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Five-Year Review Report

Fifth Five-Year Review Report
for
Uravan Uranium Project (Union Carbide)
EPA ID COD007063274

Uravan
Montrose County, Colorado

September 2015

Prepared By:
United States Environmental Protection Agency
Region 8
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List of Acronyms

^{226}Ra	radium-226
ACL	Alternate Concentration Level
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BLM	Bureau of Land Management
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
cm	centimeter
COC	Contaminant of Concern
CRP	Club Ranch Evaporation Pond
DOE	Department of Energy
EPA	U.S. Environmental Protection Agency
FYR	Five-Year Review
IC	Institutional Control
mg/L	milligram per liter
NCP	National Contingency Plan
NPL	National Priorities List
NRC	United States Nuclear Regulatory Commission
O&M	Operation and Maintenance
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To-Be-Considered
UCC	Union Carbide Corporation
UMTRCA	Uranium Mill Tailings Radiation Control Act
USV	U.S. Vanadium Corporation

Executive Summary

The Uravan Uranium Project (Union Carbide Corp.) site (Site) is located in Montrose County, Colorado. It covers about 680 acres. A radium-recovery plant began operating on Site in 1912. From the 1930s until 1984, the plant was a uranium and vanadium processing facility. Operations at the Site left behind a large volume of wastes that contaminated air, soil and groundwater near the plant and the San Miguel River. Solid wastes totaled over 10 million cubic yards and contained radioactive elements, metals and inorganic compounds. Liquid wastes from seepage collection and groundwater extraction systems totaled over 350 million gallons at the end of 2004.

Contaminants included radioactive products, including raffinates (liquid wastes from the uranium processing operations), raffinate crystals (primarily ammonium sulfate compounds), and mill tailings containing uranium and radium. Other chemicals in the tailings and groundwater included heavy metals (lead, arsenic, cadmium and vanadium), thorium and residual salts. The U.S. Environmental Protection Agency (EPA) listed the Site on the National Priorities List (NPL) in 1986. The majority of the work at this Site was conducted as a State-lead Site under a Consent Decree/Remedial Action Plan (RAP) (Civil Action No. 83-C-2384) between the State of Colorado, Union Carbide Corporation and Umetco Minerals Corporation (Umetco), lodged in February 1987. EPA was not a party to the Consent Decree. Cleanup remedies from the 1987 RAP, as amended, included:

- Capping and revegetating nearly 10 million cubic yards of radioactive tailings.
- Disposing of 530,000 cubic yards of radioactive raffinate crystals on Site.
- Eliminating process ponds.
- Pumping and treating contaminated groundwater.
- Securing 12 million yards of tailings waste along the San Miguel River.
- Dismantling the two mills and placing all old building demolition materials in a secure area.
- Excavating and disposing of contaminated soil in a secure location and replanting excavated areas.
- Dismantling and cleaning up the town of Uravan.

The wastes are contained on Site, releases to the San Miguel River are under control, and there is no longer any residential exposure to radiation from raffinates, raffinate crystals and mill tailings containing uranium, thorium and radium. On February 18, 2005, EPA did a partial deletion of 9.84 acres of the Site that previously contained two historic structures – the Boarding House and the Community Center – from the NPL. On September 4, 2007, EPA did a partial deletion of a 7-acre portion of the Site along Colorado Highway 141. The triggering action for this five-year review (FYR) is the signing of the previous FYR on September 28, 2010.

The remedy at the Site currently protects human health and the environment. Contaminated materials have been excavated from areas of the Site and placed in capped landfills on Site and

contaminated groundwater has been pumped and treated to protect the river. For the remedy to be protective over the long term, the following actions need to be taken:

- Finalize the Site remedy in a Record of Decision (ROD) and implement the institutional controls consistent with the ROD.
- Determine extent of coal ash contamination and determine if remediation is necessary.
- Determine if settlement at the B-Plant Repository is affecting the cap.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Uravan Uranium Project (Union Carbide)		
EPA ID: COD007063274		
Region: 8	**State:** CO	**City/County:** Uravan/Montrose

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" selected above, enter Agency name:** Click here to enter text.
Author name: Frances Costanzi and Johnny Zimmerman-Ward
Author affiliation: EPA Region 8 and Skeo Solutions
Review period: April 23, 2015 – September 28, 2015
Date of site inspection: May 14, 2015
Type of review: Statutory
Review number: 5
Triggering action date: September 28, 2010
Due date *(five years after triggering action date)*: September 28, 2015

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): Sitewide	Issue Category: Remedy Performance			
	Issue: No ROD is yet in place and no institutional controls are in place restricting land and groundwater use.			
	Recommendation: Finalize the site remedy in a ROD and implement institutional controls consistent with the ROD.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	09/30/2017

