FIVE-YEAR REVIEW REPORT

Cimarron Mining Corporation Superfund Site

CERCLIS # NMD980749378

U.S. Environmental Protection Agency Region 6

June 2003

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Five-Year Review Report

Second Five-Year Review Report
For
Cimarron Mining Corporation Superfund Site
Operable Unit 1 and 2
Carrizozo, Lincoln County, New Mexico

June 2003

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ACRONYMS AND ABBREVIATIONS

This document utilizes the following organization abbreviations. Abbreviations used in this document shall be interpreted according to their recognized and well-known technical or trade meanings; such abbreviations include but are not limited to the following:

EPA (or U.S. EPA)	U.S. Environmental Protection Agency
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division
NRCS	Natural Resource Conservation Service
USACE	U.S. Army Corps of Engineers

Common technical abbreviations, which may be found in this report, are listed below:

ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPC	Chemical of Potential Concern
EA	Endangerment Assessment
ESD	Explanation of Significant Difference
FS	Feasibility Study
gpm	Gallon per Minute
GW	Ground Water
HASP	Health and Safety Plan
HRS	Hazard Ranking System
I&CS	Instrumentation and Control System
lbs	Pounds
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg.	Milligram
mg/L	Milligram per Liter
NCP	National Contingency Plan
NMWQCCR	New Mexico Water Quality Control Commission Regulations
NPL	National Priorities List
NPDWR	National Primary Drinking Water Regulations
O&M	Operation and Maintenance
O&M Plan	Remedial Action Operation & Maintenance Plan

ACRONYMS AND ABBREVIATIONS
(Continued)

OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
ppb	Parts Per Billion
ppm	Parts Per Million
PRPs	Potentially Responsible Party
psi	Pounds Per Square Inch
QA/QC	Quality Assurance/Quality Control
QAP	Quality Assurance Plan
RA	Remedial Action
RA HASP	Remedial Action Health and Safety Plan
RA SAP	Remedial Action Sampling and Analysis Plan
RA QAP	Remedial Action Quality Assurance Plan
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RI/FS	Remedial Investigation/Feasibility Study
RPM	EPA Remedial Project Manager
SAP	Sampling and Analysis Plan
SDWA	Safe Drinking Water Act
Site	Cimarron Mining Corporation Superfund Site
SOP	Standard Operating Procedure

EXECUTIVE SUMMARY

The second five-year review report covers the period of January 1998 through December 2002 for the Cimarron Mining Corporation Superfund Site (Site) in Carrizozo, New Mexico. The Site was functionally divided into two operable units (OUs): OU-1 Remediation of shallow ground water contamination at the Cimarron Mill Site, and OU-2, the Sierra Blanca Mill Site. This second five-year review for the Site has been conducted because hazardous substances, pollutants, or contaminants remain at the Site above the ROD specified clean-up criteria during the review period. The results of the review indicate that the remedy has been, and is expected to continue to be protective of human health and the environment.

The Remedial Investigation (RI) showed that soil contamination at the OU-1 site was below action levels and that the shallow ground water was impacted by inorganics, including cyanide. The selected remedy included shallow ground water extraction and discharge to the City of Carrizozo Publicly Owned Treatment Works (POTW) in accordance with the effluent guideline and standards in 40 CFR413.24, subpart B. The assessment of this five-year review found that the remedy was constructed, operated and maintained in accordance with the September 21, 1991 Record of Decision (ROD) for OU-1. The remedy is functioning as designed, and has significantly reduced the cyanide concentrations in ground water. The persistence of total cyanide concentrations remaining above the cyanide cleanup level in a few monitor wells is due to hydrogeological characteristics of the impacted formation rather than failure of the pump and treat remedy selected in the ROD. The ground water monitoring data also shows that the remedy has successfully contained the ground water plume.

Although the land use at OU-1 has changed, and now includes an On-Site resident, the remedy remains protective, as the impacted shallow ground water is not used for any purposes. In addition, metal concentrations in surface soils that were above the background levels during the RI, are below the current health-based screening levels and below the original screening levels established for the site. Therefore, the metals detected above the background levels do not pose an unacceptable risk for the current land use.

Lead was the contaminant of concern in 570 cubic yards (cy) of soils, discharge pits waste, tank sediments and material piles at the OU-2. Other metals, including arsenic, were found at elevated levels at OU-2. However, these other metals presented little risk to human health and the environment compared to the risks posed by the levels of lead found at the Site. Ground water at OU-2 had not been impacted by the Site contaminants, and was, therefore, not addressed in the FS or the ROD. The selected remedy in the September 6, 1991 ROD for OU-2 addressed remediation of soil, sediments and waste material pile contamination at the Sierra Blanca Mill Site. The remedial action activities at

OU-2 included excavation, stabilization and onsite disposal of surface soils, sludge and sediment. The disposal areas were capped with clean fill and vegetated.

The data review, site inspection and interviews performed indicate that the completed remedy at OU-2, which consisted of excavation, stabilization and on site disposal of the lead contaminated waste, is functioning as intended. The soil cleanup confirmatory sampling results show that all waste exceeding the ROD specified lead cleanup level, as well as the recent health-based lead soil screening level, have been remediated. The cap on the disposal area is undisturbed and there is adequate vegetative cover to maintain its protectiveness. ARARs for soil contamination cited in the ROD were met when the remedy was completed. There have been no significant changes in the toxicity factors for lead or arsenic, the contaminants of concern. There is no other information that calls into question the protectiveness of the remedy. In consultation with New Mexico Environment Department (NMED), EPA determined that all appropriate response actions required at OU-2 had been met. Therefore, the OU-2 was partially deleted from the National Priority List (NPL) on August 21, 2001.

Overall, the ground water remediation system at OU-1 is functioning as designed, and was operated and maintained in an appropriate manner. The completed remedy at OU-2 is, and is expected to continue to be protective of human health and the environment. No deficiencies were noted in remedial action implementation. Because the remedial actions for the shallow ground water at OU-1 and lead contaminated waste at OU-2 are protective of the human health and the environment, the remedy is protective of both human health and the environment.

No indication of potential remedy failure was noted during the review. Cost and maintenance activities have been consistent with site activities.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name:(from WasteLan): Cimarron Mining Corporation Superfund Site		
EPA ID (from WasteLan): NMD980749378, Operable Unit 1 & 2		
Region: 6	**State: NM**	**City/County: Lincoln**

SITE STATUS	
NPL status: X Final ___Deleted ___Other (specify) **Partial deletion of OU-2 on 08/21/2001**	
Remediation status (choose all that apply) **___Under Construction _X_ Operating _X__Complete**	
Multiple OUs? _X_ YES ___NO	**Construction completion date: __September 1993____**
Has site been put into reuse? ___ YES ___NO	

REVIEW STATUS	
Reviewing agency: _X_ EPA ___State ___Tribe ___Other Federal Agency_____	
Author Name: Petra Sanchez	
Author Title: Remedial Project Manager	**Author affiliation: U.S. EPA, Region 6**
Review Period: January 1998 to December 2003	
Date (s) of site inspection: May 21, 2003	
Type of review: **_X_ Post-SARA __ Pre-SARA __ NPL-Removal Only** **__ Non-NPL Remedial Action Site __ NPL State/Tribe-lead** **__ Regional Discretion)**	
Review number: ___ 1(first) **_X_ 2**(second) **___3**(third) **___ Other** (specify)_____	
Trigging action:	
___ Actual RA Onsite Construction at OU#___	**_ __ Actual RA Start at OU#___**
___ Construction Completion	**__X_ Previous Five-Year Review Report**
___ Other (specify)_____	
Trigging action date: (from WasteLan): 07/15/1998	
Due date: (five years after triggering action date): 07/15/2003	

I. Introduction

The U.S. Environmental Protection Agency (EPA) has conducted a second five-year review of the remedial actions implemented at the Cimarron Mining Corporation Superfund Site (Site) in Lincoln County, New Mexico. The New Mexico Environment Department (NMED) and the U.S. Army Corps of Engineers (USACE), Albuquerque district provided support for this second five-year review. This second five-year review of the Site covers the period from January 1998 through December 2002. The purpose of this review is to determine whether the remedy at the Site is protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this Five-Year Review report.

The EPA is preparing this Five-Year Review report pursuant to CERCLA §121(c) and the National Contingency Plan (NCP). CERCLA §121 (c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

This second five-year review report summarizes:

- Site background information,
- Remedial action activities,
- Performance and operational monitoring results,
- Site inspection,
- Data review; and
- Remediation progress and status at the Site.

Most of the information summarized in this five-year review was obtained from the Site Remedial Investigation (RI)/Feasibility Study (FS) Report, Record of Decision (ROD), the first five-year review report, and remedial action and monitoring reports prepared during the review period. These

reports describe, in detail, the Site background, remedial action activities conducted, and the results of operational and performance assessment monitoring.

II. Site Chronology

Table 1 contains the Site chronology, listing milestones from initial discovery to present.

Table 1: Site Chronology

Date	Event
1960 – 1982	Iron and precious metal milling activities at Cimarron Mill Site (OU-1)
February 1980	NMEID field inspections of the Site
1982	Precious metal milling operations resumed at Sierra Blanca Mill Site (OU-2)
June 1982	NMEID revealed presence of cyanide and elevated metals in shallow ground water
June 22, 1982	NMEID sent a notice of violation to Cimarron Mining Corporation for discharge into non-permitted discharge pit.
April - May-June 1984	NMEID Site Inspections at Cimarron Mill Site & Sierra Blanca Mill Site
February 1985	NMEID Site inspection report
January to October, 1987	Expanded Site Inspection (ESI) by EPA for HRS process @ OU-1
March 1989	RI/FS commencement @ OU-1
October 4, 1989	Cimarron Mining Site (OU-1) Placed on NPL
June 15, 1990	RI/FS Completed @ OU-1
July 1990	Proposed Plan of Remedial Action for OU-1
September 21, 1990	EPA issued ROD for the for OU-1
June 1991	RI/FS completed @ OU-2
June 1991	Proposed Plan of Remedial Action for OU-2
September 6, 1991	EPA issued a ROD for the OU-2
December 1991	RD/RA Implementation at OU-2
September 24, 1992	Remedial action completion and Preliminary Close Report for OU-2
September 22, 1993	ESD for Revision of Recovery well Installation (from three wells to seven wells) @ OU-1
January 1993	Ground Water Remedy (Extraction & Treatment) Action Construction Completed @ OU-1
April 1993	Ground Water Remedy Operational and functional Period Complete @ OU-1
September 1993	Interim Closeout Report, Construction activities completion for OU-1 and OU-2
July 1996	Additional soil contaminated with lead identified at OU-2
August 1996 – July 1997	Additional lead contaminated soil areas remediated
March – May 1998	General cleanup, disposal area caps re-vegetation and monitoring well abandonment at OU-2
July 1998	First Five-Year Review Completion
August 31, 2001	Partial deletion of Sierra Blanca Operable Unit 2
December 18, 2001	Suspension of Ground Water Pumping and Performance Assessment Monitoring Implementation at OU-1
August 2002	Performance Assessment Monitoring Completion @ OU-1
March 2003	Performance Assessment Monitoring Report for OU-1

III. Background

A. Physical Characteristics

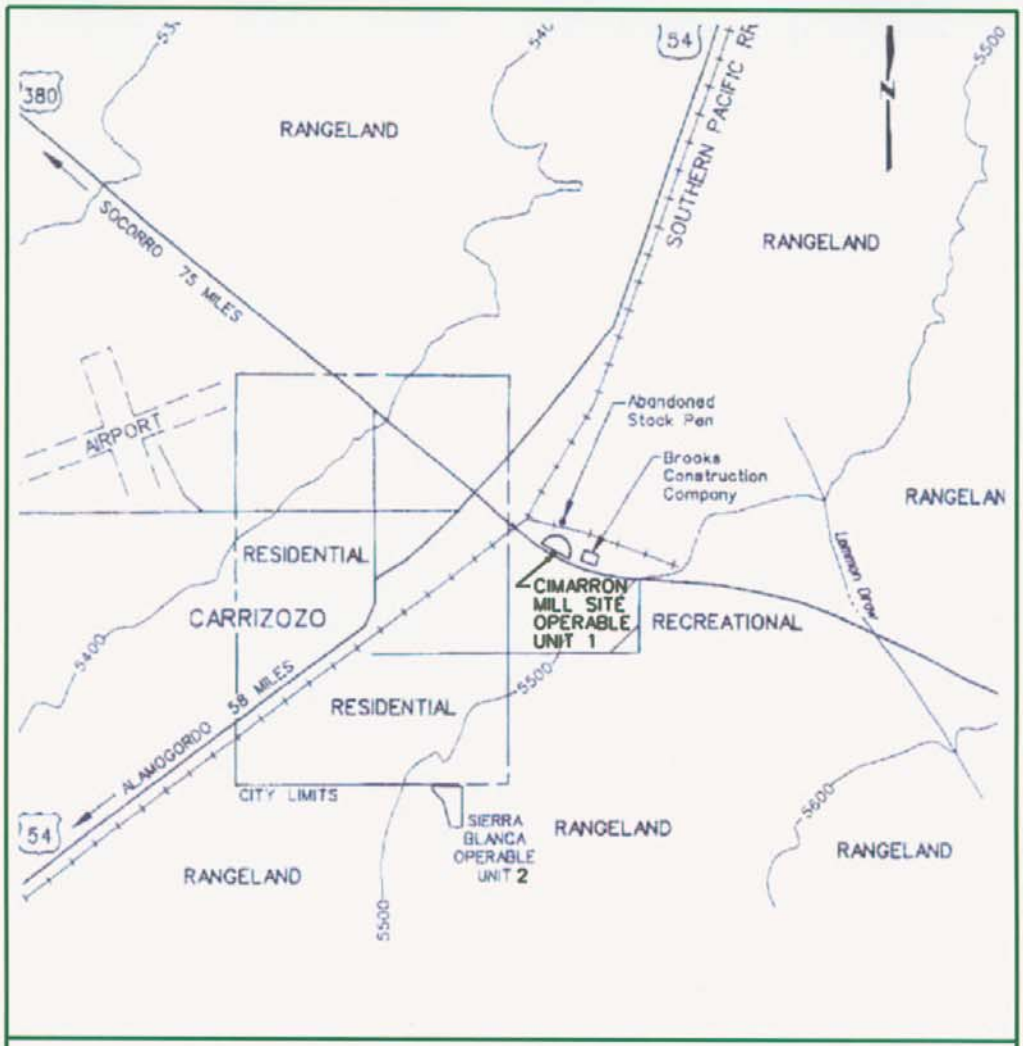
The Cimarron Mining Corporation Superfund Site (Site) is located in Carrizozo, Lincoln County, New Mexico, and is approximately 100 miles south-southeast of Albuquerque. Approximately 1500 people live within a two-mile radius of the Site. The Site consisted of a conventional agitation mill that was used initially to recover iron, and later precious metals from ores transported to the Site. EPA and New Mexico Environment Department (NMED) functionally divided the Site into two operable units (OUs). Remediation of shallow ground water contamination at the Cimarron Mill Site as OU-1, and surface waste remediation at the Sierra Blanca Mill Site as OU-2. The OU-1 is about 10.6 acres in size, and is located in NE ¼ Section 2, Township 8S, and Range 10E on north side of Highway 380. The OU-2 is 7.5 acres in size, relatively flat, and is located in T8S, R10E, and Section 11, east of U.S. Highway 54. Figure 1 shows location of both mill sites (OU-1 and OU-2).

B. Land and Resource Use

The historic land use at both mill sites involved mineral and precious metal ore milling activities. The mill sites operated from 1960 to July 1982, with some temporary shutdowns. Both mill sites were involved in iron and precious metal recoveries except cyanide, which was apparently not used at the Sierra Blanca Mill Site (OU-2). Both sites are currently inactive.

The current land use for the surrounding area is residential, rangeland, agricultural, and some recreational as shown in Figure 1. The mix of current land usage is expected to continue. An 8-foot fence restricts access to the OU-1. The OU-1 is currently used as an auto repair shop and salvage yard. The owner of the auto repair shop has resided at the Site during the past 3 years. The Sierra Blanca Mill Site is fenced and is currently owned by the Town of Carrizozo. The property is presently not being used for residential or commercial purposes.

The impacted shallow ground water aquifer at OU-1 is currently not used for any purposes. The dominant ground water flow direction at OU-1 is to the northwest. Ground water at OU-2 is not impacted by any former milling activities.



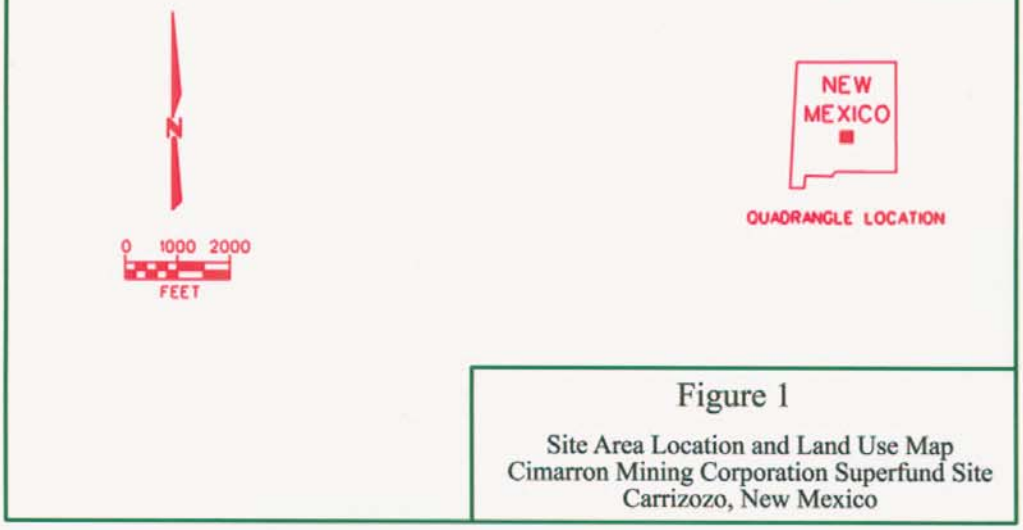


Figure 1

Site Area Location and Land Use Map
Cimarron Mining Corporation Superfund Site
Carrizozo, New Mexico

C. History of Operation and Contamination

C.1 Cimarron Mill Site, Operable Unit 1

The Cimarron Mill Site, OU-1 is an inactive milling facility originally owned by Zia Steel, Inc., and was used to recover iron from ore transported to the Site. The facility consisted of a conventional agitation mill for recovering iron and then later, precious metals from ores transported to the site. The iron recovery process took place between 1960 and 1979, and involved crushing of ore material, formation of pumpable slurry by mixing with fresh and recycled water, and collection of ferric (iron) using a magnetic separator. Cyanide was not used in this original process, and tailings were transported from the Site and used as fill material. In 1979, the Site was sold to Southwest Mineral Corporation. Soon thereafter cyanide was apparently used to extract precious metals from the ore. Details on the operation between 1979 and 1981 are not available. However, a 1980 New Mexico Environmental Improvement Division (NMEID) sample analysis report noted the presence of cyanide contamination at the Site.

Southwest Minerals, a subsidiary of Sierra Blanca Mining and Milling Company, operated without the required permits necessary for conducting cyanide processing at the Site. In Mid 1981, the operation was expanded by adding several large mixing tanks, cyanide solution tanks, thickeners, and associated pumping and conveying equipment. The contamination sources at the site included tailings piles, sediment piles, the cyanide solution and tailings spillage areas, the cinder block trenches used for cyanide solution recycling and the discharge pit. The NMEID sent a certified notice of violation to Cimarron Mining Corporation on June 22, 1982 for discharging into a non-permitted discharge pit. In July 1982, operations ceased at the Site. No legal action was taken by the State of New Mexico. The company filed for bankruptcy in July 1983, and the court assigned a bankruptcy trustee for the Site.

The NMEID field inspections for the Site in February 1980, June 1982, and in May and June 1984 revealed the presence of cyanide and elevated metals in shallow ground water, soil and mill tailings.

C.2 Sierra Blanca Mill Site, Operable Unit-2

The Sierra Blanca Mill Site, OU-2, was owned by Scott-Tex, Inc. The Sierra Blanca Mill Site was designed and operated to recover a variety of metals from ore transported to the Site, although cyanide was apparently not used at this location. The mill temporarily shutdown in the early 1970's and the Town of Carrizozo eventually became the owner of the Site. In 1979, the Sierra Blanca Mill Site was leased to American Minerals Recovery Corporation. Information reveals that the facility operator was attempting to recover silver and platinum from various ore materials. The milling operation at the Cimarron Mill Site was relocated to the Sierra Blanca Mill in June 1982, perhaps as a

result of spills at the Cimarron Site. The source of contamination at the Sierra Blanca Mill Site, OU-2, included two buildings, four discharge pits, one cinder block trench, a septic tank system, and numerous process tanks and material piles.

A March 6, 1980, NMEID memo indicates that there were two buildings at the Site, each owned by a different individual. The February 1985 NMEID Site Inspection Report described the Site as an abandoned ore processing mill with two lined impoundments, an underground storage tank, two above ground tanks, and a small unlined pit. The lining in the impoundments was torn. Actual on-site inspections were performed in April, May and June of 1984.

