility at Iron Mountain Mine (IMM).

This memorandum evaluates the effects of newly promulgated or modified federal, state, and local regulations regarding the protectiveness of human health or the environment for the remedies originally selected in the RODs for IMM.

Biotic Ligand Model

EPA promulgated continuous (4-day average) and maximum (1-hour average) copper criteria under the EPA National Recommended AWQC for Freshwater Aquatic Life Protection. The revised criteria are calculated using a bioavailability model, the Biotic Ligand Model (EPA, 2007). The Biotic Ligand Model is a metal bioavailability model that uses equilibrium reactions of copper and other cations with a single, simple type of surface ligand to estimate the effects of physicochemical exposure conditions on toxicity. The Biotic Ligand Model takes into account several parameters, including dissolved organic carbon (DOC), cations (sodium, potassium, calcium, and magnesium), anions (sulfate and chloride), pH, alkalinity, and temperature.

The Biotic Ligand Model criteria are customized to the particular water body under consideration. The model's dissolved copper criteria are highly dependent on pH and DOC. In water bodies with relatively low DOC levels, the model's dissolved copper water quality criteria can be equal to or more stringent than the current hardness-based copper criteria. In other cases, the current hardness-based copper criteria might be overly stringent for particular water bodies.

EPA's document *Aquatic Life Ambient Freshwater Quality Criteria – Copper* (EPA, 2007) provides updated guidance to states and authorized tribes to establish water quality standards under the Clean Water Act (CWA) to protect aquatic life from elevated copper exposure. The state of California has not taken any action to implement the revised EPA National Recommended AWQC criteria for copper using the Biotic Ligand Model. The applicable numeric chemical-specific standards identified in ROD 5 are presented in Table 1 (EPA, 2004). These standards should be reevaluated if the state of California implements the revised EPA National Recommended AWQC or during the next IMM Five-Year Review.

TABLE 1
Basin Plan and California Toxics Rule Water Quality Criteria for the Sacramento River below Keswick Dam
Applicable or Relevant and Appropriate Requirement Analysis, Iron Mountain Mine Five-Year Review

Parameter	Basin Plan Maximum Concentration[a] (µg/L)	California Toxics Rule Continuous Concentration[a] (4-day Average) (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]Expressed as dissolved concentrations.
[b]Concentration is dependent on hardness. Objectives presented assume a hardness of 40 mg/L.

Notes:

µg/L = micrograms per liter

Basin Plan = *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin*

Source: EPA, 2004

Public Health Goal

A revised PHG of 300 µg/L was developed for copper in drinking water, based on a review of the scientific literature since the original PHG, in 1997 (OEHHA, 2008). Copper is an essential nutrient in humans, and has not been shown to be carcinogenic in animals or humans. However, young children, and infants in particular, appear to be especially susceptible to the effects of excess copper.

The revised PHG of 300 µg/L is two orders of magnitude greater than the applicable numeric chemical-specific standards identified in ROD 5 for the protection of freshwater

aquatic life (see Table 1). Therefore, the revised PHG for copper will have no impact on the protectiveness of the remedies originally selected in the RODs for IMM.

Best Available Technology Economically Achievable Effluent Controls

Attachment 3 in the *Fourth Iron Mountain Mine Five-Year Review, Minnesota Flats Treatment Plant Effluent Discharge, Iron Mountain Five-Year Review,* provides an evaluation of the performance of the Minnesota Flats Treatment Plant (MFTP) at IMM in meeting the standards for treatment plant effluent discharge. The evaluation focuses on the discharge limits in the IMM scope of work, dated October 2, 2000 (EPA, 2000). The memorandum also reviews and provides recommendations for modifications to the technology-based effluent controls.

The Clean Water Act system of technology-based effluent controls requires that discharges achieve the best practicable technology and BAT. The HDS AMD neutralization control technology currently employed at the MFTP constitutes BAT. The BAT effluent limits are provided in Table 2 and were set in October 2000 from the limited MFTP data available at that time. However, operation of the MFTP over the last 5 years demonstrates that HDS metal removal can not achieve the initial BAT effluent limits for dissolved zinc or the BAT 30-day average limit for dissolved cadmium.

TABLE 2
Best Available Control Technology Limits
Applicable or Relevant and Appropriate Requirement Analysis, Iron Mountain Mine Five-Year Review

Parameter	30-day Average[a] (µg/L)	7-day Average[b] (µg/L)	Daily Maximum[c] (µg/L)
Copper (dissolved)	5	10	15
Cadmium (dissolved)	1	2	3
Zinc (dissolved)	10	20	30

[a]Running average of daily values for 30 consecutive days.
[b]Running average of daily values for 7 consecutive days (2 x 30 day average).
[c]Maximum allowable for any one day (3 x 30-day average).

Source: EPA, 2000, Table 14-2.

BAT effluent limits should be modified based upon metal removal level currently achieved at the MFTP. The following revisions to BAT limits are recommended (CH2M HILL, 2008; CH2M HILL, 2005):

- Change daily dissolved zinc BAT limit from 30 to 300 µg/L
- Change 7-day average dissolved zinc BAT limit from 20 to 150 µg/L
- Change 30-day average dissolved zinc BAT limit from 10 to 100 µg/L
- Change 30-day average dissolved cadmium BAT limit from 1 to 2 µg/L

Metal discharges during the past 5 years from the MFTP are substantially below the Clean Water Act Effluent Guidelines and Standards for Ore Mining and Dressing in 40 Code of Federal Regulations 440.102(a) and 440.103(a) (CH2M HILL, 2008). Revision of the dissolved zinc and 30-day dissolved cadmium BAT effluent limits to more accurately reflect metal removal by the HDS AMD neutralization process will not impact the protectiveness of the remedies originally selected in the RODs for IMM. Changes to the technology-based performance standards should not change treatment plant operations by the Site Operator, particularly with respect to pH controls.

Conclusions and Recommendations

Changes to newly promulgated or modified federal, state, and local regulations and guidance do not impact the protectiveness of human health or the environment for the remedies originally selected in the RODs for IMM.

The state of California has not taken any action to implement the revised EPA National Recommended AWQC for copper using the Biotic Ligand Model. IMM numeric surface-water standards should be reevaluated if the state of California implements the revised EPA National Recommended AWQC or during the next IMM Five-Year Review.

The dissolved zinc and 30-day dissolved cadmium BAT effluent limits should be revised to more accurately reflect metal removal by the HDS AMD neutralization process. Metal discharges during the past 5 years from the MFTP are substantially below the Clean Water Act Effluent Guidelines, and revision of the BAT limits will not impact the protectiveness of the remedies originally selected in the RODs for IMM.

Works Cited

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