OU(s): Sitewide	Issue Category: Changed Site Conditions			
	Issue: Coal ash, a non-licensed material, contamination was found when Umetco built a bridge across the San Miguel River at Montrose County Road EE-22.			
	Recommendation: Determine extent of coal ash contamination and determine if remediation is necessary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	09/30/2016

OU(s): Sitewide	Issue Category: Remedy Performance			
	Issue: There has been a slight, steady increase in settlement since 2008 at the three surface settlement monuments installed on the completed top surface of the B-Plant Repository.			
	Recommendation: Determine if settlement at the B-Plant Repository is affecting the cap.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	09/30/2016

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at the Site currently protects human health and the environment. Contaminated materials have been excavated from areas of the Site and placed in capped landfills on Site and contaminated groundwater has been pumped and treated to protect the river. For the remedy to be protective over the long term, the following actions need to be taken: • Finalize the Site remedy in a ROD and implement the institutional controls consistent with the ROD. • Determine extent of coal ash contamination and determine if remediation is necessary. • Determine if settlement at the B-Plant Repository is affecting the cap.	

Fifth Five-Year Review Report
for
Uravan Uranium Project (Union Carbide) Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 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 5 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.

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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.

Skeo Solutions, an EPA Region 8 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Uravan Uranium Project (Union Carbide) Superfund site (the Site) in Uravan, Montrose County, Colorado. EPA's contractor conducted this FYR from April 23, 2015 to September 2015. The Colorado Department of Public Health and Environment (CDPHE) is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. CDPHE, as the agency representing the State of Colorado, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fifth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at

the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit, which is addressed in this FYR.

2.0 Site Chronology

Table 1 lists important events at the Site.

Table 1: Chronology of Site Events

Event	Date
Standard Chemical Company built radium-recovery plant	1912
Town of Uravan established	1936
Initial discovery of contamination	April 1, 1980
Operations ceased at the Site	1984
All Uravan residents relocated	1986
EPA and Colorado Memorandum of Agreement signed	April 2, 1986
National Priorities List (NPL) listing	June 10, 1986
Consent decree signed	December 19, 1986
Remedial design started	January 30, 1987
Consent decree and Remedial Action Plan (RAP) lodged by U.S. District Court and State of Colorado	February 12, 1987
Remedial action started	May 1, 1987
First FYR signed	September 4, 1994
Soil Cleanup Program Methodology Report finalized	June 1999
Remedial design completed	June 1, 1999
Second FYR signed	March 20, 2000
RAP amended	2001
Application for Alternate Concentration Limits	July 2003
RAP amended	2005
Partial NPL deletion (area of former Boarding House and Community Center) finalized	February 18, 2005
Third FYR signed	September 28, 2005
Partial NPL deletion (part of the Site along Colorado Highway 141) finalized	September 4, 2007
Alternate Soil Standard Application submitted	September 2007
Remedial action completed, close-out and construction complete	September 29, 2008
Fourth FYR signed	September 28, 2010
U.S. Nuclear Regulatory Commission (NRC) approved Alternate Soil Standard Application	May 18, 2012
Radioactive Materials License Amendment (Colorado License No. 660-02, Amendment No. 13)	January 22, 2013

3.0 Background

3.1 Physical Characteristics

The approximately 680-acre Site is located in the western portion of Montrose County, Colorado, along Colorado Highway 141. The Site is about 13 miles northwest of the town of Nucla, Colorado; 81 miles south of the town of Whitewater, Colorado, in Mesa County; and 50 miles southwest of Grand Junction, Colorado (Figure 1). The area around the Site is rural with

very few residences nearby. The offices of the PRP, Umetco Minerals Corporation (Umetco), are the only remaining buildings on Site. Site habitat is characterized by an arid climate, sparse vegetation and rugged topography. The Site's topographic features are dominated by broad mesas and incised canyons. The Site is within the incised San Miguel River Valley and on the Club Mesa. The Site contained over 10 million cubic yards of byproduct wastes, including radioactive elements, metals and inorganic compounds. From 1987 until 2004, over 350 million gallons of liquid waste were collected from seepage collection and groundwater extraction systems.