D. Initial Response

D.1 Cimarron Mill Site, OU-1

EPA's Field Investigation Team (FIT) conducted an Expanded Site Inspection (ESI) at Cimarron Mill Site, OU-1, from January to October 1987. The objectives of the ESI were to collect additional data for the Hazard Ranking System (HRS) evaluation and to facilitate Remedial Investigation (RI) and Feasibility Study (FS) planning. Onsite activities performed during the ESI included:

- surface and subsurface soil sampling,
- visual inspection of process tanks and equipment,
- sampling of remnant material in tanks,
- quantifying waste volumes,
- logging and sampling of subsurface soils during installation of monitoring wells,
- ground water sampling of monitoring wells and nearby water supply wells,
- permeability testing at monitor wells, and
- identifying adjacent land uses.

Based on the findings of the Site investigations and the HRS evaluation, the Cimarron Mining Corporation Site was proposed for addition to the National Priorities List (NPL) on June 24, 1988. The Site was formerly placed on the NPL on October 4, 1989.

The RI/FS field activities began in August 1989, and were completed in June 1990. A shallow aquifer, which is not a potential drinking water source, and a deeper primary drinking water aquifer lie beneath the Site at OU-1. The RI revealed that the shallow ground water was contaminated with inorganics, including cyanide. The primary area of ground water contamination at the Site was near the cinder block trenches, as shown on Site Map 1 included in Attachment 1.

D.2 Sierra Blanca Mill Site, OU-2

EPA contractors performed several investigations of the Sierra Blanca Mill Site during the period from 1985 to 1989. These investigations identified contaminated materials above the health-based levels. Community participation, including public open house workshops, were conducted during 1989 and 1990. The EPA started the extensive RI field work and feasibility study in May 1990. The data generated from these investigations was used to estimate the nature, extent and magnitude of contamination at the Site and to develop and evaluate remedial action alternatives. The RI found approximately 570 cubic yards of surface soils, tank sediments, sludge and debris contaminated with metals (arsenic and lead). The locations of contaminated waste materials are shown on Site Map 2 in Attachment 1. The ground water at OU-2 is not impacted by Site contaminants. The RI/FS was completed in June 1991. A proposed plan of Remedial Action was released in June 1991. Following the comment period, a Record of Decision for OU-2 was signed on September 6, 1991.

E. Basis for Taking Action

Hazardous substances at the Site and the basis for taking action were:

Inorganics, including cyanide, in shallow ground water underlying approximately 2.3 acres of the Site at OU-1. The RI indicated that there is a potential for limited migration of contaminated ground water to the lower productive water zones. Therefore, the RI/FS report recommended remedial action for the cyanide contaminated ground water source in order to reduce or eliminate the potential for migration to the underlying drinking water aquifer.

Metals (arsenic and lead) in approximately 570 cubic yards of soils, tank sediment, sludge and debris at OU-2. The potential for exposure to arsenic and lead in soil, sediment, material piles and sediments in process tanks and pits posed a significant human health risk for unrestricted or other reasonable maximum exposure scenarios at Sierra Blanca Mill facility, OU-2.

IV. Remedial Actions

A. Remedy Selection

EPA issued a separate Record of Decision for each operable unit.

A.1 Cimarron Mill Site, OU-1

The only Record of Decision (ROD) for the Cimarron Mining Corporation Site (OU-1) was issued on September 21, 1990. Remedial action objectives were proposed to protect human health and the

environment. Preliminary remediation goals were based, where possible, on the baseline risk in the Endangerment Assessment (EA) and the Federal and State Applicable or Relevant and Appropriate Regulations (ARARs). The concentrations of cyanide and metals in soils, waste piles and sediment at the Cimarron Site did not constitute an unacceptable risk that would require remedial action. Site ground water, however, was impacted by inorganics, including cyanide, to a degree that remedial action was considered appropriate. The federal drinking water standards were not considered ARARs due to the characterization of the site ground water as Class IIIA water. However, human health based ground water standards of the New Mexico Water Quality Control Commission Regulations (NMWQCCR) were included as ARARs because Section 20.6.2.4101(A) of the NMWQCCR requires remediation or protection of all ground water with TDS concentrations of less than 10,000 mg/L. The NMWQCCR defines ground water as interstitial water which occurs in saturated earth material and which is capable of entering a well in sufficient amounts to be utilized as a water supply. Thus, the RA goal was to restore the ground water to human health based ground water standards in accordance with the NMWQCCR.

The NMWQCCR stanadards apply to the dissolved portion of the contaminants specified with a definition of dissolved being that given in the publication entitled, "Methods for Chemical Analysis of Water and Waste of the U.S. Environmental Protection Agency," with the exception that standards for mercury, organic compounds, and non-aqueous phase liquids shall apply to the total unfiltered concentrations of the contaminants. The NMWQCCR standard is for cyanide is 0.2 mg/L.

A total of six alternatives for the Site remediation were analyzed in detail in the FS. The detailed evaluation process followed a structured format, designed to provide the relevant information needed by the EPA to adequately compare and evaluate feasible alternatives in order to select an appropriate remedy for the Site. The selected remedy had to meet the following statutory requirements:

- Be protective of human health and the environment
- Attain ARARs (or provide grounds for a waiver)
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation in the ROD as to why it does not.

The major components of the selected remedy included:

- Pumping shallow ground water with discharge to the City of Carrizozo Publicly Owned Treatment Works (POTW); and
- Ground water monitoring.

The EA showed that soil contamination at the site was below action levels and that the ground water contaminants of concern were inorganics, including cyanide. In addition to the ground water remedy, the selected remedy included the following:

- removal of the process chemical drums, and decontamination of tanks and associated piping;
- filling in of the cinder block trenches and discharge pit;
- plugging the abandoned water supply well; and
- inspection and maintenance of the existing fence.

The selected remedy included ground water extraction for an estimated period of 13 months, during which the system's performance would be carefully monitored on a regular basis and adjusted based on the performance results.

A.2 Sierra Blanca Mill Site, OU-2

The only Record of Decision (ROD) for OU-2 was signed by the EPA on September 6, 1991. Remedial Action Objectives were proposed to protect human health and the environment. Ground water at OU-2 had not been impacted by the Site contaminants, and was, therefore, not addressed in the FS or the ROD. Lead is the contaminant of concern in soils, discharge pits, tank sediments and material piles at the OU-2. Other metals, including arsenic, were found at elevated levels at OU-2. However, these other metals presented little risk to human health and the environment compared to the risks posed by the levels of lead found at the Site. A concentration of lead in soil of 500-1000 mg/Kg was established as a cleanup level based on the Interim Guidance on Establishing Soil Cleanup Levels at Superfund Sites (OSWER Directive #93355.4-02, EPA, 1989).

The selected remedy addressed remediation of soil, sediments and waste pile contamination at the Sierra Blanca Mill Site. The major components of the selected remedy included:

- Cement Solidification/stabilization of contaminated soils and waste piles exceeding 500 mg/Kg of lead, and onsite disposal. Installation of a low permeability cover/cap for the disposal area.
- Ground water monitoring.
- Install two additional ground water monitoring wells.

The ground water sampling program, to be developed in the Operation and Maintenance Plan, may be amended and/or eliminated if data confirms that extensive remediation of the site has occurred.

In addition to the soils and waste pile remedy, the following measures were included:

- removal of the process chemical drums, and decontamination of tanks and associated piping;
- filling in discharge pits and cinder block trench with onsite soils and covering with clean fill; and
- inspection and maintenance of the existing fence.

The selected Remedial Action for the OU-2 included: excavation, cement solidification and stabilization, and onsite disposal of 225 cubic yards of contaminated material piles and tank sediments, which failed the Toxicity Characteristics Leaching Procedure (TCLP) test, including the cinder block trench sediments; excavation and on site disposal of 345 cubic yards of contaminated surface soils and sludge that did not fail the TCLP test. The Remedial Action also included implementation of institutional controls, including deed restrictions and site access restrictions.

B. Remedy Implementation

B.1 Cimarron Mill Site, OU-1

The selected Remedy specified a three-well concentric configuration for ground water pumping. During the Remedial Design (RD) process, the NMED requested a revised recovery well configuration utilizing a seven-well linear placement. This change was implemented through an Explanation of Significant Difference (ESD) to the ROD.

Construction of the ground water remedy was completed in January 1993. The ground water extraction system consists of seven (7) extraction (Recovery) wells located directly adjacent to the primary source(s) of ground water contamination (the former cinder block trenches). The wells were installed deep enough to allow well pumping to capture both the vertical and horizontal extent of cyanide contamination above clean-up criteria. The positioning of the extraction wells with respect to nearby monitor wells enabled monitoring of drawdown and ground water quality within the area influenced by the extraction wells. The monitoring and recovery well locations are shown on Site Map 3, which is included in Attachment 1.
The extracted ground water was discharged to the POTW in accordance with the effluent guidelines and standards as cited in 40 CFR413.24 Subpart B, and deemed relevant for this action. A two-inch PVC extraction well discharge header was installed below grade to transport the contaminated ground water to a PVC sewer tap located approximately 200 feet south of the site. The sewer line conveys water to the POTW located several miles from the Site. Biological activity within the existing lagoons at the POTW, coupled with effluent chlorination, photodecomposition, and dilution with other municipal sewage, provides treatment to further reduce the cyanide concentrations. The ground water

remediation system was designed to extract and transport up to 6 gallons per minute (gpm) of contaminated groundwater to the POTW. As discussed later in the data review section, the maximum ground water extraction and transport rate was about two gallons per minute, as expected based on the hydrogeological characteristics of the formation. This higher capacity of six gallons per minute was designed and constructed to include a contingency for higher than expected extraction rates due to heterogeneity of the formation or the installation and operation of additional extraction wells, if needed.

In April 1993, after initial pumping of ground water during construction and three months of testing of the constructed remedy, the remedy was determined to be Operational and Functional. The Site achieved construction completion status when the Interim Close Out Report was completed in September 1993.

B.2 Sierra Blanca Mill Site, OU-2

In December 1991, a Superfund State contract was signed by the State of New Mexico providing assurances, including cost share, for the remedial action as required by CERCLA Section 1044.C. The site remediation was performed by the Department of Interior's Bureau of Reclamation under interagency agreement #DW14412401 with the EPA. Remediation of the contaminated soil, sludge and sediments with lead content above 500 mg/Kg was performed as follows:

- Excavation, cement stabilization and on site disposal of 182 cy of waste from five material piles and 43 cy of sediments from seven tanks and the cinder block trench, all of which failed the TCLP test prior to treatment.

- Excavation and on site disposal of 345 cy of contaminated sediments from the discharge pit and surface soils, all of which passed the TCLP test.

- Placement of a low permeability soil cap on the disposal area and establishing a vegetative cover on the soil cap.

- Removal and off site disposal of process chemical drums, tanks and associated piping.

- Backfilling of excavations (discharge pits, cinder block trench and surface soil areas) with on site soils and covering with clean fill.

- Installation of two shallow ground water monitoring wells (monitor well MW-01 and MW-03)

- Inspection and maintenance of the existing fence.

The field remedial activities were completed in September 1992. A Preliminary Close Out Report was completed and signed on September 24, 1992. On September 24, 1992, after remediation was completed, the NMED surveyed the Sierra Blanca Mill Site with a X-ray Fluorescent (XRF) spectroscopy and observed levels of lead exceeding 500 mg/Kg in surface soils at two locations. The EPA and the U.S. Bureau of Reclamation were notified of the "hot spots." It was thought that the contamination in these areas occurred as a result of deposition of contaminated soils blown from the contaminated materials stockpiled during remedial action at the Site. Sampling was performed to further delineate the identified areas. A total of 294 cy of additional contaminated soils were identified. Because the additional soils were above the 500 mg/Kg lead cleanup level, the EPA, on August 5, 1996, requested that the Bureau of Reclamation perform this remedial action, as required under the interagency agreement DW14412401.

The remediation of these additional contaminated soils began on July 8, 1997. A total of 299 cy of contaminated soils were excavated, stabilized with cement and placed in the on site Disposal Area (Repository) No.2. A total of 33 cy of cement was used for stabilization, resulting into a total of 332 cy of stabilized waste placed in the Disposal Area No.2. Confirmatory sampling was performed, which found no surface soils containing lead content above the 500 mg/Kg. The disposal area was covered with a graded low permeability cap and revegetated. Remediation of these additional soils was completed in August 1997. The site after remediation completion is shown in Site Map 4 included in Attachment 1.

The site did not include any Long-Term Remedial Action (LTRA) because the cleanup levels were attained upon completion of excavation, treatment and disposal of the wastes.

C. System Operations and Maintenance

The U.S. Bureau of Reclamation initially operated the ground water remediation system until July 1997. Since July 1997, the U.S. Army Corps of Engineers (USACE), Albuquerque District has been operating the system under an interagency agreement with EPA. The ground water pumping system was inspected, and preventive maintenance was conducted and pumps were replaced, as needed, to minimize down time and maintain effective ground water pumping from the recovery wells. The system operating requirements for the Site have included:

- maintenance of the ground water pumping system,
- monitoring ground water pumping rates and volumes,
- monitoring contaminant mass removal,

- monitoring the volume of ground water discharge into the publicly owned treatment works (POTW),
- monitoring of ground water level effects of pumping,
- ground water monitoring for operational and performance assessment, and
- reporting.

The first five-year review reported that the system had only operated approximately 65% of the time over the first five-year review period. This low operation performance was primarily due to the remoteness of the Site and frequent power failures and lightning strikes. Installation of an auto dialer to alert USACE personnel of power failures and replacement of PVC piping and instrumentation in recovery well vaults were made in May 1998. This measure reduced the amount of downtime and improved operation performance overall.

The ground water extraction rates from the recovery wells continued to decline from about 2.0 gpm during the early stages of operation to about 0.5 gpm during late 1998. The low well yields were due, at least in part, to low initial water levels that have further declined with pumping. Some concerns were raised about possible plugging of well's screens and sand pack due to biological activity. A bacterial investigation was performed for the recovery system effluent in December 1998 to assess possible biofouling species. The investigation indicated a presence of iron-related well fouling bacteria.

The jack pumps were removed from the recovery wells in January 1999 to perform well cleaning and bacteria disinfection. The jack pump seals and cylinders were found to be worn and in poor operating condition. The electrical powered jack pumps at the Site operated continuously regardless of water level in the recovery wells. The jack pumps running in a dry condition had caused damage to the pump seals and cylinders.

After the jack pumps were removed, the recovery wells were treated to remove iron bacteria in February 1999. Following treatment, the wells were re-developed using a swab brush to clean the well screen. A down-hole camera investigation of the wells indicated that well screens were clean. Testing of the wells following refurbishment showed no significant improvement in the ground water recovery rates (USACE 1999). Well refurbishment and testing indicated that the low well yields were due, at least in part, to the initial low saturated thickness around the recovery wells water levels that further declined with pumping due to lowered phreatic or water table conditions.

The EPA, in consultation with the USACE and NMED, selected recovery wells RW-1, RW-5 and RW-7 for continued pumping based on the higher water recovery rates and total cyanide concentrations in these wells. Since the jack pumps were damaged, electrical submersible pumps

were installed in these three wells and pumping was restarted in June 2000. The pumps were set approximately five inches from the bottom of these wells. The submersible pump operation is controlled by water level probes integrated with pump operation control to prevent pump damage due to running in dry conditions. During the last six months prior to the suspension of the pumping for performance assessment, the monthly combined average ground water extraction rate from these wells has fluctuated between 0.2 to 0.5 gpm, as shown in Figure 2.

Overall, the system was down for approximately 37% of the time for repair and maintenance during the entire system operation from January 1993 to December 2001. The down time included four extended shut down periods ranging from four to 18 months for major troubleshooting, repair and maintenance. These extended shut down periods may have actually improved system performance because the time allowed water levels to periodically recover within the drawdown zone facilitating flushing of the cyanide impacted sediments that were bypassed during pumping. This "pulse pumping operation" is a modification that was stipulated in the ROD to allow ground water to equilibrate with contaminants adsorbed on sediments in order to improve contaminant mass removal.

BarCad sampling devices were installed in monitoring wells at the Site for ground water sampling in the monitoring wells. The BarCad sampling device is designed for permanent installation and requires purging of very low water volumes prior to sample collection. The BarCad sampling devices provide more representative samples than other sampling devices used in the past. Total cyanide concentrations in previous samplings conducted at the Site has varied considerably due to occurrence of sediments in the samples collected with bailers.

The OU-2 did not include any Long-Term Remedial Action (LTRA) because the cleanup levels were attained upon completion of excavation, treatment and disposal of the wastes. However, ground water monitoring was performed to confirm that remediation was effective. An operation and maintenance plan, which includes ground water monitoring, is being developed for OU-2.

The Operation and Maintenance (O&M) costs have exceeded the original estimate of $18,800 for the anticipated 13-month period of operation for OU-1. The higher costs are due to the significantly extended period of operation, the refurbishment of the recovery wells, the removal of the jack pumps, the installation of new electrical submersible pumps, the installation of Barcad sampling equipment, and performance assessment monitoring and reporting at OU-1. Additional lead contaminated soil area remediation in 1997, and general cleanup and re-vegetation of disposal area in 1998 contributed to the higher cost at OU-2. Table 2 lists combined annual cost for OU-1 and OU-2 from 1998 to 2002.

Table 2: Annual O&M Costs

Year	Total Cost (Rounded to nearest $100)
10/1997 to 09/1998	$72,500
10/1998 to 09/1999	$59,600
10/1999 to 09/2000	$318,00
10/2000 to 09/2001	$86,600
10/2001 to 09/2002	$89,000

V. Progress Since the Last Five-Year Review

A. Ground Water Remediation at Cimarron Mill Site, OU-1

During the first five-year review (July 1999), the remedy for OU-1 was found to be protective of human health and the environment. No deficiencies were noted, except the lower than expected operating time, as discussed in subsection IV.C herein. This lower operating time during the first five years of O&M did not affect the protectiveness of the remedy. The first five-year review (July 1998) contained the following three recommendations for ground water remedial action at the Site:

1. continue to extract and treat contaminated ground water,
2. conduct a thorough assessment of cyanide ground water contamination conditions in and around the source area to evaluate remedial action effectiveness, and
3. reduce sampling frequency for cyanide monitoring in monitoring well MW-4 and site effluent discharge to the POTW from a bi-weekly basis to a quarterly basis.

These three recommendations were addressed as follows during the second five-year O&M period:

1. The ground water extraction and treatment continued as recommended until December 18, 2001, when the system operation was suspended to implement performance assessment monitoring to evaluate remedial action effectiveness.

2. The performance assessment monitoring included water level measurements and ground water sampling for total cyanide concentrations in recovery and monitoring wells. BarCad sampling devices were installed in monitoring wells to obtain more representative ground water samples. The performance assessment monitoring results are discussed in Data Review section.

3. Sampling frequency for cyanide monitoring in monitoring well MW-4 and site effluent discharge to the POTW was reduced to a quarterly basis.

B. Sierra Blanca Mill Site, OU-2

The site inspections during the review period found that general trash, used PPE, and liner debris from remediation activities were scattered about the Site. The inspection also found almost no vegetation on the vegetative cover of the disposal area. In response to the site inspection, the following maintenance work was performed at OU-2 during the period March – May 1998:

Trash, used PPE, and liner debris, and empty drum removal: A composite sample of the used PPE and plastic liner debris at the Site was collected on March 18, 1998 and tested for Resource Conservation and Recovery Act (RCRA) metal TCLP to determine waste type in accordance with 40 CFR §261.24. The sampling results indicated that the PPE and liner debris were non-hazardous waste in accordance with 40 CFR §261.24. The used PPE, some in plastic bags, that were scattered in and around two buildings at the Site and the small pieces of plastic liner that were scattered throughout the site were manually picked up and placed in five of the empty drums that were left on Site. The empty drums, that were not used for containerizing the used PPE and the liner debris were flattened and bundled for off-site disposal. Wood pallets were gathered and removed from the Site. These non-hazardous wastes were transported to the Waste Management of New Mexico disposal facility in Rio Rancho, New Mexico.

Disposal of monitor well purge water drums: A total of four drums containing monitoring well sampling purge water were stored at two monitoring well locations at the Site. Samples of this purge water were collected on March 18, 1998 and analyzed for RCRA metal TCLP to determine waste type in accordance with 40 CFR §261.24. The sampling results showed that the purge water was not a hazardous waste. The purge water was emptied and the drums were flattened, bundled and transported to the Waste Management of New Mexico disposal facility in Rio Rancho, New Mexico for disposal as a non-hazardous special waste.

Abandonment of monitoring wells: Six monitoring wells (MW-01 through MW-06) were abandoned during the period May 4th through May 6th, 1998. The well abandonment was coordinated with the New Mexico State Engineer Office (NMSEO). The abandonment method consisted of filling the well casing with cement grout.

Re-vegetation: Re-vegetation of one-disposal cell cover and one of the reclaimed areas where further remediation occurred was performed during May 11th and 12th, 1998. The total area revegetated was 4.2-acres. Nitrogen and phosphate amendments were added to the soil at a rate of 24 and 41 lbs/acre, respectively, based on the results of soil sampling and the optimal nutrient level recommended by the Natural Resource Conservation Service (NRCS) office in Carrizozo, New Mexico. The following native vegetation seed mixture, as recommended by the NRCS, was used for re-vegetation.

Alma – Blue Grama	45%
Alkali Sacaton	15%
Viva – Galleta Grass	15%
Sand Dropseed	10%
Four Wing Saltbush	10%
Yellow Sweet Clover	05%

The re-vegetation consisted of amending the soil nutrients, disking of top soil, planting of vegetation seeds using a seed drill, broadcasting of straw mulch, and crimping of the straw mulch to protect the vegetation seeds.