The majority of the work at this Site was conducted as a State-lead Site under a Consent Decree/Remedial Action Plan (CD/RAP) (Civil Action No. 83-C-2384) between the State of Colorado, Union Carbide Corporation and Umetco Minerals Corporation (Umetco), lodged in February 1987. EPA was not a party to the Consent Decree. The 1987 RAP, as amended, defined nine areas for solids remediation (Figure 2 shows the current Site area. Figure 3 shows the Site layout in 1987):

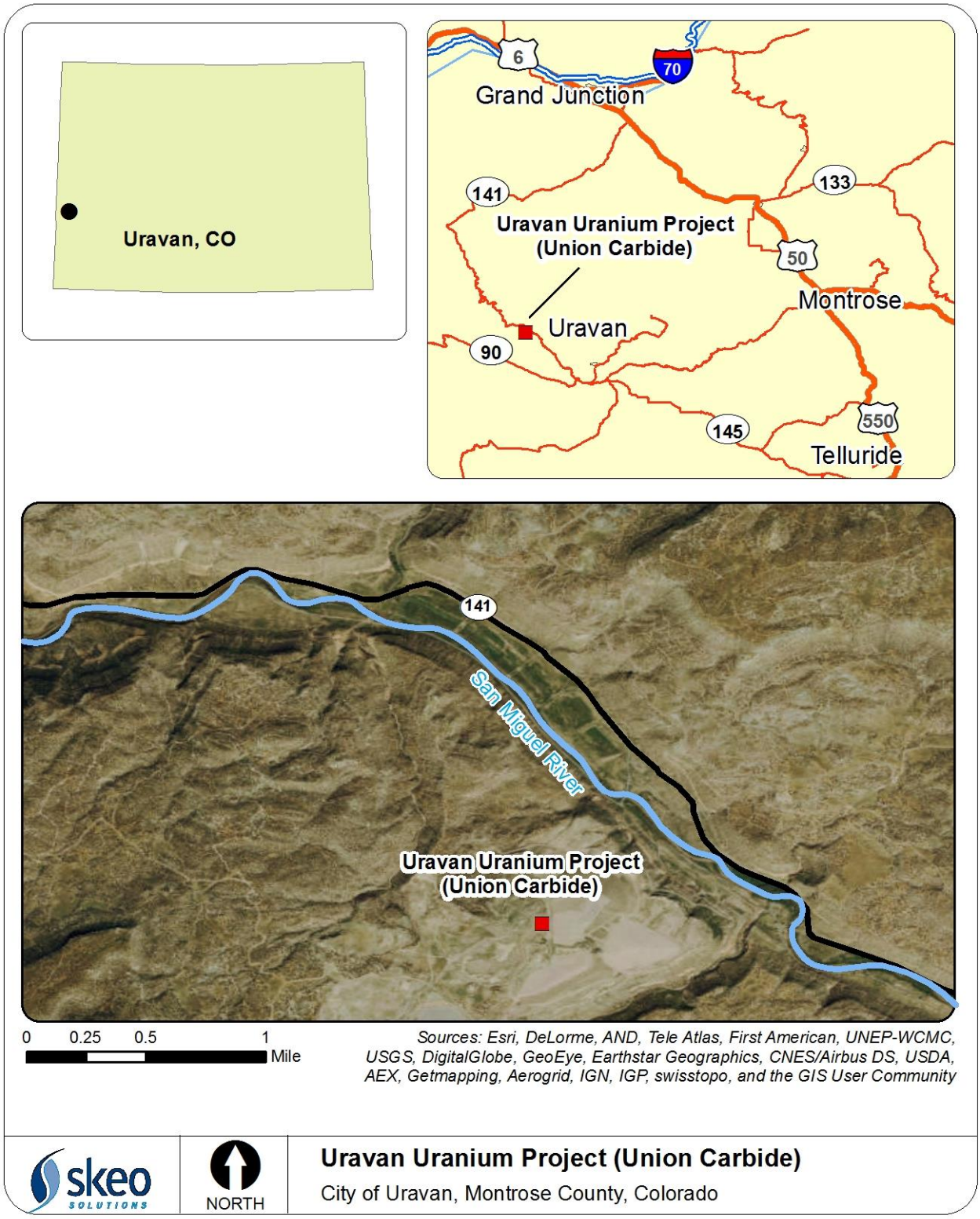
- Atkinson Creek Crystal Disposal Area
    - Covered, unlined repository containing raffinate crystals, adjacent to Colorado Highway No. 141.
- Club Ranch Ponds (CRPs) Area
    - Consisted of six unlined evaporation ponds containing primarily raffinate crystals and ponded liquids adjacent to and above the San Miguel River.
- River Ponds Area
    - Consisted of seven small ponds containing settles solids and tailings along the San Miguel River next to the mill.
- Tailings Piles
    - Consisted of three Tailings Piles containing over 10,000,000 tons of tailings on Club Mesa above the San Miguel River.
- Club Mesa Area
    - Located upslope from Tailings Piles 1, 2 and 3. Includes two clay-lined storage ponds, a neutralized sludge storage area, an area used for the spray evaporation of raffinate liquid, and an adjacent area of soils contaminated by spray from the evaporation procedure.
- Mill Areas
    - The A- and B- Plant areas, an ore stockpile area, a barrel storage area, a heap leach site, a yard (bone yard) for scrap equipment and adjacent contaminated materials.
- Town and Adjacent Areas
    - Consisted of the town of Uravan, town dump, adjacent drainage ways (Atkinson Creek, San Miguel River, Hieroglyphic Canyon and dry washes) and remnant waste materials previously used in near-Site construction activities.
- Burbank Quarry
    - Borrow pit for rock and random fill during cleanup and reclamation activities. It was the designated final repository site for raffinate crystals.

- Borrow Areas on Club Mesa
    - The Borrow Areas on Club Mesa were not contaminated. They were used as sources of the clayey soils and random backfill during remedial activities.

The RAP also defined contaminated liquids subject to remedial actions to include tailings seepage (hillside and toe berm), tailings dewatering liquids, ponded liquids, surface runoff and groundwater.

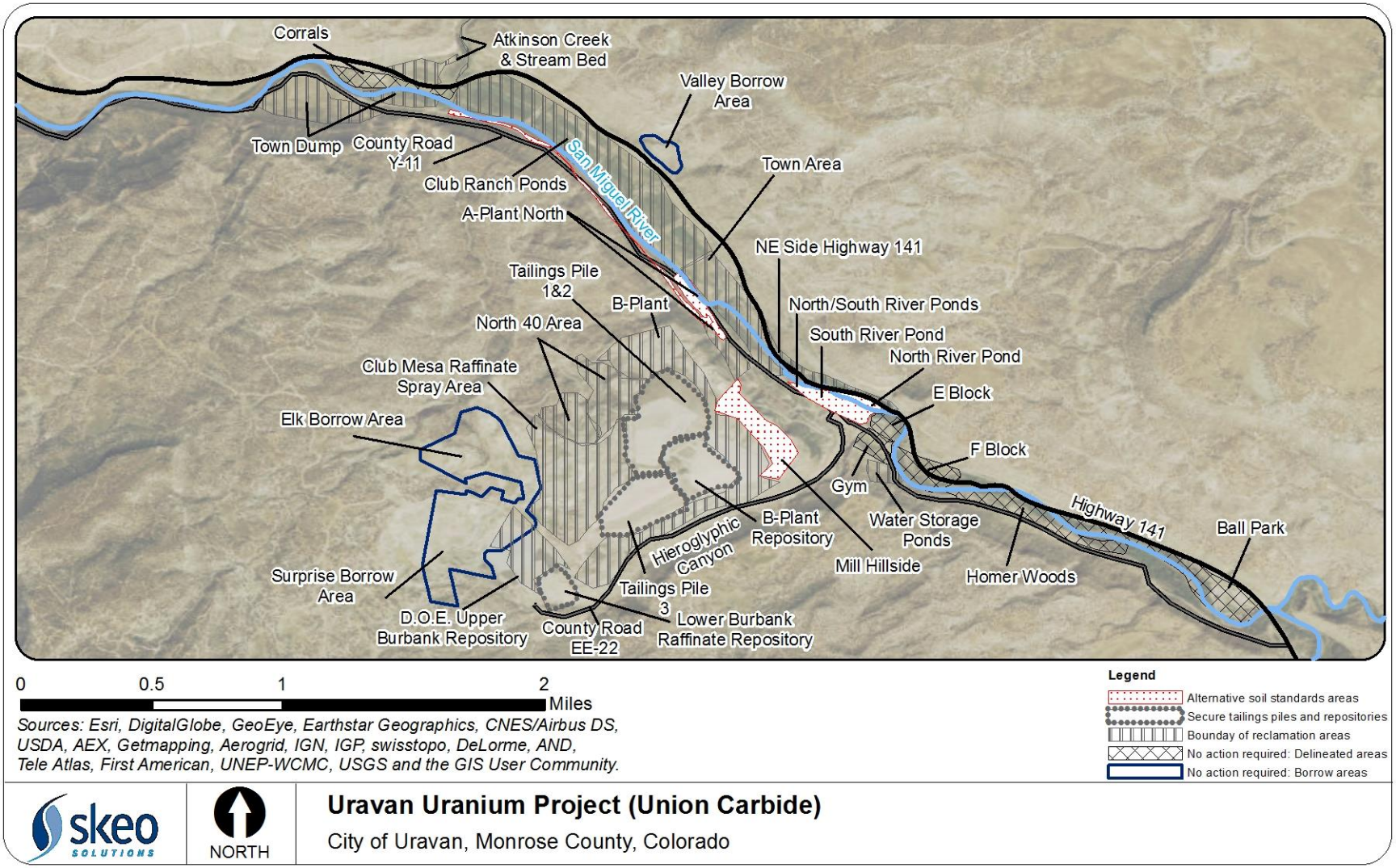
Groundwater in the region is transmitted via secondary (joint) permeability and primary (intergranular) permeability. Secondary permeability in the region tends to be directional and highly variable. The RAP indicated that the Chinle Formation, which underlies the Kayenta-Wingate Aquifer, was the first hydrogeologic unit of concern for the Site. The RAP stated that all geologic units below this aquitard, which underlies the deepest water-bearing zone of concern, should not be affected by the migration of contaminated liquids. The RAP, as amended, provides further descriptions of the hydrogeologic units. The groundwater system in the San Miguel River valley is a complex, fractured aquifer that maintains a recharge-discharge relationship with the San Miguel River.