In consultation with NMED, EPA determined that all appropriate response actions required at OU-2 have been met. EPA verified that the implemented remedy at OU-2 is protective. Therefore, on June 21, 2000, the EPA proposed partial deletion of OU-2 from the NPL. On August 21, 2001, the OU-2 portion of the Site was partially deleted from the NPL.

VI. Five-Year Review Process

The Cimarron Mining Corporation Superfund Site (Site) second five-year review was lead by Ms. Petra Sanchez, the EPA Remedial Project Manager for the Site. The following team members assisted in the review:

- Brian Jordan, USACE Technical Manager
- Carl Albury, NMED Representative
- Natver Patel, Project Manager, AVM Environmental Services, Inc.

This five-year review included the following:

- Document Review
- Data Review
- Site Inspection
- Interviews, and
- Five-Year Review Report Development and Review.

A. Document Review

The five-year review consisted of a review of relevant documents, including O&M records and monitoring data (see Attachment 2). ARARs for ground water, soil, and waste cleanup levels, listed in the September 1990 ROD for the OU-1 and September 1991 ROD for the OU-2 were reviewed.

B. Data Review

B.1 Cimarron Mill Site, OU-1

A review of records and monitoring reports through March 2003, was performed for this data review. A summary of ground water pumping, discharge and contaminant mass recovery data is included in Attachment 3. The ground water pumping data are summarized in Figure 2. The data indicate that approximately 1,830,757 gallons of ground water was extracted and discharged to POTW during remedial action. The pumping data also show that the pumping rates decline over time. The initial decline in average pumping rates through January 1999, is thought to be the result of water level drawdown and reduced pumping efficiency due to wear and deterioration of the jack pumps. The results of the well refurbishment and testing indicated that the declines were not caused by well plugging. The overall low well yields and general decline through each pumping cycle are due in part, to the initial low saturated thickness that further decline with pumping. Average total cyanide concentration and mass recovery in extracted ground water is summarized in Figure 3. These results indicate an average total cyanide concentration of 0.11 mg/L in extracted and discharged water to POTW is far below the 5.0 mg/L pre-treatment discharge standard. A total of 1.74 lbs. of total cyanide mass was removed during the remedial action implementation.

Figure 2
Ground Water Pumping Data @ OU-1

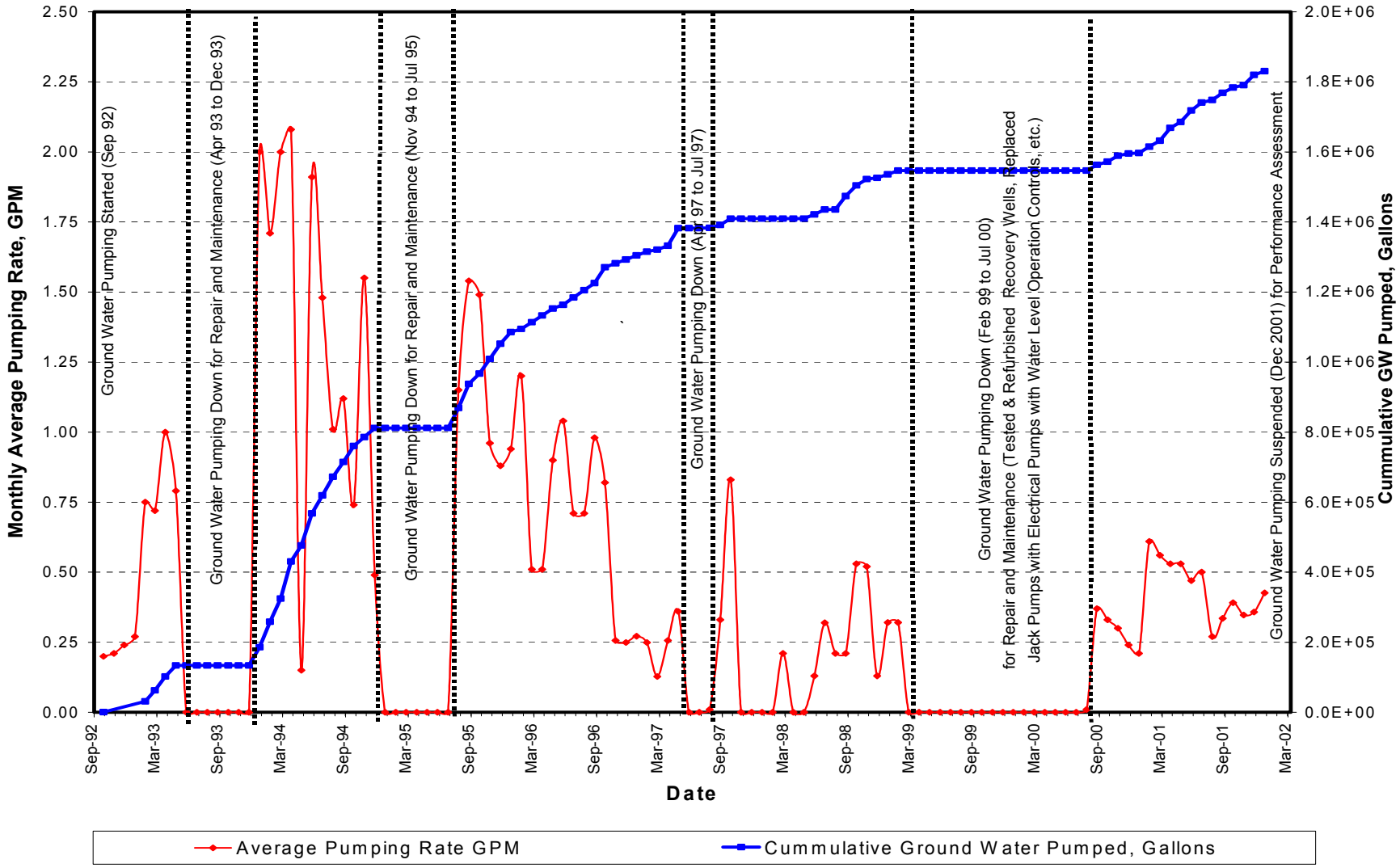
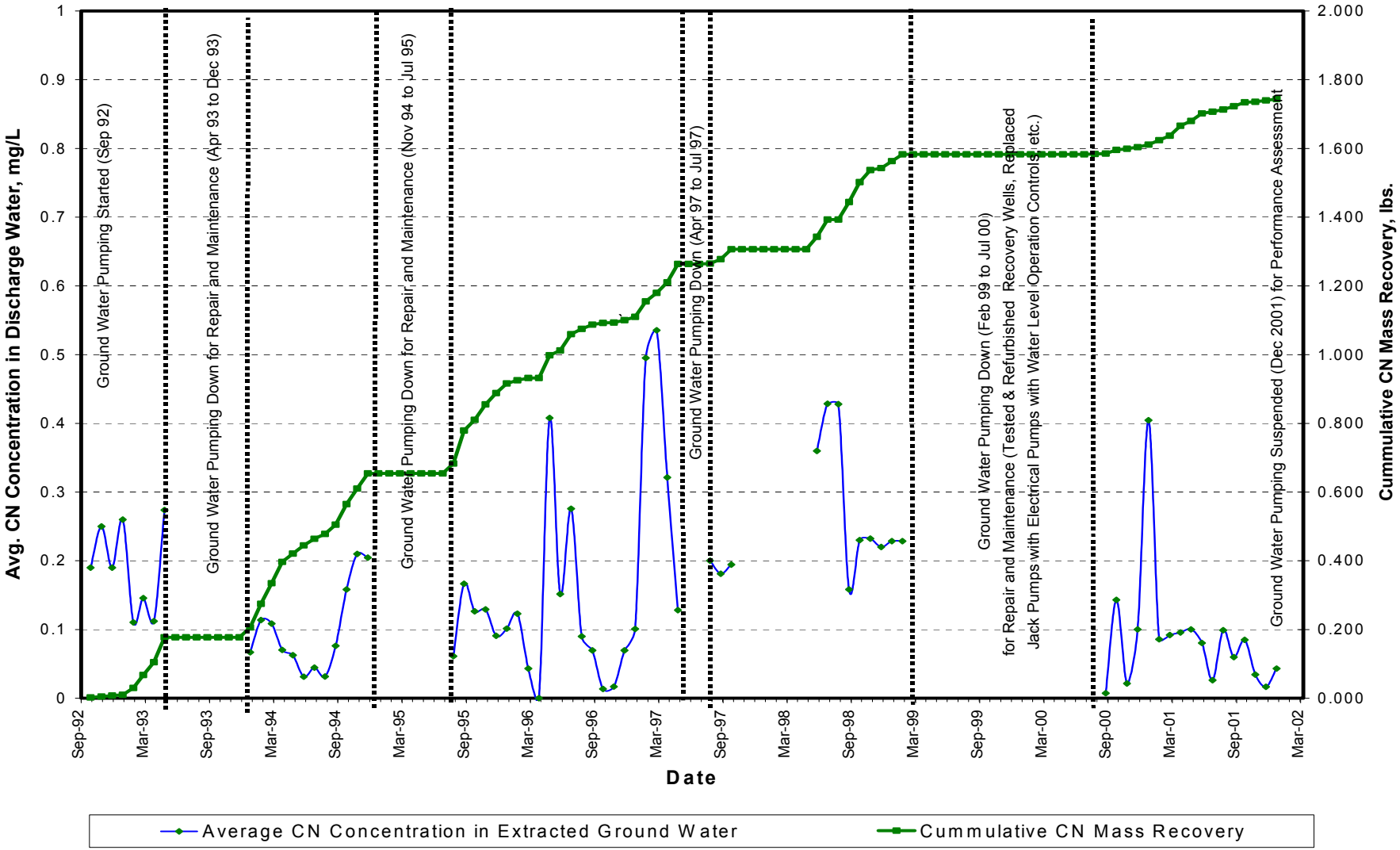


Figure 3
Total Cyanide Concentrations and Mass Recovery in Extracted Ground Water @ OU-1



Results of the total cyanide concentrations in monitoring and recovery wells at the Site are summarized in Attachment 3. For operational and performance monitoring, the unfiltered ground water samples are analyzed for total cyanide using EPA 335.2/SM 4500 CN-C. The reported total cyanide concentrations include dissolved and suspended free cyanide, weak-acid dissociable cyanide and strong metal complexes. This provides a conservative approach in evaluating compliance with the cyanide cleanup level. Table 3 summarizes the changes in total cyanide concentrations due to remedial action in the four monitor wells that exhibited pre-remediation total cyanide concentrations above the cleanup level of 0.2 mg/L.

Table 3: Comparison of Initial and Current Total Cyanide Ground Water Concentrations

Monitor Well	1990 Highest Concentration Pre-Remedial Action (mg/L)	Current (Dec 2002) Concentrations (mg/L)	ROD Specified Cyanide Cleanup Level (mg/L)
MW-04	4.35	1.14	0.20
MW-06	0.45	0.38	0.20
MW-08	0.55	<0.01	0.20
MW-10	1.52	0.55	0.20

These results show declines in all four wells, although there is considerable variation in the magnitude of decline. Time series plot for monitoring wells that exhibited any total cyanide concentrations above the 0.2 mg/L cleanup level during sampling are shown in Figure 4. The total cyanide concentration time series plots for recovery wells are shown in Figure 5.

These results show a significant decline in total cyanide concentrations in the wells that exhibited high total cyanide concentrations prior to remedial action, including wells MW-04, MW-10, RW-5 and RW-6. However, at the present time, the total cyanide concentrations still remain above the 0.2 mg/L ROD specified cleanup level for cyanide in three monitor wells and three recovery wells.

Water level measurements performed during ground water pumping and after cessation of pumping were examined to determine the extent of draw down around recovery wells, and the rate and extent of water level recovery following cessation of pumping. The water level data summary is included in Attachment 3. The water level information together with the total cyanide sampling data are used to evaluate the possible influence of water levels on the rebound in total cyanide levels following cessation of pumping.

Figure 4
Total Cyanide Concentration Trend in Monitoring Wells @ OU-1

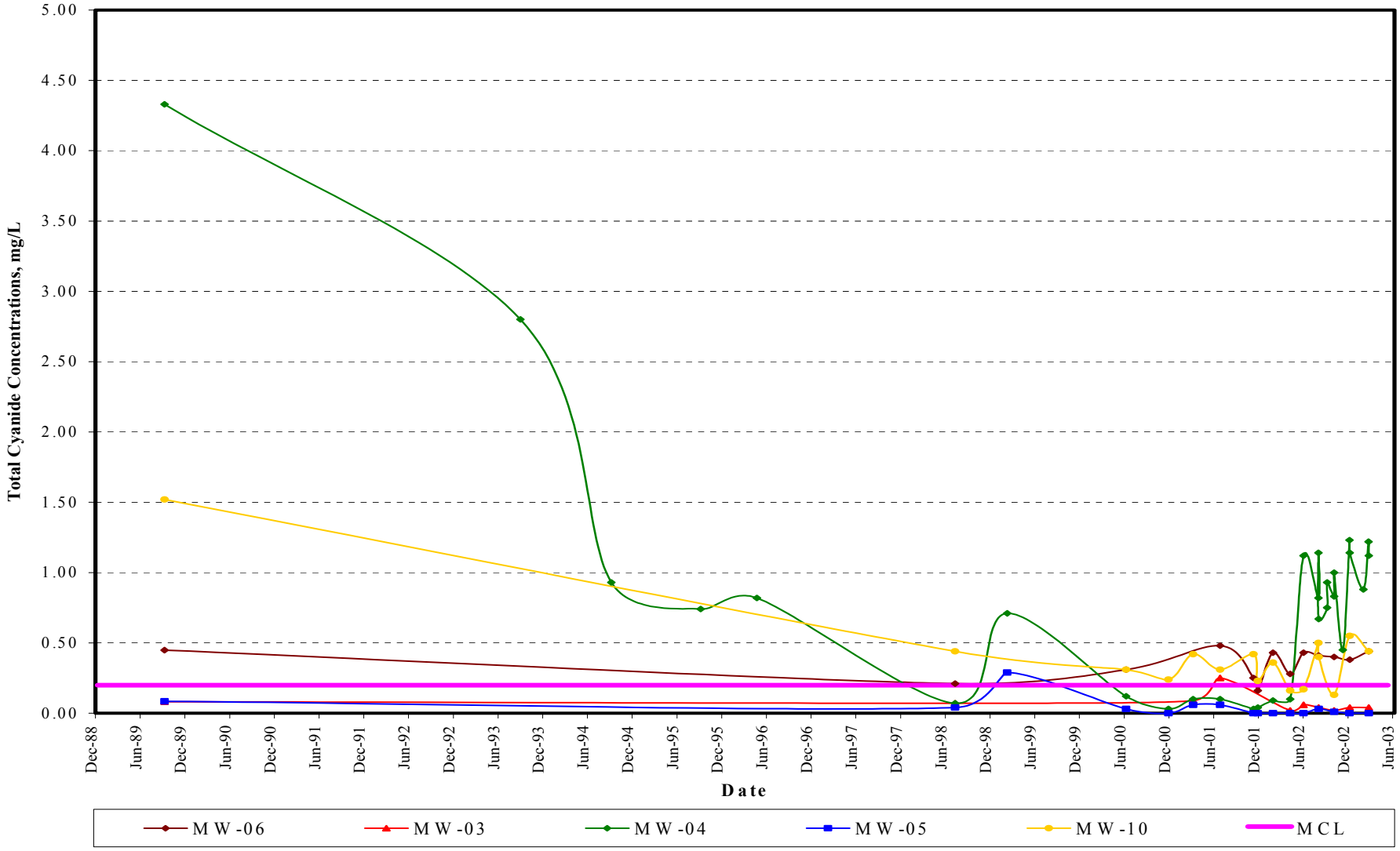
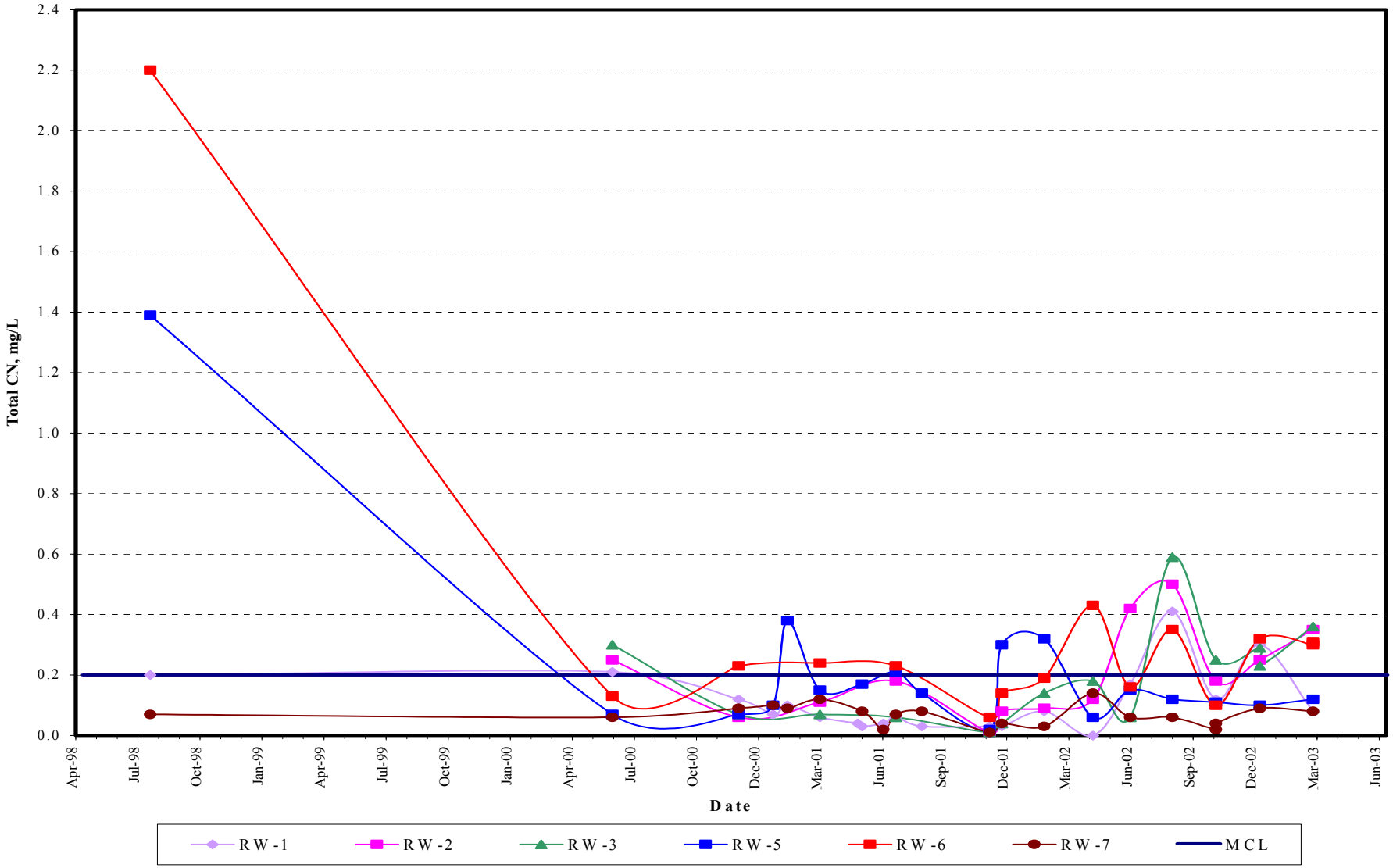


Figure 5
Total Cyanide Concentration Trend in Recovery Wells @ OU-1



Water level elevations for monitoring wells are plotted in Figure 6 and Figure 7. The water levels in monitoring wells located in the vicinity of the remediation wells show fluctuations that correspond closely with the temporary shut down periods and pumping rates shown in Figure 2. These wells also show a water level recovery of approximately a foot or more following suspension of pumping in December 2001. Water levels in wells MW-03 and MW-14 located upgradient of the remediation wells and in wells MW-15 and MW-16 located downgradient of the remediation wells show a slight decline during remedial action and little or no recovery following cessation of pumping. The water levels in the three recovery wells that were not pumped after January 1999, show drawdown and recovery patterns similar to the monitoring wells located in the vicinity of the remediation wells, as shown in Figure 8.

Performance monitoring was conducted following the December 2001, ground water pumping suspension to evaluate remediation progress toward meeting the ground water restoration goal of 0.2 mg/L cyanide concentration, and to evaluate whether the selected remedy is capable of meeting the restoration criteria in a reasonable time-frame. While most wells indicate a rebound in water levels following cessation of pumping in December 2001, the water level rise in well MW-04 was above any previous measurement obtained at this well as shown in Figure 6. This water level rise at well MW-04, which was inconsistent with the expected water level rebound following cessation of pumping, was first noticed during the June 4, 2002, water level measurements. Inspection of the well location found a continuous source of water discharge and ponding within 15 feet of the well. The source of this water originated from water overflow from a swamp cooler at the nearby residential house-trailer located on Site, given the circumstantial evidence presented at the Site. The discharge rate from the swamp cooler was measured and estimated to be approximately 250 gallons per day.