Figure 1: Site Location Map



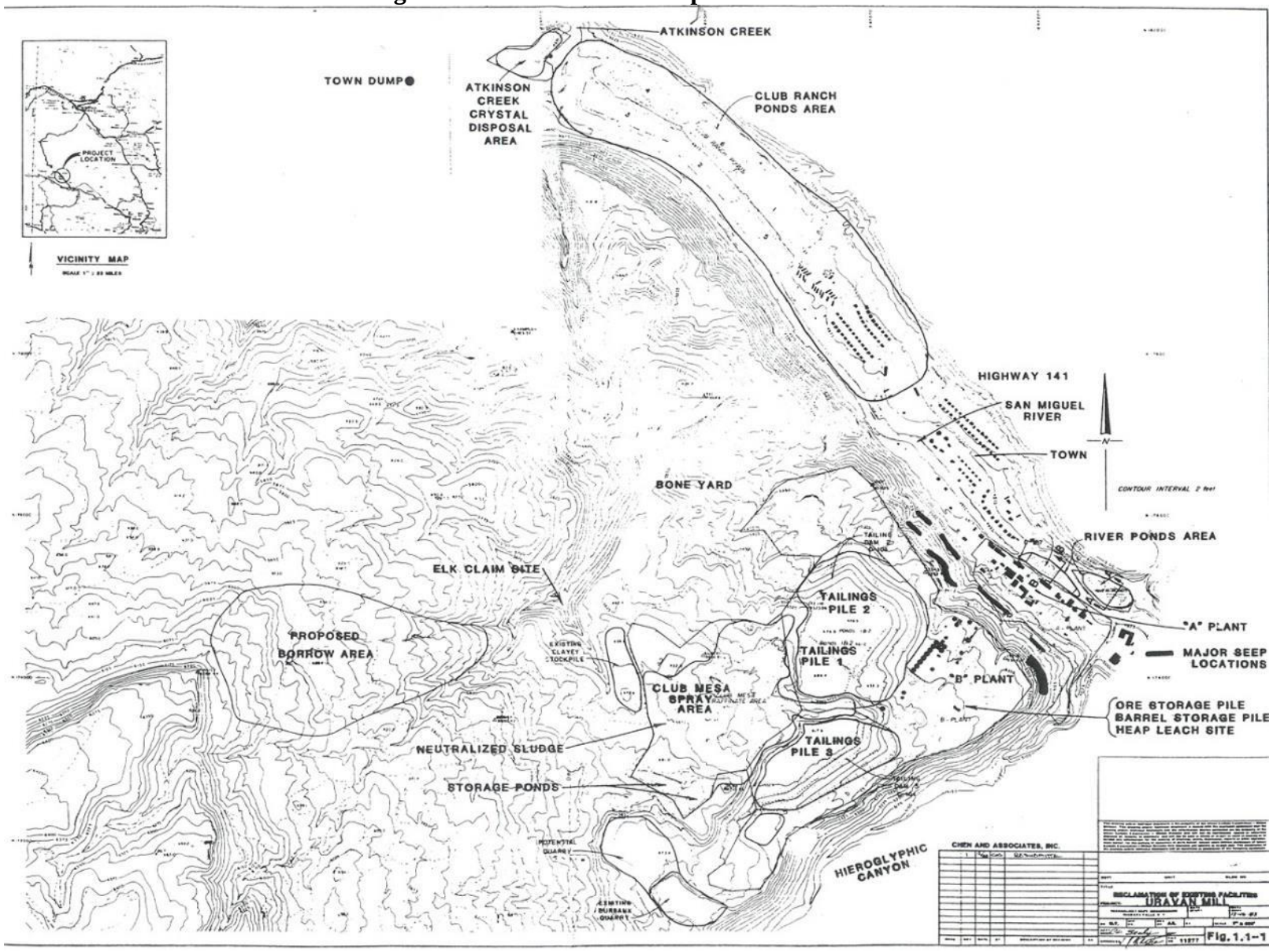
Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 3: 1987 RAP Reclamation of Existing Facilities Uravan Mill Map



3.2 Land and Resource Use

Mining operations in this area of Colorado began in the early 1900s. In 1912, the Standard Chemical Company built a radium mill on the valley floor along the San Miguel River; this area later became known as "A-Plant." The mill produced radium until 1919. From the 1930s to 1984, the plant processed uranium and vanadium.