The monitoring results in Figures 4 and 5 show a rebound in total cyanide concentrations in monitoring well MW-04 and in three recovery wells following cessation of pumping. The rebound concentrations for total cyanide in wells MW-04, RW-2, RW-3, and RW-6 were in the range of 2 to 3 times the 0.2 mg/L remediation target. The water level measurements show that the increase in total cyanide concentrations corresponds with the rise in water elevations in each of these wells. Total cyanide concentrations observed since June 2000, in other Site wells appear to fluctuate with no apparent trends related to pumping or recovery following cessation of pumping. The total cyanide concentrations in most of these other wells remained below the 0.2 mg/L cleanup level for cyanide, although concentrations in wells MW-06 and MW-10 fluctuated between 0.15 and 0.5 mg/L.

The total cyanide concentrations in ground water at the Site appear to decrease with depth, even though there are strong downward vertical gradients at the Site. These results suggest high rates of attenuation of metal cyanides due to adsorption. The apparent rebound in total cyanide concentration

Figure 6

Water Level Elevation Trend in Monitoring Wells @ OU-1

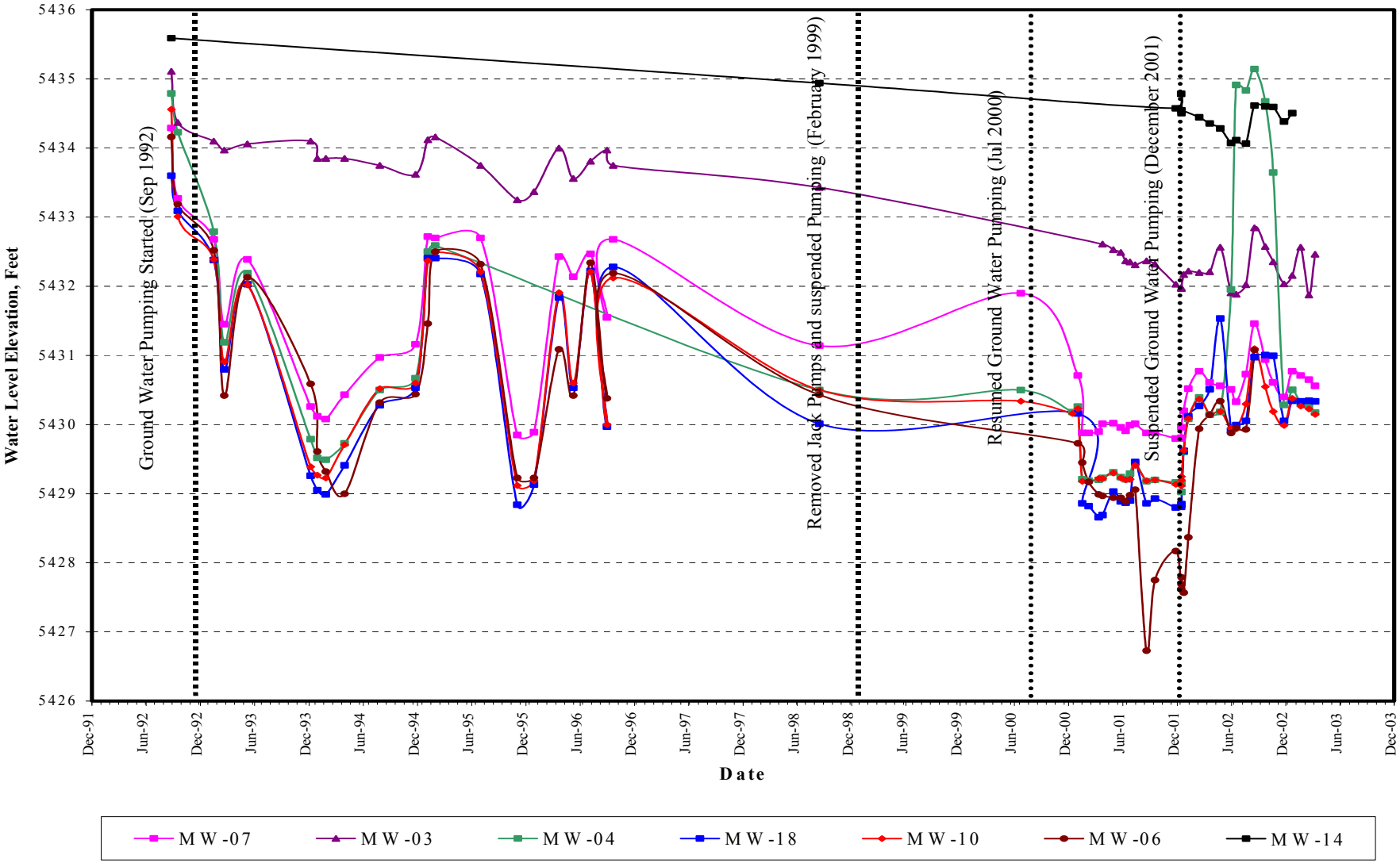


Figure 7
Water Level Elevation Trend in Monitoring Wells @ OU-1

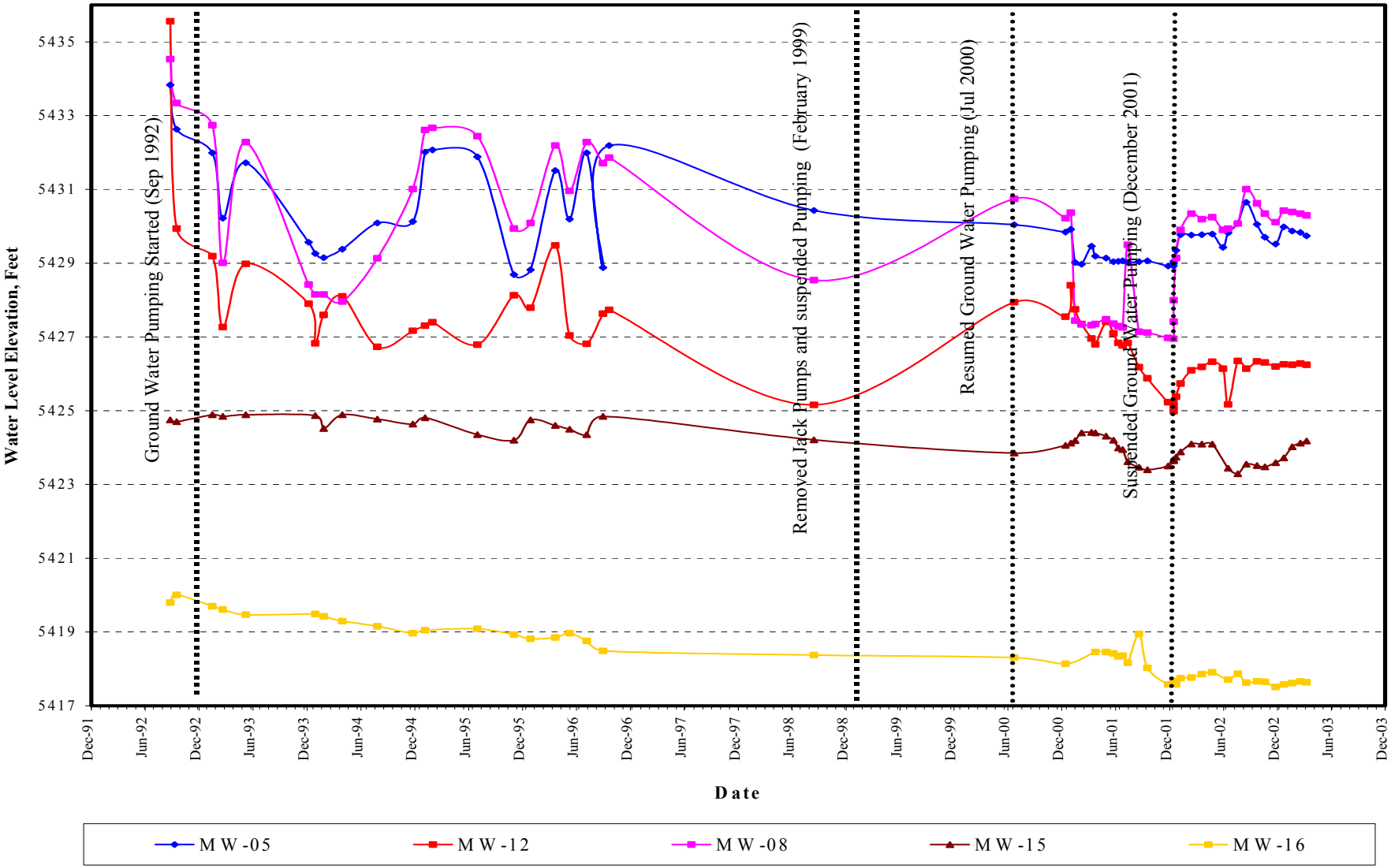
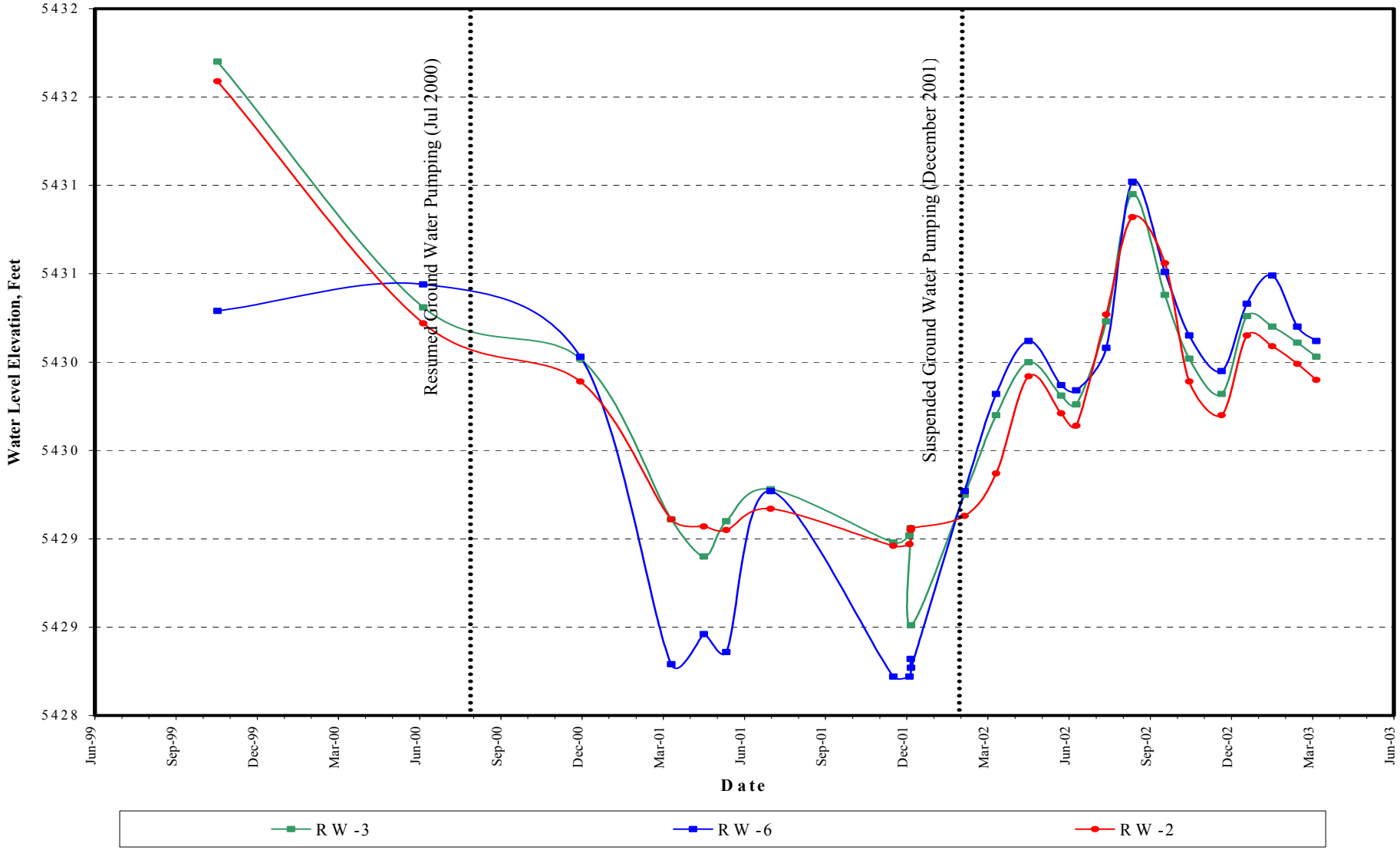


Figure 8
Water Level Elevation Trend in Recovery Wells @ OU-1



observed with the recovery or rise in water table elevations at wells MW-04, RW-1, RW-2 and RW-3 may be due to re-suspension of iron cyanide colloids and dissolution of metal cyanide complexes adsorbed on sediments near the original water table. The formation of metal cyanide complexes and adsorption by clay minerals and organic material in the sediment limits both the vertical and horizontal transport of cyanide in ground water. It also adversely affects the performance of ground water pumping for cyanide removal. As the water table is drawn down, ground water flushing becomes less efficient as ground water flow bypasses the location of highest concentrations near the water table. Pulse pumping was performed at the Site as indicated by Figures 6 through 8, and the cyanide removal may have been greater than that with continuous pumping, even though the total cyanide removed by pumping during the remedial action is relatively low. Thus, it appears that pulse pumping could provide a better mechanism for cyanide removal than continuous pumping.

In summary, the proposed remedial action objective of protection of human health and the environment continues to be met at the Site. Monitoring results show a significant decrease in total cyanide concentrations in monitor wells. The total cyanide concentrations are above the 0.20 mg/L cyanide clean-up level in only three of fourteen monitoring wells on Site. However, the performance monitoring results, included in Attachment 3; water levels, ground water extraction rates, rates of decline in ground water concentrations, and mass recovery rates; indicate that it may take 50 years or more before clean-up standards are achieved in all portions of the shallow ground water at the Site.

B.2 Sierra Blanca Mill Site, OU-2

A review of the information and soil remediation reports through May 1997 was conducted. The data and information review was used to support the remedy implementation description in Section IV.B.2 of this Five-year Review report. A preliminary close out report was completed in September 1992.

A total of 299 cy of additional contaminated soils exceeding the lead clean-up level were identified in two locations by a XRF survey performed in September 1992 by NMED following completion of the initial work. The contaminated soils were excavated, stabilized with cement and disposed in a disposal area that was capped and graded. The results of the confirmatory sampling performed following removal of the additional contaminated soils are summarized in Table 4. The confirmatory sampling results found no remaining soil with lead concentrations above the 500 mg/Kg cleanup levels.

Table 4: Lead Soil Cleanup Confirmatory Sampling Results @ OU-2

Sample Location	Sample Date	Lead Conc. In Soil (mg/Kg)

L-28	07/10/97	337
L-30	07/10/97	134
S-6	07/08/97	14
S-10	07/08/97	95
S-30	07/09/97	Not Detected
S-36	07/09/97	54
O-7	07/10/97	12
O-8	07/10/97	270

As indicated previously, the site did not include any Operation and Maintenance of Long-Term Remedial Action (LTRA) because the cleanup levels were attained upon completion of excavation, treatment and disposal of the wastes, and ground water was not impacted.

C. Site Inspections

Inspections at both operable units were conducted on May 21, 2003, by the EPA RPM, NMED representative and USACE representative. The purpose of the inspection was to assess the protectiveness of the remedies.

C.1 Cimarron Mill Site, OU-1

The remedy at OU-1 consists of shallow ground water remediation system. The ground water extraction and discharge to the POTW is currently suspended for the continued performance assessment monitoring. The remediation system components inspection at OU-1 included the ground water recovery wells, the instrumentation and piping in the recovery well vaults and the discharge vault. The monitoring wells and the site boundary fence were also inspected. The ground water remediation system components were in good condition. Monitoring wells were locked and secured. An 8-foot fence restricts access to the OU-1. The OU-1 is currently used as an auto repair shop and salvage yard. Mr. Tim Means, the owner of the auto repair shop, resides at the Site. The Carrizozo Municipal Water Supply System provides the water to the On Site residence and there are no Site water wells, or On-Site use of ground water for any purposes. The On-Site mobile home does not have any sewage discharge. The ponding area, which appeared last year near the mobile home due to a leaking swamp cooler, was also inspected. No standing water was observed. The cooler is now equipped with appropriate fittings and a float to avoid future leakage and ponding.

No significant issues were identified regarding the remediation system. Although the Site is currently being used for residential purposes, the impacted water is not used as a source of drinking water, thus

no change in exposure or risk has occurred as discussed in the technical assessment section. The On Site resident provides adequate access control to the Site.

C.2 Sierra Blanca Mill Site, OU-2

The remedy at the OU-2 consisted of excavation, treatment and On Site disposal of soils, sediment and sludge, followed by capping and vegetation of the disposal area. The ground water at OU-2 has not been impacted. Examination of the cap showed no erosion and the vegetation on the cap was in excellent condition. The current owner, the Town of Carrizozo, decommissioned two buildings during this five-year review period. The Town of Carrizozo is currently using the Site for equipment and material storage, including an excavated Under Ground Storage Tank (UST). The UST was empty, although strong fuel odors were noticed. The Site is surrounded by a barb wire fence. Gates were not locked. Nevertheless, the current use and limited access control do not impact the protectiveness of the remedy because the surface soil remediation has been completed and the vegetation cover of the disposal sites is in excellent condition.

D. Interviews

D.1 Cimarron Mill Site, OU-1

An interview was conducted with Mr. Tim Means, the owner of the OU-1 Site, on May 21, 2003. Mr. Means was first updated with the progress of remediation at OU-1. Mr. Means did not show any concern with any Site activities. He understood that the shallow ground water can not be used at this time, and any future installation of a well would require sealing the annular space outside the well casing through the impacted shallow ground water zone. Mr. Means indicated that he intends to start a fruit tree orchard at the Site within a few years. The orchard will primarily be located upgradient of the impacted area. Mr. Means also indicated that he is willing to complete a site access agreement for remedial and monitoring activities, as well as, deed restriction on the property that would prohibit installation and completion of any well into the impacted shallow ground water zone.

D.2 Sierra Blanca Mill Site, OU-2

The Town of Carrizozo owns the OU-2 Site. An interview with Mr. Wes Lindsey, a city of Carrizozo trustee, was conducted on May 21, 2003. Mr. Lindsey was updated with the progress of remediation at OU-2. Mr. Lindsey was questioned concerning the storage of a UST on the OU-2 site. He stated that he was unaware of the tank on Site and that the tank would be properly removed and decommissioned. The Site document repository is currently located in the damaged city hall building and not currently accessible to the community. The document repository will be relocated to the

current location of city hall in the recreation center. The NMED Project Representative, Mr. Carl Albury, stated that he would perform an inventory of the repository relative to the NMED's repository. Ms. Petra Sanchez, the EPA RPM, mentioned the potential for redevelopment of the OU-2 site with the assistance of the EPA and State Brownfield programs. Mr. Lindsey indicated that the Town of Carrizozo was interested in receiving more information on both programs.

VII. Technical Assessment

A. Is remedy functioning as intended by the ROD?

The review of documents, ARARs, risk assumptions, and results of site inspections indicate that the remedies at both operable units are functioning as intended by the applicable RODs.

A.1 Cimarron Mill Site, OU-1

The shallow ground water remedial actions have been effective at reducing the total cyanide concentrations in shallow ground water at the Site. System operation procedures are implemented in accordance with the Operation and Maintenance (O&M) Plan. The System performance was maintained by replacing inefficient jack pumps with submersible electrical pumps for improved pumping operations. The jack pump seals and cylinder wear faster in recovery wells not charging sufficiently due to very low yielding shallow aquifer. The initial bi-weekly sampling frequency for a few wells was reduced to a quarterly basis, as specified in the last five-year review.

Total cyanide concentrations exceed the 0.20 mg/L cyanide clean-up level in only three of the fourteen monitoring wells currently monitored at the Site. However, the monitoring results indicate that total cyanide concentrations have ceased to decline in some wells and concentrations are significantly above the remediation goal at a few locations. The remediation target for cyanide in ground water was based on the NMWQCCR ground water standard for cyanide. However, the very low and non detectable levels of free cyanide and weak-acid dissociable cyanide found in ground water at the Site, as discussed in Sections 4.2.2 and 4.23 of the March 3, 2003, Performance Monitoring Report indicate that the total cyanide is comprised mainly of strong complexes with iron that are not toxic. Furthermore, these iron cyanide complexes are extremely stable and persistent under most environmental conditions. Under the current oxidizing conditions in the shallow ground water with near neutral pH, the total cyanide is persistent with minimal degradation and transport is strongly controlled by adsorption of the iron cyanide complexes.
These conditions adversely impact the performance of formation flushing by the ground water pumping system with respect to removal of cyanide and attainment of the clean-up criteria. The performance monitoring data and evaluation provide estimates of the mass of total cyanide removed

by the ground water flushing remediation system. However, it is not possible to derive an estimate of the mass of total cyanide in the subsurface at the Site with the available data. This stems primarily from the extreme difficulty in determining the magnitude of cyanide adsorption. These difficulties also reduce the reliability and accuracy of any estimate for the time frame required to reduce total cyanide to levels below the ROD specified clean-up criteria throughout the area of attainment.