Due to radioactive contamination in the area, the RAP required that all residents of the town of Uravan vacate their residences by December 31, 1986. The RAP stated that Union Carbide Corporation (UCC)/Umetco could not allow any building or improvement at the Site to be constructed or occupied as a residence. The only building currently on Site is the Umetco offices.

The PRP performs an annual survey of land use within five miles of the Site. Recreational activities in the area include, but are not limited to, hunting, fishing, camping and rafting. Limited mine reclamation and exploration drilling activities were observed from 2010 to 2014. Cattle, although not dairy cattle, graze during the spring and fall. There are no gardens or fruit trees in restricted areas of the Site. Mine dumps and sub-ore stockpiles were identified as having the potential to affect reclamation activities.

The San Miguel River flows northwest with pronounced seasonal fluctuations. This stream flow pattern is characteristic of rivers whose flow is derived primarily from snowmelt runoff. Peak discharges on the San Miguel River generally occur in late spring or early summer.

Umetco expects to transfer portions of the Site to the Department of Energy (DOE)'s Legacy Management program, to Montrose County for institutional control management and to the Bureau of Land Management (BLM).

3.3 History of Contamination

In 1928, UCC purchased the Standard Chemical Company holdings in Colorado through its subsidiary U.S. Vanadium Corporation (USV). UCC expanded the "A-Plant" in 1934, constructing a mill and roasting plant to recover vanadium from carnotite ore. UCC added uranium recovery circuits shortly thereafter. The town of Uravan was established in 1936 to house workers at the mill and mine facilities, and their families. USV sold the recovered vanadium and uranium concentrates to the U.S. Army. Construction began in 1943 for a new plant at Uravan (termed the WSP Plant) near the existing USV mill (termed the WAA Plant). USV's WAA Plant was under government contract by June 1944. Operations at the government's WSP Plant at Uravan began in July 1943 and ended in 1945. USV subsequently dismantled the plant. In 1945, USV's WAA mill reverted to private operations. The "B-Plant" was constructed in 1955 on a bench on Club Mesa, several hundred feet above the San Miguel River.

The Uravan mill's capacity continued to expand in the 1950s to meet U.S. government weapons programs' demand for uranium, pursuant to a contractual agreement between USV and the U.S. Atomic Energy Commission (AEC). The Uravan mill received uranium/vanadium ores from

over 200 mines in the area. The mill operated under a series of licenses issued by AEC (subsequently regulated by the U.S. Nuclear Regulatory Commission, or NRC) and the State of Colorado from 1948 to the present. The Site currently operates under Colorado License No. 660-02, Amendment 13, which expires January 31, 2018.

Between 1936 and 1984, when UCC operated the mill complex, the companies produced about 42 million pounds of uranium oxide and 222 million pounds of vanadium oxide. Umetco, a subsidiary of UCC (later, a subsidiary of Dow Chemical) has maintained the Site since its closure in 1984.

Byproduct wastes at Uravan comprised milling and cleanup residues that included mill tailings, evaporation crystals and sludges, milling refuse and mill debris. These wastes totaled over 10 million cubic yards and contained radioactive elements, metals and inorganic compounds. Liquid wastes from seepage collection and groundwater extraction systems totaled over 350 million gallons at the end of 2004. These liquids also contained radioactive elements, metals and inorganic compounds.

Most of the Site work falls under the 1978 Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II program. UMTRCA Title I sites were inactive prior to 1978; Title II sites were or are active after the act was in place. A small portion of the Site is Title I (Burbank Quarry Repository). Most of the Site is Title II.

3.4 Initial Response

In December 1983, the State of Colorado filed a CERCLA natural resources damages claim against UCC and Umetco. Operations ceased at the Site in 1984. EPA proposed the Site for listing on the National Priorities List (NPL) on October 15, 1984. EPA finalized the listing on June 10, 1986. On April 2, 1986, EPA and the State of Colorado entered into a Memorandum of Agreement, through which CDPHE became the lead oversight agency. The effects of Uravan operations on the natural resources of the State precipitated the December 1986 filing of Civil Action 83-C-2384 against UCC/Umetco by the State of Colorado. The State and UCC/Umetco subsequently assigned representatives to develop an agreement regarding remedial actions at Uravan. The joint group developed a RAP in 1987. The RAP was based on reassessment of previous reclamation and studies performed for UCC/Umetco, and analysis of data from recent field work. The RAP stated that UCC/Umetco would cause all residents of the town of Uravan to vacate their residences by December 31, 1986. It also stated that UCC/Umetco would not allow any building or improvement at the Site to be constructed for or occupied as a residence.