In the ROD for the OU-1, the shallow ground water over approximately 2.3 acres of the Site was identified as having total cyanide concentrations above the 0.2 mg/L ground water standard. Using the average pumping rate of 567 gallons per day maintained by the three recovery wells operating over the period from August 4, 2000, through December 18, 2001, it is projected to take 16.6 years of continuous pumping to flush one pore volume through the impacted shallow ground water based on a 30% porosity and average thickness of 15 feet. Even though it is not possible to reliably estimate the total mass of dissolved, colloidal and adsorbed cyanide at the Site due to lack of site specific data, it is likely that flushing of several pore volumes would be required before total cyanide concentrations attain the cyanide clean-up levels in all portions of the shallow ground water at the Site.

Recent monitoring data shows that not all of the shallow ground water within the 0.2 mg/L total cyanide isochlor from the ROD exceeds the MCL. Therefore, the actual pore volume where total cyanide exceeds the cleanup level is less than that determined from the ROD. On the other hand, geologic complexities and current recovery well locations requires pumping of a volume much greater than one pore volume to remove one pore volume from the impacted zone. Furthermore, since the cyanide occurs predominantly as iron complexes in the very shallow ground water near the water table and in the unsaturated zone above the water table, pumping draws down the water table and does not effectively flush these cyanide complexes from the formation. Therefore, pulsed pumping is necessary to periodically surge and flush total cyanide from the draw down cone around the pumping wells.

Based on the estimated pore volume removal rate of over 16 years with the current remediation system, continued pulse pumping for a number of decades would be required to provide adequate formation flushing. This still may not be adequate to permanently attain the ROD specified clean-up criteria throughout the entire Site as leaching of cyanide from the unsaturated zone by recharge and/or rising water tables during wet periods could cause total cyanide concentrations in shallow ground water at some areas of the Site to increase above the specified cyanide clean-up criteria.

Natural degradation processes cannot be relied upon to attain clean-up criteria in a reasonable time frame because of the presence of cyanide as iron cyanide complexes. The overall degradation process for these cyanide complexes are controlled by the rate of breakdown for these iron cyanide complexes, which appear to be very stable in ground water.

In summary, it is estimated to take 50 years or more before the cleanup level is achieved in all portions of the shallow ground water at the Site. Furthermore, the current pump and treat remedy does not appear to be capable of appreciably reducing the restoration time frame over the rate of natural restoration.

A.2. Sierra Blanca Mill Site, OU-2

Excavation, stabilization and disposal and capping of all contaminated soils and wastes has achieved the remedial objectives by minimizing migration of contaminated soils to ground water, prevent direct contact with, or ingestion of, contaminants in soils and waste.

The cap and surrounding areas are undisturbed. Vegetation on the cap has been effective in preventing any erosion from taking place. The ground water monitoring indicates that remediation of contaminated soils and burial of bulk wastes has been effective at minimizing leaching of contaminants.

B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

There have been no significant changes in physical conditions at either operable unit that would affect the protectiveness of the remedies.

Changes in Standards and to be Considered

Table 3 lists the Constituents of Concern (COCs), ARARs and guidelines that were identified in the September 1990 ROD for OU-1.

Table 5: Ground Water Remediation ARARs for OU-1

COC	Chemical Specific Standard Remediation Goal ARAR	Action Specific Standard Pretreatment ARAR	Source
Cyanide (CN)	0.2 mg/L	-	NMWQCCR GWS, 20.6.2.3103 NMAC EPA MCL (SDWA), 40 CFR 141.11
	-	5.0 mg/L	EPA Effluent Guidelines and Standards 40CFR 413.24

This five-year review did not identify any new or stringent risk levels promulgated since the signing of the ROD in September 1990. However, Region 6 of EPA has developed medium specific risk-based screening levels. This includes a screening level of 0.73 mg/L for free cyanide in tap water for

the residential scenario, which considers ingestion and inhalation. This 0.73 mg/L cyanide screening level may be appropriate and considered, instead of the 0.20 mg/L NMWQCCR ground water standard specified in the ROD.

Table 4 lists the Constituents of Concern (COCs) and ARARs for surface soils, sediments and sludge remediation at OU-2 contained in the September 1991 ROD and recent human health medium specific screening levels identified during the five-year review.

Table 6: Surface Soils, sediments and sludge Remediation ARARs for OU-2

COC	Media	Cleanup Level	Standard		Source
Lead	Surface soils, sediments, and sludge	500 mg/Kg	Previous (ROD)	500-1000 mg/Kg	Interim Guidance on Establishing Soil Cleanup Levels at Superfund Sites (OSWER Directive #93355.4-02, EPA, 1989).
			Recent	400 mg/Kg	EPA Region 6-Human health medium specific screening levels (February 2002)
			Recent	400 mg/Kg	NMED Soil Screening Levels, December 2000, Revision-1

The recent ARARs for lead in soils have changed from 500 mg/Kg to 400 mg/Kg since signing of the ROD in September 1991 as shown in Table 3. However, when remediation was completed, the ARARs for the soil and waste contamination cited in the ROD were met. The confirmatory soil sampling results show the highest lead level of 370 mg/Kg in surface soils, indicating that the cleanup meets the 400 mg/Kg recent health-based soil screening level. Therefore, the recently identified cleanup level, which is slightly more stringent, does not impact the protectiveness of the completed remedy. No change to the cleanup level is warranted.

Changes in Exposure Pathways, Toxicity and Other Contaminant Characteristics

Cimarron Mill Site, OU-1

The Cimarron Mill Site is currently used for residential and commercial purposes. However, the Carrizozo Municipal Water Supply provides water to the residence. Therefore, no change in exposure pathway has occurred due to change in the land use. A potential change in the shallow ground water exposure pathway may be addressed by implementing institutional controls. If institutional controls are not implemented to address a potential exposure to impacted water due to a land use change to residential purposes, a risk assessment for potential use of impacted water for tap water may be warranted.

The total cyanide concentrations in ground water have decreased. Sampling results of the down gradient monitoring wells (MW-05, MW-12, MW-15, MW-16 and MW-17), included in Attachment 1, show that the ground water plume has been successfully contained.

Seventeen metals were detected in surface soils above the background levels at the Cimarron Mill Site during the RI. Under the conditions at the Site during the RI, no hazard index value exceeded unity, and the highest exposure resulting from site visits or inhalation of fugitive dust in Carrizozo was calculated to be 4.7×10^{-8}. At the time of the ROD signing in September 1990, and during the last five-year review, the Site was not used as a residence. As indicated previously, the property owner currently resides on the Site. The metals detected in the surface soils at concentrations above the background levels are below the risk-based soil screening levels for a residential scenario specified in the February 5, 2002, EPA Region 6 Human Health Medium-Specific Screening Levels. Therefore, even though the exposure scenario has changed, the metals detected above the background levels in the surface soils at the Site do not pose any unacceptable risk for residential scenario.

Any changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy. Toxicity and other factors for contaminants of concern (cyanide) have not changed. Although the ground water cleanup level is based on the NMWQCCR ground water standard for cyanide, the monitoring results indicate that the cyanide in ground water is comprised of iron cyanide complexes that are much less toxic.

Sierra Blanca Mill Site, OU-2

No change in exposure pathways was identified at OU-2. No change in contaminant characteristics was found during this review. The confirmatory soil sampling results for lead (Table 4) show that the waste remediation met not only the 500 mg/Kg ROD specified clean-up level, but also the recent health-based soil screening level of 400 mg/Kg for lead. The completed remedy continues to be protective.

C. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information came to light that could call into question the protectiveness of the remedies at either operable unit. No ecological targets were identified in the risk assessment performed during the RI or the first five-year review, and none were identified during this five-year review at either operable unit. The shallow ground water does not discharge to surface on or near the Site.

Technical Assessment Summary

Cimarron Mill Site, OU-1

According to the data reviewed, the site inspections, and the interviews, the remedy at OU-1 is functioning as intended in the ROD. There have been no changes in physical conditions of the Site that would affect protectiveness of the remedy. The persistence of total cyanide concentrations remaining above the cleanup level in a few monitor wells is due to hydrogeological characteristic of the impacted formation rather than the pump and treat remedy selected in the ROD. Although the remediation cleanup level was based on the NMWQCCR ground water standard for cyanide, the total cyanide monitored in ground water at the Site includes free cyanide, weak-acid dissociable cyanide and strong iron complexes. Ground water sampling for cyanide speciation at the Cimarron Mill Site was performed by USGS in 1999 and by USACE in 2000. The very low and non detectable levels of free cyanide and weak-acid dissociable cyanide found in ground water at the Site, as reported in the March 3, 2003, Performance Monitoring Report, indicate that the cyanide is comprised mainly of strong complexes with iron which is much less toxic.

The change in land use at the Site does not impact the protectiveness of the remedy because the impacted ground water is not being used for any purpose and no exposure pathway is presented. There is no information that calls into question the protectiveness of the remedy.

Sierra Blanca Mill Site, OU-2

The data review, site inspection, and interviews indicate that the completed remedy at OU-2, which consisted of excavation, stabilization and on site disposal of the lead contaminated waste, is functioning as intended. The soil cleanup confirmatory sampling results show that all waste exceeding the ROD specified lead cleanup level of 500 mg/Kg, as well as the recent health-based lead soil screening level of 400 mg/Kg, have been met. The cap on the disposal area is undisturbed and there is adequate vegetative cover to maintain its protectiveness. ARARs for soil contamination cited in the ROD were met when the remedy was completed. There have been no significant changes in the toxicity factors for lead or arsenic, the contaminants of concern. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

No significant issues or deficiencies of the remedy or the implementation of the remedy were identified during this five-year review at either operable unit that would currently affect

protectiveness. Any difficulties observed during routine operation of the System were addressed and corrected as needed. However, the following recommendations are noted:

A. Cimarron Mill Site, OU-1

As discussed in the data review section of this report, while most wells showed a rebound in water levels following cessation of pumping in December 2001, the water level rise in well MW-04 was above any previous measurement recorded at this well. This water level rise at well MW-04, which was inconsistent with the expected water level rebound following cessation of pumping, was first noticed during monitoring on June 4, 2002. Inspection of the well location found a continuous source of water discharge and ponding within 15 feet of the well. The source of this water was water overflow from a swamp cooler at the nearby residential house-trailer located on Site. A water level decline in MW-04 was observed on September 27, 2002. This decline corresponded with the elimination of water discharge following shutdown of the water supply to the swamp cooler.

The monitoring data included in Attachment 3, and Figure 4 of this report show a significant cyanide concentration rebound in monitoring well MW-04 following cessation of the pumping. While some of the rebound in cyanide concentrations may have been from the water table recovery due to cessation of pumping, part of the increase in cyanide concentrations observed at well MW-04 appears to be due to leaching of metal cyanide complexes by infiltration of the ponded water from the swamp cooler overflow at the nearby residential house-trailer. Thus, land use restrictions should be considered to prevent future leaching of iron cyanide complexes from the unsaturated zone by water infiltration from ponds, leaky pipes, leach fields or water discharges located in the former cyanide source areas. In addition, an institutional control or a measure for limiting completion of a well into the shallow ground water should be implemented to prevent potential exposure to contaminated ground water.

B.2 Sierra Blanca Mill Site, OU-2

The Sierra Blanca Mill Site is currently owned by the Town of Carrizozo, and is used for storage by the Town of Carrizozo. Access and use of the Site is controlled by the town in agreement with the EPA and NMED. Implementation of institutional controls, including deed restriction for zoning as specified in the ROD may be necessary for future protectiveness of the completed remedy.

IX. Recommendations and Follow-up Actions.

A. Cimarron Mill Site, OU-1

As previously discussed, total cyanide concentrations in the shallow ground water have significantly decreased, and the clean-up level has been attained in 11 out of the 14 monitoring wells on Site. However, the monitoring results indicate that the total cyanide concentrations have ceased to further decline over time, and are remaining constant above the remediation goal at a few locations. Therefore, EPA recommends the following actions consistent with Section IX of the ROD for OU-1:

1. The ROD recognized that contamination may be persistent at some locations in the shallow ground water and that reductions of cyanide concentrations to less than 200 ug/l at all points throughout the Site by ground water extraction may not be technically practicable. Institutional controls will be implemented to restrict access to those portions of the aquifer that remain above health-based goals, should this aquifer be proposed for use as a drinking water source. Should Institutional Controls become necessary, the land use restriction should also consider conditions to prevent leaching of iron cyanide complexes from the unsaturated zone by water infiltration from ponds, leaky pipes, leach fields, water discharges, and irrigation of a potential fruit orchard on site in future.

2. Monitoring results show a significant decline in total cyanide concentrations, however, at the present time, the total cyanide concentrations remain above the ROD specified 0.2 mg/L cleanup level for cyanide in some areas. In promulgating the MCL for cyanide, the EPA stated that the MCL for cyanide applies to "free cyanide" (or cyanides amenable to chlorinations). However, the EPA approved the use of the "total" cyanide analytical method to adequately screen samples for the presence of cyanide. Given the difficulties in removing total cyanide from the subsurface due to the predominance of iron cyanide complexes and the low toxicity of this speciated form of iron cyanide, it is appropriate to examine compliance with the MCL using "free" cyanide or weak acid dissociable cyanide rather than total cyanide.

B. Sierra Blanca Mill Site, OU-2

EPA recommends monitoring ground water near the disposal cell to ensure no leachate has infiltrated to ground water.

X. Protectiveness Statements

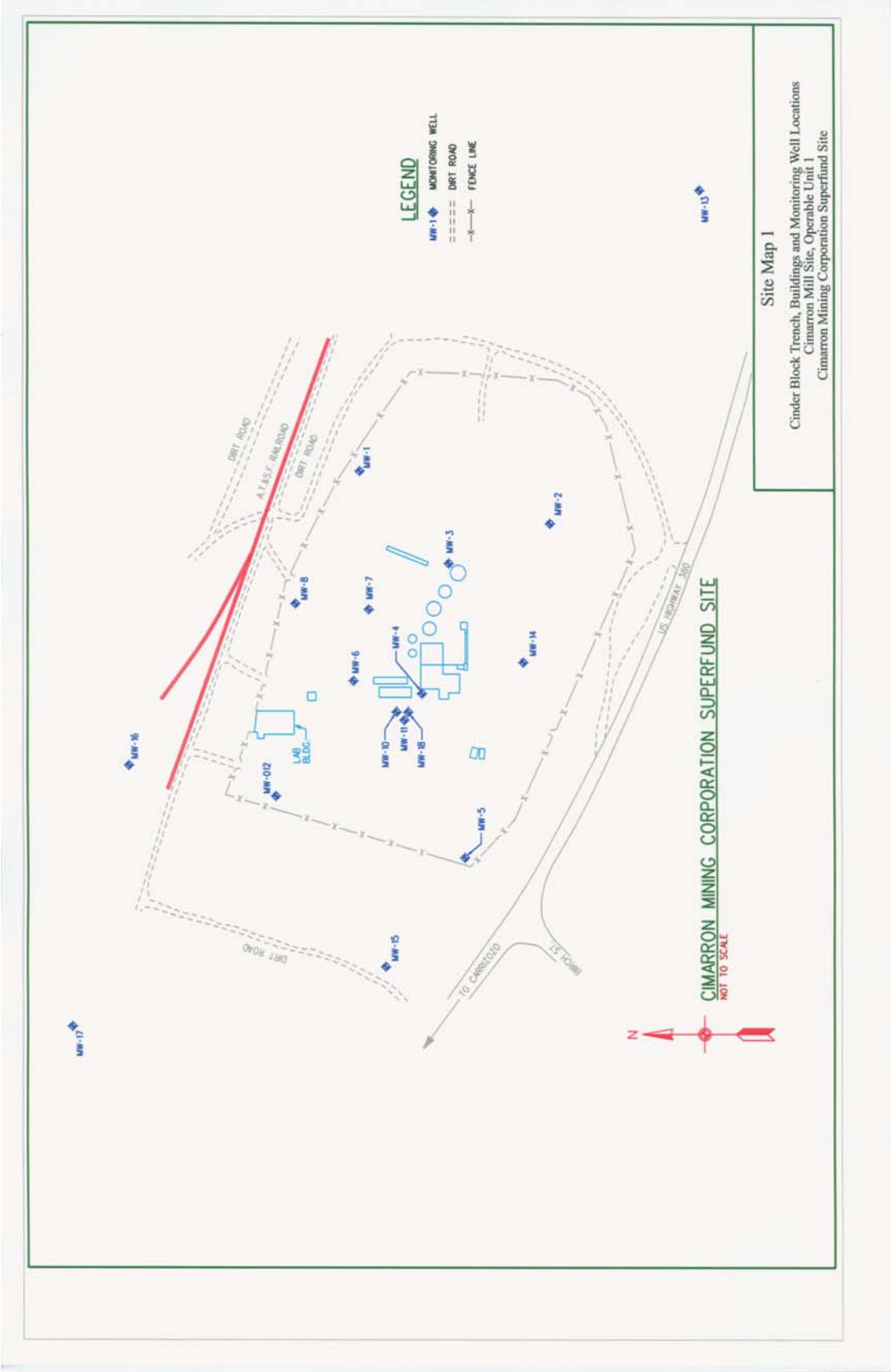
The remedy for the Site is protective of human health and the environment. The shallow ground water remedy at OU-1 is operating and functioning as designed. The ground water pump and treat remedy has significantly decreased ground water total cyanide concentrations. The total cyanide ground water concentrations are above the cyanide cleanup level in only three of fourteen monitoring wells. The ground water monitoring data show that the remedy has successfully contained the ground water plume. Even though the land uses at the Site have changed, the remedy remains protective, as the impacted shallow ground water is not used for any purpose. A potential exposure to shallow ground water will be prevented by putting institutional controls in place if necessary.

The completed remedy at OU-2 is protective of human health and the environment.

XI. Next Review

This is a statutory site that requires an on going five-year review. The next five-year review is due five years from the signature date.