3.5 Basis for Taking Action

The RAP indicated that mining, milling and waste disposal practices had resulted in:

- Wind and surface water dispersal of tailings materials and uncontrolled release of radon from the tailings piles.
- Seepage of contaminated liquids into soils and groundwater from several areas in the mill complex and waste disposal areas.

- Large quantities of waste in locations that posed a risk to public health and the environment, based on considerations of the potential for release of hazardous materials to the environment.

The RAP identified threatened, endangered and sensitive species in the area of the Site, including birds of prey such as peregrine falcons and bald eagles.

The June 1999 Soil Cleanup Methodology Report included a risk assessment. The report indicated that if soil cleanup levels could not be met in an area, additional detailed soil risk assessments would be performed. Specific exposure routes of concern include incidental ingestion of soil, dermal contact (uranium [toxicity endpoint] and metals), inhalation of resuspended soil particulates, external gamma radiation, and ingestion of beef associated with ranching (cattle grazing) activities. Risk-based soil cleanup objectives were developed for three exposure scenarios: recreational hikers, on-Site monitoring workers and ranchers – meat ingestion.

4.0 Remedial Actions

In 1985, the State of Colorado and UCC/Umetco began discussions regarding clean-up activities to be conducted at the Site. Following these discussions, the State of Colorado and UCC/Umetco prepared a Consent Decree and associated RAP. The RAP was considered at the time to be the functional equivalent of an EPA remedial investigation/feasibility study (RI/FS) and Record of Decision (ROD). The U.S. District Court for the District of Colorado lodged the Consent Decree and RAP on February 12, 1987. A ROD will be written to finalize the Site remedy, because the RAP is no longer considered to be functionally equivalent to an agency decision document. EPA has determined that a decision document is needed to accurately reflect the activities and cleanup standards associated with the Site.

4.1 Remedy Selection

Under the Consent Decree, Umetco was required to complete clean-up activities specified in the RAP, as amended. Umetco prepared design and construction, health and safety, and other related environmental documents. Umetco submitted the documents to the State of Colorado for review and approval. As remedial activities progressed, Umetco and CDPHE periodically modified and approved these documents to reflect changing Site conditions. These documents formed the basis for conducting, monitoring and assessing the remedial activities and determining if the selected remedy is protective of human health and the environment.

Under the Consent Decree, Umetco completed the following general remedial activities specified in the RAP, as amended:

- Remove and clean up dispersed materials and contaminated soil from about 400 acres.
- Relocate more than 3 million cubic yards of mill wastes and contaminated materials to secure repositories on Club Mesa.

- Construct waste and tailing repository covers, liquid evaporation and retention ponds, and permanent runoff control structures, using more than 1.7 million cubic yards of earthen materials.
- Construct five double-lined ponds (totaling 40 acres) for the evaporation of hillside seepage, tailing pile seepage and extracted groundwater.
- Construct and use a new repository in the "B-Plant" area capable of containing more than 1.8 million cubic yards of evaporative pond demolition debris and radioactive waste.
- Demolish and remove about 50 major mill facility structures and buildings, including the process systems and circuits, and remove over 260 buildings in the town of Uravan.
- Collect over 70 million gallons of hillside and tailing seepage, containing about 6,000 tons of inorganic compound contamination. Hillside and tailing seepage that was collected was transferred to CRPs for management by evaporation.
- Extract about 245 million gallons of contaminated liquids from the groundwater and remove about 14,500 tons of contaminated inorganic compounds. Contaminated groundwater collected was transferred to CRPs for management by evaporation.
- Remove contaminated materials from the Old and New Town Dumps with placement in the Club Mesa tailing repository.

Atkinson Creek Crystal Disposal Area

In the RAP, CDPHE selected a remedy for the Atkinson Creek Disposal Area that would excavate and dispose of the raffinate crystals in the on-Site Burbank Quarry (an approved raffinate crystal storage area) and dispose of other contaminated soils in the Tailings Piles on Club Mesa. The objectives of this remedy were to remove the source of potential future groundwater and surface water contamination by raffinate crystal dissolution or erosion.

Club Ranch Ponds Area

In the RAP, CDPHE selected a remedy for the CRPs Area that would excavate and dispose of raffinate crystals in the on-Site Burbank Quarry and dispose of other contaminated soils in the Tailings Piles on Club Mesa. The objectives of this remedy were to remove the source of potential future contamination of the Kayenta-Wingate Aquifer and the San Miguel River.

River Ponds Area

In the RAP, CDPHE selected a remedy for the River Ponds Area that would excavate and dispose of all sludges and tailings on Site in the Tailings Piles of Club Mesa. The objectives of this remedy were to remove the source of potential future contamination of the groundwater and the San Miguel River.