ATTACHMENT 1
Site Maps


LEGEND
MW-1 MONITORING WELL
DIRT ROAD
FENCE LINE
Site Map 1
Cinder Block Trench, Buildings and Monitoring Well Locations
Cimarron Mill Site, Operable Unit 1
Cimarron Mining Corporation Superfund Site
CIMARRON MINING CORPORATION SUPERFUND SITE
NOT TO SCALE
N
DIRT ROAD
ATASF RAILROAD
DIRT ROAD
DIRT ROAD
LAB BLDG.
TO CARRIZOZO
BECH ST.
US HIGHWAY 380
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-10
MW-11
MW-12
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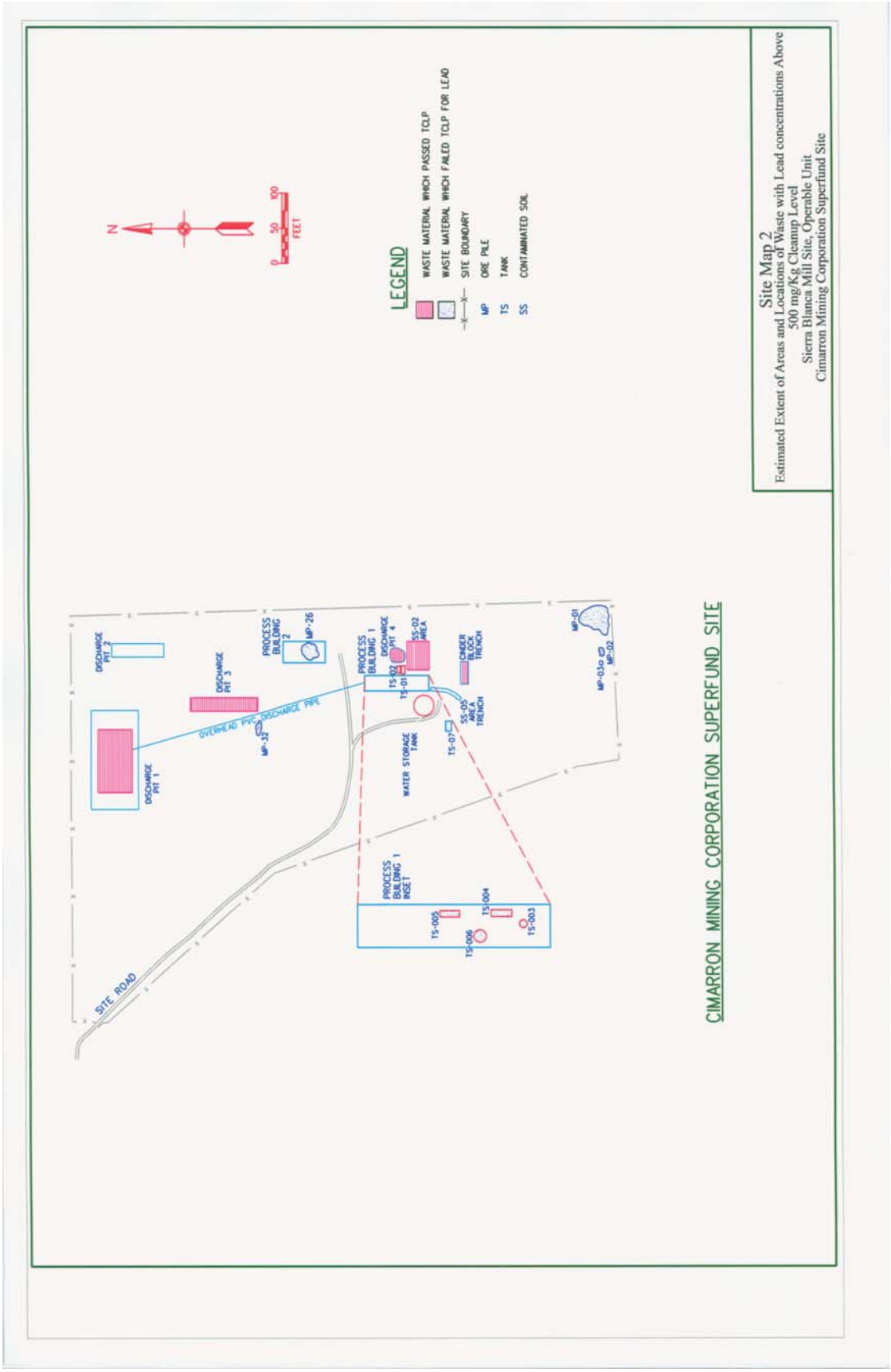
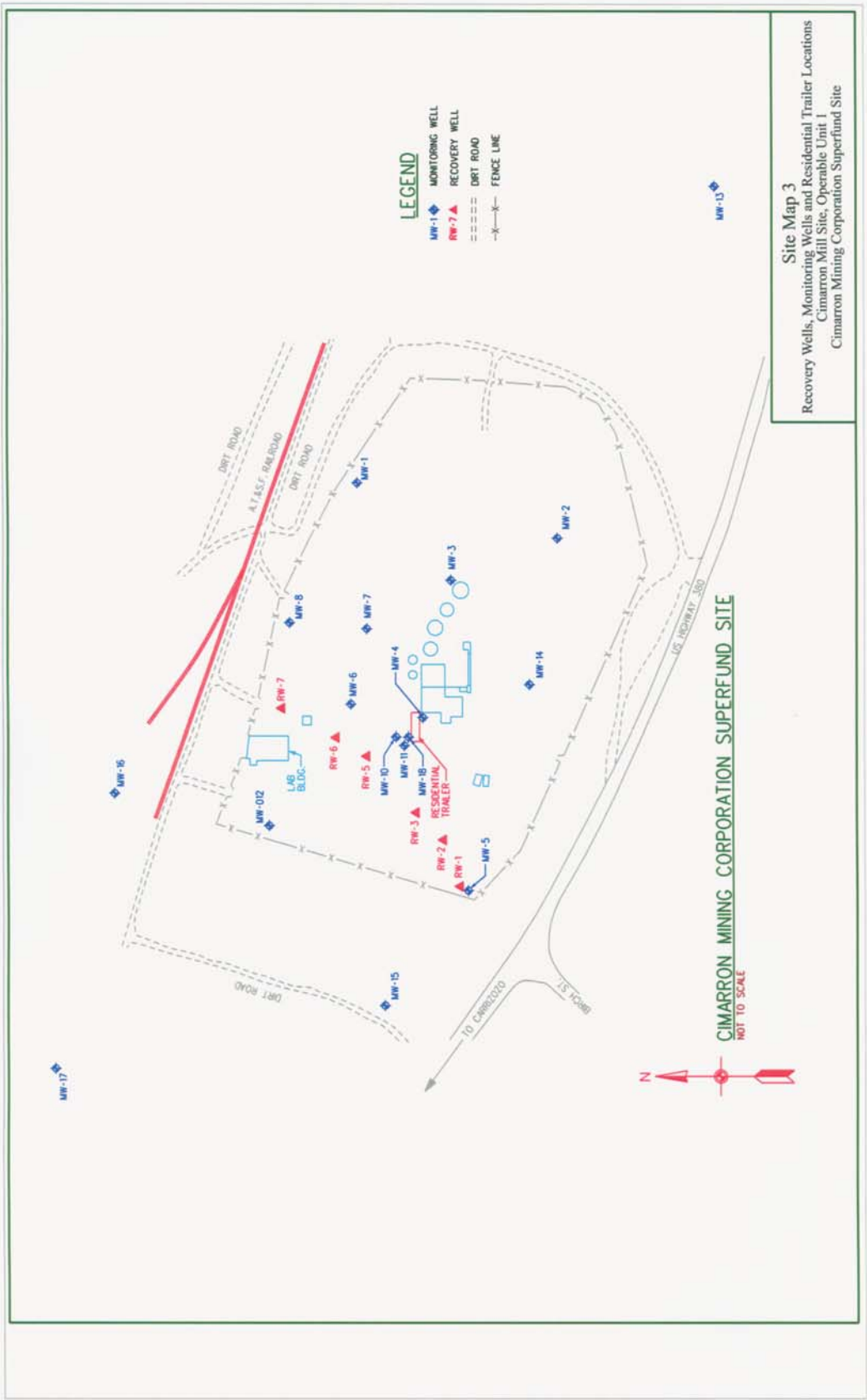
MW-15
MW-16
MW-17
MW-18


N
0
50
100
FEET
LEGEND
WASTE MATERIAL WHICH PASSED TCLP
WASTE MATERIAL WHICH FAILED TCLP FOR LEAD
SITE BOUNDARY
MP ORE PILE
TS TANK
SS CONTAMINATED SOIL
DISCHARGE PIT 2
DISCHARGE PIT 3
DISCHARGE PIT 1
OVERHEAD PVC DISCHARGE PIPE
MP-32
PROCESS BUILDING 2
MP-26
PROCESS BUILDING 1
DISCHARGE PIT 4
SS-02 AREA
TS-02
TS-01
WATER STORAGE TANK
CINDER BLOCK TRENCH
SS-05 AREA TRENCH
TS-07
MP-01
MP-03
MP-02
PROCESS BUILDING 1 INSET
TS-005
TS-006
TS-004
TS-003
SITE ROAD
CIMARRON MINING CORPORATION SUPERFUND SITE
Site Map 2
Estimated Extent of Areas and Locations of Waste with Lead concentrations Above
500 mg/Kg Cleanup Level
Sierra Blanca Mill Site, Operable Unit
Cimarron Mining Corporation Superfund Site


LEGEND
MW-1 MONITORING WELL
RW-7 RECOVERY WELL
DIRT ROAD
FENCE LINE
Site Map 3
Recovery Wells, Monitoring Wells and Residential Trailer Locations
Cimarron Mill Site, Operable Unit 1
Cimarron Mining Corporation Superfund Site
CIMARRON MINING CORPORATION SUPERFUND SITE
NOT TO SCALE
N
DIRT ROAD
A.T.&S.F. RAILROAD
DIRT ROAD
DIRT ROAD
LAB BLDG.
RESIDENTIAL TRAILER
TO CARRIZOZO
BIRCH ST.
US HIGHWAY 380
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-10
MW-11
MW-13
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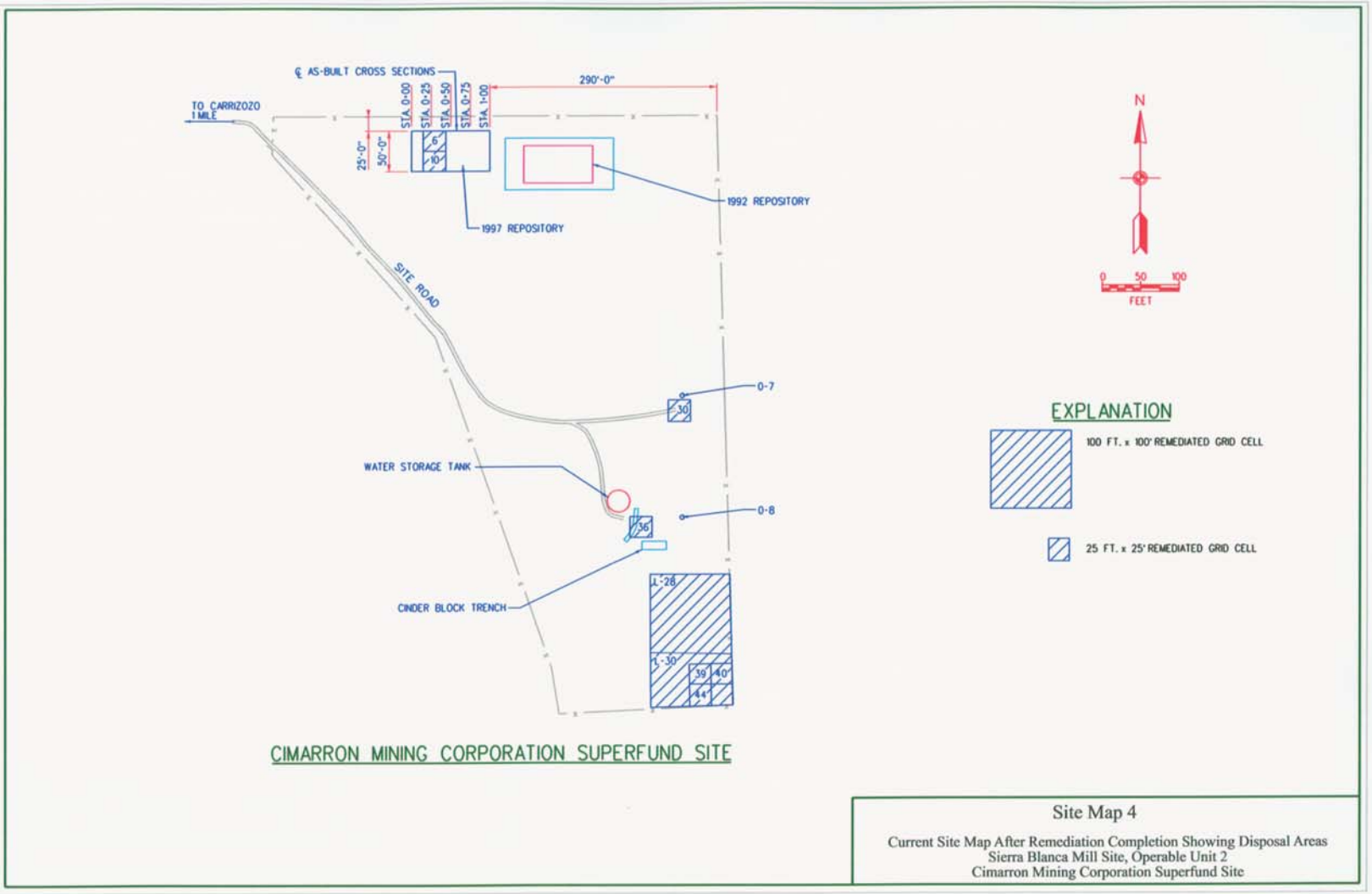
RW-7



Site Map 4

Current Site Map After Remediation Completion Showing Disposal Areas
Sierra Blanca Mill Site, Operable Unit 2
Cimarron Mining Corporation Superfund Site

ATTACHMENT 2
Site Documents Reviewed

Cimarron Mining Site Documents & Information Reviewed

"Remedial Investigation/Feasibility Study Report for RI/FS and Related Activities" at the Cimarron Mining Corporation Site, Carrizozo, New Mexico, Volume 1 of 5, June 1990.

U. S. Environmental Protection Agency "*Decision Summary Cimarron Mining Corporation Site, Operable Unit 1, Record of Decision*", Carrizozo, New Mexico, September 1990.

U. S. Environmental Protection Agency "*Decision Summary Cimarron Mining Corporation Site, Operable Unit 2, Record of Decision*", Carrizozo, New Mexico, September 1991.

U. S. Environmental Protection Agency "*Preliminary Close Out Report, Cimarron Mining Superfund Site*, Carrizozo, Lincoln County, New Mexico, September 1992.

U. S. Environmental Protection Agency "*Interim Close Out Report for Operational and Functional Determination,Cimarron Mining Superfund Site*, Carrizozo, Lincoln County, New Mexico, September 1993.

"Cimarron Mining Operable Unit 2, Sierra Blanca Unit, Cimarron Mining Corporation Superfund Site, Carrizozo, New Mexico, Contaminated Soil Remediation", Prepared by U.S. Bureau of Reclamation, Provo, Utah, Prepared for U. S. Environmental Protection Agency, Region 6, Dallas, Texas, August 1997.

"Completion Report for General Environmental Cleanup and Monitoring Well Abandonment", at Cimarron Mining Corporation Superfund Site, prepared by AVM Environmental Services, Inc., Grants, New Mexico, prepared for U. S. Army Engineer District, Albuquerque, New Mexico, May 1998.

U. S. Environmental Protection Agency, "*Ground Water Remedial Action Five-Year Review*", Cimarron Mining Corporation Superfund Site, Carrizozo, Lincoln County, New Mexico, July 1998.

"*Cimarron Abandoned Mining Site Well Refurbishment and Pump Test Report*", prepared for U. S. Environmental Protection Agency, Region 6, prepared by U. S. Army Corps of Engineers, Albuquerque District, April 5, 1999.

"*Recovery Well Yield Investigation Report*", Cimarron Mining Superfund Site, Carrizozo, New Mexico, prepared for U. S. Army Corps of Engineers, Albuquerque District, prepared by AVM Environmental Services, Inc., Grants, New Mexico, and Applied Hydrology Associates Inc., Denver, Colorado, February 22, 2000.

"*Completion Report for Pump Installation and Ground Water Sampling*", at Cimarron Mining Superfund Site, Carrizozo, New Mexico, prepared for U. S. Army Corps Engineers, Albuquerque, New Mexico, prepared by AVM Environmental Services, Inc., Grants, New Mexico, August 28, 2000.

New Mexico Environment Department, Table A-1 NMED Soil Screening Levels, "*Technical Background Document for Development of Soil Screening Levels* ", December 18, 2000.

"*Ground Water Pumping System Monitoring and Sampling Report*", Cimarron Mining Superfund Site, Carrizozo, New Mexico, prepared for U. S. Army Engineer District, Albuquerque, New Mexico, prepared by AVM Environmental Services, Inc., Grants, New Mexico, July 21, 2001.

"Operation and Maintenance and Performance Monitoring Plan for Ground Water Remediation", Cimarron Abandoned Mining Site, Carrizozo, New Mexico, prepared for U. S Army Corps of Engineers, prepared by AVM Environmental Services, Inc. and Applied Hydrology Associates, Inc., November 2001.

EPA Region 6- Human Health Medium-specific Screening Levels, February 5, 2002

"*Performance Monitoring Report for Ground Water Remediation*", Cimarron Abandoned Mining Site, Carrizozo, New Mexico, prepared for U. S. Army Corps of Engineers, prepared by AVM Environmental Services, Inc., Grants, New Mexico and Applied Hydrology Associates, Inc., Denver, Colorado, March 3, 2003.

ATTACHMENT 3
Remediation System Monitoring
&
Ground Water Sampling Results Summary

Table 1
Remediation System Monitoring Data

Sample/ Reading Date	Discharge Meter Reading(1) (Gallons)	Total Discharge (Gallons)	Average Daily Discharge (Gallons)	Average Pumping Rate (GPM)	Cumulative Ground Water Pumped (Gallons)	Average Cyanide Concentration (mg/L)	Cyanide Mass Removal (lbs.)	Cumulative CN Mass Removal (lbs.)
25-Sep-92	0							
27-Sep-92	750	750	375	0.14	750	0.190	0.002	0.002
21-Jan-93	30,000	29,250	252	0.75	30,000	0.250	0.016	0.018
27-Jan-93	31,200	1,200	200	0.75	31,200	0.190	0.012	0.030
03-Feb-93	38,760	7,560	1,080	0.75	38,760	0.260	0.014	0.044
10-Feb-93	46,320	7,560	1,080	0.75	46,320	0.170	0.014	0.057
16-Feb-93	52,800	6,480	1,080	0.50	52,800	0.164	0.006	0.063
25-Feb-93	62,520	9,720	1,080	0.50	62,520	0.100	0.004	0.068
03-Mar-93	66,840	4,320	720	1.00	66,840	0.099	0.008	0.076
10-Mar-93	71,880	5,040	720	1.00	71,880	0.105	0.009	0.085
17-Mar-93	81,960	10,080	1,440	1.00	81,960	0.083	0.007	0.092
24-Mar-93	92,040	10,080	1,440	1.00	92,040	0.070	0.006	0.098
31-Mar-93	102,120	10,080	1,440	1.00	102,120	0.092	0.008	0.105
07-Apr-93	112,200	10,080	1,440	2.00	112,200	0.150	0.004	0.109
14-Apr-93	122,280	10,080	1,440	0.65	122,280	0.227	0.007	0.116
15-Apr-93	125,160	2,880	2,880	0.33	125,160	0.251	0.010	0.126
19-Apr-93	128,904	3,744	936	0.03	128,904	0.275	0.020	0.146
29-Apr-93	133,656	4,752	475	2.00	133,656	0.163	0.031	0.177
13-Dec-93	142,440	8,784	39	2.00	142,440	0.050	0.008	0.186
21-Dec-93	165,480	23,040	2,880	2.00	165,480	0.023	0.004	0.190
28-Dec-93	185,640	20,160	2,880	2.00	185,640	0.100	0.017	0.206
04-Jan-94	205,800	20,160	2,880	2.00	205,800	0.140	0.020	0.227
11-Jan-94	225,960	20,160	2,880	2.00	225,960	0.170	0.021	0.248
19-Jan-94	243,240	17,280	2,160	1.50	243,240	0.120	0.017	0.265
26-Jan-94	258,360	15,120	2,160	1.50	258,360	0.080	0.010	0.275
02-Feb-94	278,520	20,160	2,880	2.00	278,520	0.080	0.013	0.289
09-Feb-94	298,680	20,160	2,880	2.00	298,680	0.120	0.020	0.309
18-Feb-94	324,600	25,920	2,880	2.00	324,600	0.100	0.022	0.331
04-Mar-94	364,920	40,320	2,880	2.00	364,920	0.060	0.020	0.351
16-Mar-94	399,480	34,560	2,880	2.00	399,480	0.080	0.023	0.374
23-Mar-94	419,640	20,160	2,880	2.00	419,640	0.090	0.015	0.389
28-Mar-94	430,440	10,800	2,160	1.50	430,440	0.090	0.008	0.397
06-Apr-94	444,696	14,256	1,584	1.10	444,696	0.060	0.007	0.404
13-Apr-94	455,784	11,088	1,584	1.10	455,784	0.050	0.005	0.409
20-Apr-94	466,872	11,088	1,584	1.10	466,872	0.080	0.007	0.416
26-Apr-94	476,376	9,504	1,584	1.10	476,376	0.060	0.005	0.421
03-May-94	487,464	11,088	1,584	1.10	487,464	0.090	0.008	0.429
31-May-94	568,104	80,640	2,880	2.00	568,104	0.024	0.016	0.445
09-Jun-94	594,024	25,920	2,880	2.00	594,024	0.045	0.010	0.455
15-Jun-94	609,576	15,552	2,592	1.80	609,576	0.042	0.005	0.461
21-Jun-94	619,080	9,504	1,584	1.10	619,080	0.040	0.003	0.464
06-Jul-94	642,120	23,040	1,536	1.07	642,120	0.007	0.001	0.465
13-Jul-94	652,200	10,080	1,440	1.00	652,200	0.090	0.008	0.473
20-Jul-94	662,280	10,080	1,440	1.00	662,280	0.049	0.004	0.477
27-Jul-94	672,360	10,080	1,440	1.00	672,360	0.018	0.002	0.478

Note: (1) Installed new discharge flow meter on August 8, 1998

Table 1 (Continued)
Remediation System Monitoring Data

Sample/ Reading Date	Discharge Meter Reading(1) (Gallons)	Total Discharge (Gallons)	Average Daily Discharge (Gallons)	Average Pumping Rate (GPM)	Cumulative Ground Water Pumped (Gallons)	Average Cyanide Concentration (mg/L)	Cyanide Mass Removal (lbs.)	Cumulative CN Mass Removal (lbs.)
02-Aug-94	681,864	9,504	1,584	1.10	681,864	0.140	0.011	0.489
11-Aug-94	694,824	12,960	1,440	1.00	694,824	0.090	0.010	0.499
17-Aug-94	704,000	9,176	1,529	1.06	704,000	0.030	0.002	0.501
24-Aug-94	714,800	10,800	1,543	1.07	714,800	0.040	0.004	0.505
01-Sep-94	727,800	13,000	1,625	1.13	727,800	0.050	0.005	0.510
07-Sep-94	737,100	9,300	1,550	1.08	737,100	0.140	0.011	0.521
16-Sep-94	748,400	11,300	1,256	0.87	748,400	0.190	0.018	0.539
20-Sep-94	752,200	3,800	950	0.66	752,200	0.270	0.009	0.548
28-Sep-94	760,280	8,080	1,010	0.70	760,280	0.260	0.018	0.565
05-Oct-94	766,500	6,220	889	0.62	766,500	0.230	0.012	0.577
12-Oct-94	772,800	6,300	900	0.63	772,800	0.240	0.013	0.590
19-Oct-94	779,100	6,300	900	0.63	779,100	0.170	0.009	0.599
26-Oct-94	786,000	6,900	986	0.68	786,000	0.190	0.011	0.610
02-Nov-94	792,700	6,700	957	0.66	792,700	0.200	0.011	0.621
16-Nov-94	804,200	11,500	821	0.57	804,200	0.250	0.024	0.645
30-Nov-94	811,800	7,600	543	0.38	811,800	0.150	0.010	0.654
13-Jul-95	826,616	14,816	66	0.05	826,616	0.230	0.028	0.683
19-Jul-95	846,115	19,499	3,250	2.26	846,115	0.150	0.024	0.707
28-Jul-95	868,528	22,413	2,490	1.73	868,528	0.120	0.022	0.729
03-Aug-95	882,011	13,483	2,247	1.56	882,011	0.080	0.009	0.738
09-Aug-95	895,440	13,429	2,238	1.55	895,440	0.020	0.002	0.741
16-Aug-95	910,433	14,993	2,142	1.49	910,433	0.110	0.014	0.754
30-Aug-95	937,684	27,251	1,947	1.35	937,684	0.110	0.025	0.779
20-Sep-95	955,184	17,500	833	0.58	955,184	0.150	0.022	0.801
27-Sep-95	967,104	11,920	1,703	1.18	967,104	0.080	0.008	0.809
05-Oct-95	979,024	11,920	1,490	1.03	979,024	0.040	0.004	0.813
11-Oct-95	987,727	8,703	1,451	1.01	987,727	0.140	0.010	0.823
18-Oct-95	997,667	9,940	1,420	0.99	997,667	0.150	0.012	0.836
27-Oct-95	1,008,853	11,186	1,243	0.86	1,008,853	0.150	0.014	0.850
08-Nov-95	1,025,239	16,386	1,366	0.95	1,025,239	0.140	0.019	0.869
14-Nov-95	1,032,613	7,374	1,229	0.85	1,032,613	0.140	0.009	0.878
21-Nov-95	1,041,524	8,911	1,273	0.88	1,041,524	0.130	0.010	0.887
30-Nov-95	1,052,435	10,911	1,212	0.84	1,052,435	0.010	0.001	0.888
08-Dec-95	1,060,013	7,578	947	0.66	1,060,013	0.060	0.004	0.892
19-Dec-95	1,075,902	15,889	1,444	1.00	1,075,902	0.110	0.015	0.906
27-Dec-95	1,085,543	9,641	1,205	0.84	1,085,543	0.120	0.010	0.916
03-Jan-96	1,094,311	8,768	1,253	0.87	1,094,311	0.220	0.016	0.932
09-Apr-96	1,134,018	39,707	409	0.28	1,134,018	0.160	0.053	0.985
17-Apr-96	1,148,984	14,966	1,871	1.30	1,148,984	0.080	0.010	0.995
25-Apr-96	1,152,535	3,551	444	0.31	1,152,535	0.080	0.002	0.998
14-May-96	1,163,606	11,071	583	0.40	1,163,606	0.160	0.015	1.012
07-Aug-96	1,196,910	33,304	392	0.27	1,196,910	0.150	0.042	1.054
14-Aug-96	1,212,599	15,689	2,241	1.56	1,212,599	0.140	0.018	1.072
21-Aug-96	1,225,577	12,978	1,854	1.29	1,225,577	0.140	0.015	1.087
04-Sep-96	1,247,056	21,479	1,534	1.07	1,247,056	0.140	0.025	1.112

Note: (1) Installed new discharge flow meter on August 8, 1998

Table 1 (Continued)
Remediation System Monitoring Data

Sample/ Reading Date	Discharge Meter Reading(1) (Gallons)	Total Discharge (Gallons)	Average Daily Discharge (Gallons)	Average Pumping Rate (GPM)	Cumulative Ground Water Pumped (Gallons)	Average Cyanide Concentration (mg/L)	Cyanide Mass Removal (lbs.)	Cumulative CN Mass Removal (lbs.)
10-Sep-96	1,256,322	9,266	1,544	1.07	1,256,322	0.110	0.008	1.121
18-Sep-96	1,263,731	7,409	926	0.64	1,263,731	0.060	0.004	1.125
25-Sep-96	1,270,499	6,768	967	0.67	1,270,499	0.140	0.008	1.133
30-Apr-97	1,382,700	112,201	517	0.36	1,382,700	0.140	0.131	1.264
17-Jul-97	1,382,750	50	1	0.00	1,382,750	0.010	0.000	1.264
30-Jul-97	1,382,800	50	4	0.00	1,382,800	1.440	0.001	1.264
17-Aug-97	1,391,400	8,600	478	0.33	1,391,400	0.190	0.014	1.278
01-Sep-97	1,409,200	17,800	1,187	0.82	1,409,200	0.190	0.028	1.306
24-Feb-98	1,409,300	100	1	0.00	1,409,300	1.200	0.001	1.307
07-May-98	1,421,300	12,000	167	0.12	1,421,300	0.360	0.036	1.343
07-Aug-98	1,474,100	52,800	574	0.40	1,474,100	0.230	0.101	1.444
26-Sep-98	30,260	30,260	757	0.53	1,504,360	0.230	0.058	1.502
20-Oct-98	48,329	18,069	753	0.52	1,522,429	0.230	0.035	1.537
27-Nov-98	51,600	3,271	182	0.13	1,525,700	0.230	0.006	1.543
31-Jan-99	72,576	20,976	323	0.22	1,546,676	0.230	0.040	1.583
04-Aug-00	72,820	244	16	0.01	1,546,920	0.064	0.000	1.583
09-Aug-00	73,056	236	48	0.03	1,547,156	0.069	0.000	1.584
30-Aug-00	88,909	15,853	753	0.52	1,563,009	0.060	0.008	1.592
20-Sep-00	98,132	9,223	438	0.30	1,572,232	0.060	0.005	1.596
07-Nov-00	114,891	16,759	350	0.24	1,588,991	0.060	0.008	1.605
18-Dec-00	120,880	5,989	146	0.10	1,594,980	0.089	0.004	1.609
22-Dec-00	122,956	2,076	527	0.37	1,597,056	0.111	0.002	1.611
04-Jan-01	123,001	45	3	0.00	1,597,101	0.097	0.000	1.611
20-Jan-01	141,118	18,117	1,137	0.79	1,615,218	0.085	0.013	1.624
10-Feb-01	158,047	16,929	800	0.56	1,632,147	0.094	0.013	1.637
03-Mar-01	174,530	16,483	790	0.55	1,648,630	0.096	0.013	1.650
16-Mar-01	186,218	11,688	897	0.62	1,660,318	0.095	0.009	1.660
29-Mar-01	194,448	8,230	640	0.44	1,668,548	0.101	0.007	1.667
20-Apr-01	211,216	16,768	758	0.53	1,685,316	0.094	0.013	1.680
04-May-01	222,573	11,357	810	0.56	1,696,673	0.093	0.009	1.689
23-May-01	239,014	16,441	867	0.60	1,713,114	0.081	0.011	1.700
29-May-01	244,004	4,990	825	0.57	1,718,104	0.058	0.002	1.702
15-Jun-01	256,691	12,687	744	0.52	1,730,791	0.029	0.003	1.705
29-Jun-01	266,857	10,166	727	0.50	1,740,957	0.029	0.002	1.708
18-Jul-01	274,131	7,274	386	0.27	1,748,231	0.064	0.004	1.712
03-Aug-01	284,012	9,881	615	0.43	1,758,112	0.069	0.006	1.717
24-Aug-01	294,192	10,180	274	0.34	1,768,292	0.075	0.006	1.724
07-Sep-01	301,806	7,614	91	0.38	1,775,906	0.069	0.004	1.728
21-Sep-01	309,714	7,908	94	0.39	1,783,814	0.068	0.004	1.732
05-Oct-01	316,688	6,974	88	0.35	1,790,788	0.072	0.004	1.737
30-Nov-01	345,554	28,866	243	0.36	1,819,654	0.016	0.004	1.740
18-Dec-01	356,657	11,103	96	0.43	1,830,757	0.036	0.003	1.744
TOTAL		**1,830,757**	**1,213**	**0.84**		**0.114**	**1.744**	

Note: (1) Installed new discharge flow meter on August 8, 1998

Table 2
Total Cyanide Sampling Results in Monitoring Wells

Sample Date	Total Cyanide Concentrations, mg/L													
	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-10	MW-11	MW-12	MW-14	MW-15	MW-16	MW-17	MW-18
10/01/89	0.081	4.33	0.09	0.45	0.01	0.56	1.52	(1)	(1)	(1)	(1)	(1)	(1)	(1)
09/22/93	(1)	2.8	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
09/28/94	(1)	0.93	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
09/27/95	(1)	0.74	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
05/14/96	(1)	0.82	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
08/01/98	(1)	0.07	0.04	(1)	(1)	(1)	0.44	(1)	(1)	(1)	(1)	(1)	(1)	(1)
03/01/99	(1)	0.71	0.29	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
06/28/00	(1)	0.12	0.03	0.31	(1)	<0.01	0.31	(1)	<0.01	(1)	<0.10	<0.10	<0.01	0.06
12/18/00	(1)	0.03	<0.01	(1)	<0.01	<0.01	0.24	(1)	<0.01	(1)	<0.01	<0.01	<0.01	<0.01
03/29/01	0.09	0.10	0.06	(1)	<0.01	<0.01	0.42	(1)	<0.01	(1)	<0.01	<0.01	<0.01	0.09
07/17/01	0.25	0.10	0.06	0.48	<0.01	<0.01	0.31	<0.01	<0.01	(1)	<0.01	<0.01	<0.01	0.04
11/30/01	(1)	0.03	<0.01	0.25	0.08	<0.01	0.42	(1)	<0.01	<0.01	<0.01	<0.01	(1)	<0.01
12/18/01	(1)	0.04	<0.01	0.16	<0.01	<0.01	0.23	0.02	<0.01	<0.01	<0.01	<0.01	(1)	0.02
02/17/02	(1)	0.09	<0.01	0.43	<0.01	<0.01	0.36	0.01	<0.01	<0.01	<0.01	<0.01	0.10	0.02
04/29/02	0.02	0.10	<0.01	0.28	<0.01	<0.01	0.16	<0.01	<0.01	<0.01	<0.01	<0.01	(1)	0.02
06/22/02	0.06	1.12	<0.01	0.43	<0.01	0.01	0.17	0.04	0.03	<0.01	<0.01	<0.01	(1)	0.03
08/22/02	-	1.14	-	-	-	-	0.50	-	-	-	-	-	-	-
08/23/02	0.04	0.67	0.03	0.41	<0.01	0.01	0.40	0.02	<0.01	<0.01	<0.01	<0.01	(1)	0.01
10/25/02	0.02	1.00	0.01	0.40	<0.01	<0.01	0.13	0.01	<0.01	<0.01	<0.01	<0.01	(1)	0.01
12/28/02	0.04	1.14	<0.01	0.38	<0.01	<0.01	0.55	<0.01	<0.01	<0.01	<0.01	<0.01	(1)	<0.01
02/21/03	(1)	0.88	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
03/15/03	0.04	1.12	<0.01	0.44	<0.01	<0.01	0.44	<0.01	<0.01	<0.01	<0.01	<0.01	(1)	<0.01

Note: (1) Sampling was not performed or no sampling data are available.

Table 3
Total Cyanide Sampling Results in Recovery Wells

Sample Date	Total Cyanide Concentration, mg/L					
	RW-1	RW-2	RW-3	RW-5	RW-6	RW-7
01-Aug-98	0.20	(1)	(1)	1.39	2.20	0.07
01-Jun-00	0.21	0.25	0.30	0.07	0.13	0.06
01-Dec-00	0.12	0.06	0.07	0.07	0.23	0.09
20-Jan-01	0.07	(1)	(1)	0.10	(1)	0.10
10-Feb-01	0.10	(1)	(1)	0.38	(1)	0.09
29-Mar-01	0.06	0.11	0.07	0.15	0.24	0.12
04-May-01	1.35	(1)	(1)	0.46	(1)	0.11
23-May-01	0.04	(1)	(1)	0.10	(1)	(1)
29-May-01	0.03	(1)	(1)	0.17	(1)	0.08
29-Jun-01	0.04	(1)	(1)	(1)	(1)	0.02
17-Jul-01	0.06	0.18	0.06	0.21	0.23	0.07
24-Aug-01	0.03	(1)	(1)	0.14	(1)	0.08
30-Nov-01	0.03	0.01	0.01	0.02	0.06	0.01
18-Dec-01	0.03	0.08	0.04	0.30	0.14	0.04
17-Feb-02	0.08	0.09	0.14	0.32	0.19	0.03
29-Apr-02	<0.01	0.12	0.18	0.06	0.43	0.14
22-Jun-02	0.17	0.42	0.06	0.15	0.16	0.06
22-Aug-02	0.41	0.50	0.59	0.12	0.35	0.06
24-Oct-02	0.12	0.18	0.25	0.11	0.10	0.02
27-Dec-02	0.30	0.25	0.29	0.10	0.32	0.09
15-Mar-03	0.08	0.35	0.36	0.12	0.31	0.08

Note: (1) Sampling was not performed or no sampling data are available.

Table 4
Cimarron Superfund Site Monitoring Well Water Level Measurement Results

Date	Water Level (Feet from Top of Well Casing)															
	MW-03	**MW-04**	**MW-05**	**MW-06**	**MW-07**	**MW-08**	**MW-10**	**MW-11**	**MW-12**	**MW-14**	**MW-15**	**MW-16**	**MW-18**	**RW-02**	**RW-03**	**RW-06**
TOC Elevation Feet	5473.80	5471.82	5468.60	5470.06	5470.50	5467.30	5470.56	5470.90	5464.76	5479.70	5466.86	5461.60	5471.00	5462.97	5463.20	**5462.32**
26-Oct-89	36.99	35.71	33.07	35.14	34.41	31.07	33.44	70.90	27.44	41.61	43.95	39.10	(1)	(1)	(1)	(1)
22-Sep-92	39.73	37.71	36.19	37.71	37.41	34.25	37.53	(1)	34.79	(1)	42.40	41.75	37.92	(1)	(1)	(1)
21-Jan-93	40.00	39.15	36.83	38.38	38.00	34.85	38.15	(1)	35.54	(1)	42.21	42.06	38.63	(1)	(1)	(1)
25-Feb-93	40.13	40.75	38.60	40.48	39.23	38.58	39.63	(1)	37.46	(1)	42.25	42.15	40.21	(1)	(1)	(1)
14-May-93	40.04	39.75	37.10	38.77	38.29	35.31	38.52	(1)	35.75	(1)	42.21	42.29	(1)	(1)	(1)	(1)
13-Dec-93	40.00	42.15	39.25	40.31	40.42	39.17	41.15	(1)	36.83	(1)	(1)	(1)	41.75	(1)	(1)	(1)
04-Jan-94	40.25	42.42	39.56	41.29	40.56	39.44	41.27	(1)	37.90	(1)	42.23	42.27	41.96	(1)	(1)	(1)
02-Feb-94	40.25	42.45	39.67	41.58	40.60	39.44	41.31	(1)	37.13	(1)	42.58	42.33	42.02	(1)	(1)	(1)
06-Apr-94	40.25	42.21	39.44	41.90	40.25	39.63	40.83	(1)	36.63	(1)	42.21	42.46	41.60	(1)	(1)	(1)
02-Aug-94	40.35	41.44	38.73	40.58	39.71	38.46	40.002	(1)	38.00	(1)	42.33	42.60	40.73	(1)	(1)	(1)
30-Nov-94	40.48	41.27	38.69	40.46	39.52	36.58	39.94	(1)	37.56	(1)	42.46	42.79	40.48	(1)	(1)	(1)
11-Jan-95	39.98	39.44	36.81	39.44	37.96	34.98	38.17	(1)	37.42	(1)	42.29	42.71	38.60	(1)	(1)	(1)
05-Feb-95	39.94	39.35	36.75	38.40	37.98	34.92	38.04	(1)	37.33	(1)	(1)	(1)	38.60	(1)	(1)	(1)
07-Jul-95	40.35	(1)	36.94	38.58	37.98	35.15	38.33	(1)	37.94	(1)	42.75	42.67	38.83	(1)	(1)	(1)
08-Nov-95	40.85	(1)	40.13	41.67	40.83	37.65	41.42	(1)	36.60	(1)	42.90	42.83	42.17	(1)	(1)	(1)
03-Jan-96	40.73	(1)	40.00	41.67	40.79	37.50	41.35	(1)	36.94	(1)	42.35	42.94	41.88	(1)	(1)	(1)
27-Mar-96	40.10	(1)	37.31	39.81	38.25	35.40	38.63	(1)	35.25	(1)	42.50	42.91	39.17	(1)	(1)	(1)
14-May-96	40.54	(1)	38.63	40.48	38.54	36.63	39.94	(1)	37.69	(1)	42.60	42.79	40.48	(1)	(1)	(1)
11-Jul-96	40.29	(1)	36.83	38.56	38.21	35.31	38.33	(1)	37.92	(1)	42.75	43.00	38.79	(1)	(1)	(1)
04-Sep-96	40.13	(1)	39.94	40.52	39.13	35.88	40.54	(1)	37.10	(1)	42.25	43.27	41.04	(1)	(1)	(1)
25-Sep-96	40.35	(1)	36.63	38.71	38.00	35.73	38.42	(1)	37.00	(1)	(1)	(1)	38.73	(1)	(1)	(1)
19-Aug-98	40.67	41.44	38.39	40.47	39.54	39.05	40.04	50.26	39.57	44.76	42.89	43.38	41.00	(1)	(1)	(1)
12-Nov-99	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	31.38	31.50	32.03
27-Jun-00	(1)	41.44	38.78	43.90	38.78	36.85	42.20	(1)	36.79	(1)	43.25	43.45	(1)	32.75	32.89	31.88
18-Dec-00	(1)	41.76	38.98	43.90	(1)	37.37	40.38	(1)	37.18	(1)	43.04	43.62	(1)	33.08	33.18	32.29
05-Jan-01	(1)	41.68	38.90	41.17	39.97	37.22	40.31	58.01	36.33	(1)	42.98	(1)	40.85	(1)	(1)	(1)
20-Jan-01	(1)	42.73	39.80	41.45	40.80	40.15	41.36	57.50	36.98	(1)	42.91	(1)	42.15	(1)	(1)	(1)
10-Feb-01	(1)	42.75	39.85	41.73	40.80	40.25	41.37	56.79	37.38	(1)	42.70	(1)	42.19	(1)	(1)	(1)
16-Mar-01	(1)	42.74	39.36	41.91	40.78	40.27	41.32	55.72	37.77	(1)	42.69	(1)	42.35	(1)	(1)	(1)

Table 4 (Continued)
Cimarron Superfund Site Monitoring Well Water Level Measurement Results

Date	Water Level (Feet from Top of Well Casing)															
	MW-03	**MW-04**	**MW-05**	**MW-06**	**MW-07**	**MW-08**	**MW-10**	**MW-11**	**MW-12**	**MW-14**	**MW-15**	**MW-16**	**MW-18**	**RW-02**	**RW-03**	**RW-06**
TOC Elevation Feet	5473.80	5471.82	5468.60	5470.06	5470.50	5467.30	5470.56	5470.90	5464.76	5479.70	5466.86	5461.60	5471.00	5462.97	5463.20	**5462.32**
29-Mar-01	41.49	42.71	39.63	41.93	40.67	40.24	41.32	55.45	37.93	(1)	42.70	43.30	42.32	33.86	34.09	34.03
04-May-01	41.57	42.63	39.68	41.96	40.66	40.11	41.24	54.88	37.32	(1)	42.79	43.30	41.98	33.90	34.30	33.86
29-May-01	41.61	42.70	39.78	41.96	40.72	40.23	41.31	54.48	37.63	(1)	42.90	43.34	42.12	33.92	34.10	33.96
15-Jun-01	41.73	42.73	39.77	42.01	40.77	40.30	41.34	54.31	37.89	(1)	43.11	43.42	42.14	(1)	(1)	(1)
29-Jun-01	41.75	42.65	39.76	41.92	40.69	40.33	41.33	54.00	37.96	(1)	43.15	43.40	42.11	(1)	(1)	(1)
17-Jul-01	41.79	42.49	39.80	41.84	40.67	38.09	41.13	54.00	37.89	(1)	43.48	43.59	41.55	33.80	33.92	33.05
24-Aug-01	41.73	42.76	39.78	44.17	40.80	40.45	41.35	53.38	38.55	(1)	43.63	42.81	42.15	(1)	(1)	(1)
21-Sep-01	41.78	42.74	39.76	43.15	40.80	40.47	41.34	53.14	38.85	(1)	43.70	43.73	42.08	(1)	(1)	(1)
30-Nov-01	42.07	43.13	40.05	43.02	41.11	40.97	41.61	54.24	39.71	45.48	43.89	44.18	42.21	34.01	34.22	34.10
18-Dec-01	42.12	43.14	40.04	43.57	41.11	40.99	41.63	53.69	39.71	45.27	43.71	44.10	42.20	34.00	34.18	34.10
19-Dec-01	42.13	43.15	39.98	43.50	41.10	40.53	41.50	54.03	39.80	45.55	43.72	44.11	42.16	33.92	34.14	34.00
19-Dec-01	42.13	43.27	39.92	43.40	40.95	39.95	41.55	53.92	39.95	45.51	43.75	44.08	42.17	33.91	34.69	34.05
27-Dec-01	41.93	42.69	39.62	43.62	40.71	38.80	41.12	57.69	39.56	45.55	43.65	44.18	41.39	(1)	(1)	(1)
12-Jan-02	41.88	42.21	39.20	42.82	40.39	38.04	40.66	56.33	39.20	45.57	43.51	44.01	40.89	(1)	(1)	(1)
17-Feb-02	41.90	41.90	39.21	41.25	40.14	37.60	40.38	54.79	38.84	45.61	43.29	43.99	40.74	33.84	33.95	33.05
24-Mar-02	41.89	42.15	39.20	41.05	40.30	37.75	40.60	54.65	38.75	45.70	43.30	43.90	40.50	33.60	33.50	32.50
29-Apr-02	41.90	42.11	39.18	40.85	40.35	37.70	40.56	54.52	38.61	45.77	43.30	43.85	39.85	33.05	33.20	32.20
4-Jun-02	42.56	40.34	39.54	41.31	40.40	38.04	40.80	54.74	38.80	45.98	(1)	(1)	41.47	33.26	33.39	32.45
21-Jun-02	42.58	37.38	39.15	41.24	40.58	38.01	40.81	54.04	39.77	45.94	43.95	44.05	41.39	33.33	33.44	32.48
24-Jul-02	42.44	37.46	38.89	41.26	40.18	37.87	40.45	57.96	38.59	45.99	44.10	43.89	41.33	32.70	32.97	32.24
22-Aug-02	41.62	37.15	38.32	40.11	39.45	36.94	39.65	54.00	38.80	45.44	43.84	44.13	40.41	32.15	32.25	31.30
27-Sep-02	41.89	37.62	38.92	40.44	39.97	37.32	40.20	54.78	38.60	45.45	43.88	44.09	40.38	32.41	32.82	31.81
24-Oct-02	42.11	38.65	39.27	40.75	40.30	37.60	40.56	54.15	38.63	45.46	43.91	44.11	40.39	33.08	33.18	32.17
29-Nov-02	42.43	42.01	39.45	41.18	40.51	37.83	40.76	55.39	38.74	45.67	43.80	44.25	41.33	33.27	33.38	32.37
27-Dec-02	42.31	41.79	38.99	40.98	40.14	37.52	40.37	54.31	38.68	45.55	43.67	44.18	41.04	32.82	32.94	31.99
24-Jan-03	41.90	41.98	39.10	41.02	40.20	37.56	40.48	55.96	38.69	45.58	43.37	44.14	41.05	32.88	33.00	31.83
21-Feb-03	42.59	42.02	39.14	40.99	40.26	37.60	40.52	54.63	38.66	45.57	43.27	44.10	41.04	32.98	33.09	32.12
14-Mar-03	42.00	42.12	39.23	40.95	40.35	37.65	40.60	54.16	38.69	45.69	43.21	44.12	41.05	33.07	33.17	32.20

Note: (1) Water level data not available

Cimarron Mining Corporation
Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program. N/A means "not applicable."

I. SITE INFORMATION	
Site Name: Cimarron Mining Corporation Superfund Site Operable Unit 1	**EPA ID: NMD980749378**
City/State: Carrizozo, NM	**Date of Inspection:** 21 May 2003
Agency Completing 5 Year Review: EPA Reg. IX	**Weather/temperature:** Sunny, 80° F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☐ Access controls ☐ Institutional controls ☒ Groundwater pump and treatment ☐ Surface water collection and treatment ☐ Other: DNAPL recovery	
Attachments: ☐ Inspection team roster attached	☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager: USACE
   Name: Brian Jordan
   Title: Chemist
   Date: 21 May 2003
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

2. O&M staff: AVM Environmental
   Name: Natver Patel
   Title: Senior Scientist
   Date: 21 May 2003
   Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

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: City Hall
Contact:
Name: LeAnne Weihbrecht
Title: City Clerk
Date: 21 May 2003
Phone Number: 505-648-2371
Problems, suggestions: None ☐ Additional report attached (if additional space required).

Agency: City Hall
Contact:
Name: Wes Lindsay
Title: City Trustee
Date: 21 May 2003
Phone Number: 505-648-2371
Problems, suggestions: None ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

4. Other interviews (optional) ☐ N/A ☐ Additional report attached (if additional space required).

Tim Means, Current Site Resident
Discussed Dismantling the Remedy: Concrete vaults will be removed; subset of monitoring wells to be left for monitoring.
Discussed deed restriction for shallow aquifer.
Discussed future land use and the placement of a future fruit orchard

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M Manuals	☒ Readily available	☒ Up to date	☐ N/A
☒ As-Built Drawings	☒ Readily available	☒ Up to date	☐ N/A
☐ Maintenance Logs	☐ Readily available	☐ Up to date	x N/A

Remarks:

2. Health and Safety Plan Documents

☒ 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:

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

Remarks:

4. Permits and Service Agreements

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒N/A

Remarks: No Permits required at the time of the inspection as the system is currently in a performance assessment

5. **Gas Generation Records** ☐ Readily available ☐Up to date ☒N/A
Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒N/A
Remarks: There are no onsite settlement monuments.

7. **Groundwater Monitoring Records** ☒ Readily available ☒Up to date ☐ N/A
Remarks:

8. **Leachate Extraction Records** ☐Readily available ☐ Up to date ☒N/A
Remarks:

9. **Discharge Compliance Records** ☐ Readily available ☐ Up to date ☐N/A
Remarks:

10. **Daily Access/Security Logs** ☐ Readily available ☐Up to date ☒N/A
Remarks:

IV. O&M Costs ☒ Applicable ☐ N/A

1. O&M Organization
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☐ Contractor for PRP
   ☐ Other:

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

Total annual cost by year for review period if available

From (Date): 10/1997	To (Date): 9/1998	Total cost:	72,500	☐ Breakdown attached
From (Date): 10/1998	To (Date): 9/1999	Total cost:	59,600	☐ Breakdown attached
From (Date): 10/1999	To (Date): 9/2000	Total cost:	31,800	☐ Breakdown attached
From (Date): 10/2000	To (Date): 9/2001	Total cost:	86,600	☐ Breakdown attached
From (Date): 10/2001	To (Date): 9/2002	Total cost:	89,000	☐ Breakdown attached

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

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

1. Fencing

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

2. **Other Access Restrictions:** Site is currently occupied

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

3. Institutional Controls

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):
Frequency:
Responsible party/agency:
Contact:
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: ☐ Additional report attached (if additional space required).

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

4. General

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

2. Land use changes onsite ☐ N/A
Remarks: Current Site resident lives on site and operates a automotive repair business

3. Land use changes offsite ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

1. Roads ☐ Applicable ☒ N/A

1. Roads damaged ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks:

2. Other Site Conditions

Remarks:

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

1. Landfill Surface
1. Settlement (Low spots) ☐ Location shown on site map ☐ Settlement not evident Areal extent: Depth: Remarks:
2. Cracks ☐ Location shown on site map ☐ Cracking not evident Lengths: Widths: Depths: Remarks:
3. Erosion ☐ Location shown on site map ☐ Erosion not evident Areal extent: Depth: Remarks:
4. Holes ☐ Location shown on site map ☐ Holes not evident Areal extent: Depth: Remarks:
5. Vegetative Cover ☐ Cover properly established ☐ No signs of stress ☐ Grass ☐ Trees/Shrubs Remarks:
6. Alternative Cover (armored rock, concrete, etc.) ☐ N/A Remarks:
7. Bulges ☐ Location shown on site map ☐ Bulges not evident Areal extent: Height: Remarks:
8. Wet Areas/Water Damage ☐ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent: ☐ Ponding ☐ Location shown on site map Areal extent: ☐ Seeps ☐ Location shown on site map Areal extent: ☐ Soft subgrade ☐ Location shown on site map Areal extent: Remarks: .
9. Slope Instability ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability

	Areal extent: Remarks:		
2.	Benches (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.)		☐ Applicable ☐ N/A
1.	Flows Bypass Bench Remarks:	☐ Location shown on site map	☐ N/A or okay
2.	Bench Breached Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Bench Overtopped Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Letdown Channels (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.)		☐ Applicable ☐ N/A
1.	Settlement Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of settlement
2.	Material Degradation Material type: Remarks:	☐ Location shown on site map Areal extent:	☐ No evidence of degradation
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of erosion
4.	Undercutting Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ No evidence of undercutting
5.	Obstructions Type: Areal extent: Height: Remarks:	☐ Location shown on site map	☐ N/A

6. Excessive Vegetative Growth ☐ No evidence of excessive growth
☐ Evidence of excessive growth ☐ Vegetation in channels but does not obstruct flow
☐ Location shown on site map Areal extent:
Remarks:

4. Cover Penetrations ☐ Applicable ☐ N/A

1. Gas Vents ☐ N/A
☐ Active ☐ Passive ☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O& M
Remarks:

2. Gas Monitoring Probes ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

3. Monitoring Wells (within surface area of landfill) ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

4. Leachate Extraction Wells ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks: There are no settlement monuments onsite.

5. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. Gas Treatment Facilities ☐ N/A
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O& M
Remarks:

2. Gas Collection Wells, Manifolds and Piping ☐ N/A

☐ Good condition ☐ Needs O& M
Remarks:

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

6. Cover Drainage Layer ☐ Applicable ☐ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A
Remarks:

2. Outlet Rock Inspected ☐ Functioning ☐ N/A
Remarks:

7. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. Siltation ☐ Siltation evident ☐ N/A
Areal extent: Depth:
Remarks:

2. Erosion ☐ Erosion evident ☐ N/A
Areal extent: Depth:
Remarks:

3. Outlet Works ☐ Functioning ☐ N/A
Remarks:

4. Dam ☐ Functioning ☐ N/A
Remarks:

8. 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:

1.	Perimeter Ditches/Off-site discharge	☐ Applicable	☐ N/A
1.	Siltation Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ Siltation not evident
2.	Vegetative Growth Areal extent: Remarks:	☐ Location shown on site map Type:	☐ Vegetation does not impede flow
3.	Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ Erosion not evident
4.	Discharge Structure ☐ Functioning ☐ Good Condition Remarks:	☐ Location shown on site map	☐ N/A
	VIII. VERTICAL BARRIER WALLS	☐ Applicable	☒ N/A
1.	Settlement Areal extent: Remarks:	☐ Location shown on site map Depth:	☐ Settlement not evident
2.	Performance Monitoring ☐ Performance not monitored ☐ Performance monitored ☐ Evidence of breaching Remarks:	Frequency: Head differential:	☐ N/A
	IX. GROUNDWATER/SURFACE WATER REMEDIES	☒ Applicable	☐ N/A
1.	Groundwater Extraction Wells, Pumps, and Pipelines	☒ Applicable	☐ N/A
1.	Pumps, Wellhead Plumbing, and Electrical ☒ All required wells located ☒ Good condition ☐ Needs O& M Remarks:		☐ N/A
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances		☐ N/A

☒ System located ☒ Good condition ☐ Needs O& M
Remarks:

3. Spare Parts and Equipment ☐ N/A
☒ Readily available ☒ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:

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

1. Collection Structures, Pumps, and Electrical ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

3. Spare Parts and Equipment ☐ N/A
☐ Readily available ☐ Good condition
☐ Requires Upgrade ☐ Needs to be provided
Remarks:

3. Treatment System ☒ Applicable ☐ N/A

1. Treatment Train (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers ☐ Filters (list type):
☐ Additive (list type, e.g., chelation agent, flocculent)
☒ Others (list): Effluent sent to City POTW
☒ Good condition ☐ Needs O&M
☒ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☒ Quantity of groundwater treated annually (list volume): approximately 210,000 gallons
☐ Quantity of surface water treated annually (list volume):
Remarks:

2. Electrical Enclosures and Panels (properly rated and functional) ☐ N/A
☒ Good condition ☐ Needs O& M
Remarks:

3. Tanks, Vaults, Storage Vessels ☐ N/A
☒ Good condition ☐ Proper secondary containment ☐ Needs O&M
Remarks:

4. Discharge Structure and Appurtenances ☐ N/A
☒ Good condition ☐ Needs O& M
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) ☐ N/A
☒ All required wells located ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled
☒ Good condition ☐ Needs O&M
Remarks:

4. Monitored Natural Attenuation ☐ Applicable ☒N/A

1. Monitoring Wells (natural attenuation remedy) ☐ N/A
☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☐ Needs O&M
Remarks:

X. OTHER REMEDIES ☐ Applicable ☒ N/A

XI. OVERALL OBSERVATIONS

1. Implementation of the Remedy

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

slow and inefficient.

2. Adequacy of O&M

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

3. Early Indicators of Potential Remedy Failure

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.

4. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

Cimarron Mining Corporation
Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program. N/A means "not applicable."

I. SITE INFORMATION	
Site Name: Cimarron Mining Corporation Superfund Site Operable Unit 2	**EPA ID: NMD980749378**
City/State: Carrizozo, NM	**Date of Inspection:** 21 May 2003
Agency Completing 5 Year Review: EPA Reg. IX	**Weather/temperature:** Sunny, 80° F
Remedy Includes: (Check all that apply) ☒ Landfill cover/containment ☐ Access controls ☐ Institutional controls ☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☐ Other: DNAPL recovery	
Attachments: ☐ Inspection team roster attached	☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. O&M site manager: New Mexico Environment Department
   Name: Carl Albury
   Title: Project manager
   Date: 21 May 2003
   Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

2. O&M staff:
   Name:
   Title:
   Date:
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone Number:
   Problems, suggestions: ☐ Additional report attached (if additional space required).

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: City Hall
Contact:
Name: LeAnne Weihbrecht
Title: City Clerk
Date: 21 May 2003
Phone Number: 505-648-2371
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency: City Hall
Contact:
Name: Wes Lindsay
Title: City Trustee
Date: 21 May 2003
Phone Number: 505-648-2371
Problems, suggestions: Discussed the access controls of the property, site information repository, potential use of Brownfields Program ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

Agency:
Contact:
Name:
Title:
Date:
Phone Number:
Problems, suggestions: ☐ Additional report attached (if additional space required).

4. Other interviews (optional) ☒ N/A ☐ Additional report attached (if additional space required).

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. O&M Documents			
☐ O&M Manuals	☐ Readily available	☐ Up to date	☒ N/A
☐ As-Built Drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance Logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
2. Health and Safety Plan Documents			
☐ 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:			
3. O&M and OSHA Training Records	☐ Readily available	☒ Up to date	☒ N/A
Remarks:			
4. Permits and Service Agreements			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
Remarks: No Permits required at the time of the inspection as the system is currently in a performance assessment			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks: There are no onsite settlement monuments.			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
9. **Discharge Compliance Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks:			
IV. O&M Costs		☒ Applicable	☐ N/A

1. O&M Organization
☒ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Other:

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

Total annual cost by year for review period if available

From (Date): 10/1997	To (Date): 9/1998	Total cost:	72,500	☐ Breakdown attached
From (Date): 10/1998	To (Date): 9/1999	Total cost:	59,600	☐ Breakdown attached
From (Date): 10/1999	To (Date): 9/2000	Total cost:	31,800	☐ Breakdown attached
From (Date): 10/2000	To (Date): 9/2001	Total cost:	86,600	☐ Breakdown attached
From (Date): 10/2001	To (Date): 9/2002	Total cost:	89,000	☐ Breakdown attached

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

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

1. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks: Site is currently not controlled for access

2. Other Access Restrictions:

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

3. Institutional Controls

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):			
Frequency:			
Responsible party/agency:			
Contact:			
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:	☐ Additional report attached (if additional space required).		

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

4. General

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

2. Land use changes onsite ☒ N/A
Remarks:

3. Land use changes offsite ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

1. Roads ☐ Applicable ☒ N/A

1. Roads damaged ☐ Location shown on site map ☐ Roads adequate

☐ N/A

Remarks:

2. Other Site Conditions

Remarks:

VII. LANDFILL COVERS ☒ Applicable N/A

1. Landfill Surface		
1. Settlement (Low spots) Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ Settlement not evident
2. Cracks Lengths: Remarks:	☐ Location shown on site map Widths:	☒ Cracking not evident Depths:
3. Erosion Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ Erosion not evident
4. Holes Areal extent: Remarks:	☐ Location shown on site map Depth:	☒ Holes not evident
5. Vegetative Cover ☒ Cover properly established Remarks:	☐ No signs of stress	☐ Grass ☐ Trees/Shrubs
6. Alternative Cover (armored rock, concrete, etc.) Remarks:		☒ N/A
7. Bulges Areal extent: Remarks:	☐ Location shown on site map Height:	☒ Bulges not evident
8. Wet Areas/Water Damage ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks: .	☐ Location shown on site map Areal extent: ☐ Location shown on site map Areal extent: ☐ Location shown on site map Areal extent: ☐ Location shown on site map Areal extent:	☒ Wet areas/water damage not evident
9. Slope Instability Areal extent:	☐ Slides	☐ Location shown on site map ☒ No evidence of slope instability

	Remarks:		
2.	Benches (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.)	☐ Applicable	☒ N/A
1.	Flows Bypass Bench Remarks:	☐ Location shown on site map	☐ N/A or okay
2.	Bench Breached Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Bench Overtopped Remarks:	☐ Location shown on site map	☐ N/A or okay
3.	Letdown Channels (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.)	☐ Applicable	☒ N/A
1.	Settlement Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ No evidence of settlement
2.	Material Degradation Material type: Areal extent: Remarks:	☐ Location shown on site map	☐ No evidence of degradation
3.	Erosion Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ No evidence of erosion
4.	Undercutting	☐ Location shown on site map	☐ No evidence of undercutting

Areal extent: Depth:
Remarks:

5. Obstructions ☐ Location shown on site map ☐ N/A
Type:
Areal extent: Height:
Remarks:

6. Excessive Vegetative Growth ☐ No evidence of excessive growth
☐ Evidence of excessive growth ☐ Vegetation in channels but does not obstruct flow
☐ Location shown on site map Areal extent:
Remarks:

4. Cover Penetrations ☐ Applicable ☐ N/A

1. Gas Vents ☐ N/A
☐ Active ☐ Passive ☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O& M
Remarks:

2. Gas Monitoring Probes ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

3. Monitoring Wells (within surface area of landfill) ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

4. Leachate Extraction Wells ☐ N/A
☐ Routinely sampled
☐ Properly secured/locked ☐ Functioning ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M
Remarks:

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks: There are no settlement monuments onsite.

5. Gas Collection and Treatment	☐ Applicable	☒ N/A
1. Gas Treatment Facilities ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
2. Gas Collection Wells, Manifolds and Piping ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
6. Cover Drainage Layer	☐ Applicable	☒ N/A
1. Outlet Pipes Inspected ☐ Functioning Remarks:		☐ N/A
2. Outlet Rock Inspected ☐ Functioning Remarks:		☐ N/A
7. Detention/Sedimentation Ponds	☐ Applicable	☒ N/A
1. Siltation ☐ Siltation evident Areal extent: Depth: Remarks:		☐ N/A
2. Erosion ☐ Erosion evident Areal extent: Depth: Remarks:		☐ N/A
3. Outlet Works ☐ Functioning Remarks:		☐ N/A
4. Dam ☐ Functioning Remarks:		☐ N/A
8. Retaining Walls	☐ Applicable	☒ N/A

1. Deformations Horizontal displacement: Vertical displacement: Remarks:	☐ Location shown on site map	☐ Deformation not evident Rotational displacement:
2. Degradation Remarks:	☐ Location shown on site map	☐ Degradation not evident
1. Perimeter Ditches/Off-site discharge		☐ Applicable ☒ N/A
1. Siltation Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ Siltation not evident
2. Vegetative Growth Areal extent: Type: Remarks:	☐ Location shown on site map	☐ Vegetation does not impede flow
3. Erosion Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ Erosion not evident
4. Discharge Structure ☐ Functioning ☐ Good Condition Remarks:	☐ Location shown on site map	☐ N/A
VIII. VERTICAL BARRIER WALLS		☐ Applicable ☒ N/A
1. Settlement Areal extent: Depth: Remarks:	☐ Location shown on site map	☐ Settlement not evident
2. Performance Monitoring ☐ Performance not monitored ☐ Performance monitored Frequency: ☐ Evidence of breaching Head differential: Remarks:		☐ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES	☐ Applicable	☒ N/A
1. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☐ N/A
1. Pumps, Wellhead Plumbing, and Electrical ☐ All required wells located ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ System located ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
3. Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires Upgrade ☐ Needs to be provided Remarks:		☐ N/A
2. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☒ N/A
1. Collection Structures, Pumps, and Electrical ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs O& M Remarks:		☐ N/A
3. Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires Upgrade ☐ Needs to be provided Remarks:		☐ N/A
3. Treatment System	☒ Applicable	☐ N/A
1. Treatment Train (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters (list type): ☐ Additive (list type, e.g., chelation agent, flocculent) ☐ Others (list): ☐ Good condition ☐ Needs O&M ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified		

☐ Quantity of groundwater treated annually (list volume):
☐ Quantity of surface water treated annually (list volume):
Remarks:

2. Electrical Enclosures and Panels (properly rated and functional) ☐ N/A
☐ Good condition ☐ Needs O& M
Remarks:

3. Tanks, Vaults, Storage Vessels ☐ N/A
☐ Good condition ☐ Proper secondary containment ☐ Needs O&M
Remarks:

4. Discharge Structure and Appurtenances ☐ N/A
☐ Good condition ☐ Needs O& M
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) ☐ N/A
☐ All required wells located ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☐ Good condition ☐ Needs O&M
Remarks:

4. Monitored Natural Attenuation ☐ Applicable ☒N/A

1. Monitoring Wells (natural attenuation remedy)

☐ N/A

☒ All required wells located ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled
☒ Good condition ☐ Needs O&M
Remarks:OU-2 has been delisted from the NPL.

X. OTHER REMEDIES ☐ Applicable ☒ N/A

XI. OVERALL OBSERVATIONS

1. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.) The remedy is functioning in relation to the containment of the site cyanide plume. Cyanide removal is slow and inefficient. OU-2 has been delisted from the NPL. The landfill and cover are functioning as designed.

2. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. The current O&M procedures are adequate for the remedy. None identified

3. Early Indicators of Potential Remedy Failure

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.

4. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None