Tailings Piles

In the RAP, CDPHE selected a remedy for the Tailings Piles that would cease discharge to the Tailings Piles, remove the liquids and cover the slopes of the Tailings Piles before final reclamation. The objectives of this remedy were to minimize surface water infiltration, seepage from the Tailings Piles, wind and water erosion, and radon emanation from the Tailings Piles after contaminated materials were placed there.

Club Mesa Area

In the RAP, CDPHE selected a remedy for the Club Mesa Area that would excavate and dispose of raffinate crystals in the on-Site Burbank Quarry, and dispose of other contaminated soils in the Tailings Piles on the Club Mesa. The objective of this remedy was to remove the source of future potential contamination of surrounding soils and the underlying soils and bedrock.

Mill Areas

In the RAP, CDPHE selected excavation and on-Site disposal of contaminated equipment, structure, waste materials, contaminated soils and ancillary contaminated materials into the Tailings Piles, the Burbank Quarry or a disposal site in the Elk Claim Area as the remedy for the Mill Areas. The objectives of this remedy were to remove the source of future potential contamination of surrounding soils and the underlying soils and bedrock.

Town and Adjacent Areas

In the RAP, CDPHE selected a remedy for the Town and Adjacent Areas that would excavate and dispose of town-area contaminated materials, waste from the town dumps, remnant tailings, streams and stormwater drainage deposits, and wind-blown material into the on-Site Tailings Piles repositories, the on-Site Burbank Quarry or on-Site disposal site in the Elk Creek Claim Area. The objectives of this remedy were to remove the source of future potential contamination of surrounding soils, underlying soils, groundwater and surface water.

Burbank Quarry

The Burbank Quarry was originally intended to be the source of riprap for remedial activities. Random fill and clays were mined from the quarry pit for use in remedial construction. The Burbank Quarry (now known as the Burbank Repository) was used as the raffinate repository and was available to serve as the repository for other wastes as approved by CDPHE.

In the RAP, as amended, CDPHE selected a remedy that placed the raffinate crystals removed from the Atkinson Creek Crystal Disposal Area, the CRPs and the Club Mesa Spray Area in below-grade Burbank Quarry locations. Raffinate crystals were to be dispersed in clay-lined cells that would be capped by earthen materials and riprapped for erosion control and protection. Umetco designed the Burbank Quarry cap systems in consideration of the probable maximum precipitation events and maximum credible earthquakes.

Hillside Seepage and Tailings Liquids

Seepage had been occurring intermittently along about 4,600 linear feet of the Club Mesa rim. Seepage occurred near the contact between the Summerville and Salt Wash Formations. It exited the valley walls of Hieroglyphic Canyon and the San Miguel River above the "A-Plant" Area. The seepage was composed of geochemically modified tailings solutions from the Tailings Piles and the Club Mesa Spray Area.

The dewatering and consolidation process forced liquids from the Tailings Piles during this process, and for some time before and after final reclamation activities. Seepage was collected by a toe drain system at the base of the Tailings Pile slopes and conveyed to the CRPs with the Hillside Seepage System liquids. Remediation activities minimized the potential for discharge of contaminated surface waters from the Site into the San Miguel River.

Ponded Liquids

Contaminated liquid in the CRPs consisted primarily of toe drain and hillside seepage collected since 1985 and raffinate solution. These liquids seeped into the subsurface at an undetermined rate. Remediation activities minimized the potential for contaminated surface water to be released into the underlying bedrock and aquifer.

Surface Runoff

Surface water runoff from the Site will continue after Umetco completes remediation and reclamation activities. Hydrology studies for existing and reclaimed facilities were conducted. Section 5.3.3 of the RAP governs quality of the stormwater runoff.

Remediation activities minimized the potential for contaminated surface water to be released into the San Miguel River. CDPHE chose a remedy for surface water management to create stormwater control features to convey stormwater away from remediated features, collect stormwater from within the RAP Boundary for management at the CRPs until Site remediation and reclamation activities finished, and collect stormwater runoff from repository surface areas to preclude erosion damage.

Groundwater

The RAP required extraction and evaporation of Kayenta-Wingate groundwater in the CRPs Area. The goal of the RAP activities for Kayenta-Wingate Aquifer restoration was to remove and manage fractured bedrock contamination and improve groundwater in the Kayenta-Wingate Formation to a beneficial use. As stated in the RAP, achieving this goal, coupled with the removal of raffinate crystals and ponded liquids from the San Miguel River valley, substantially reduced the contaminated non-point load to the river.

Umetco monitored groundwater wells in accordance with the requirements of the Uravan Groundwater Monitoring Procedure E-11 and the ACL application dated July 2003. The ACL report established ACLs for groundwater at Uravan as shown in Table 2 below.

Table 2: July 2003 Groundwater ACLs

Constituent	ACL
Aluminum	7.9 mg/L
Ammonium	6,900 mg/L
Cadmium	0.26 mg/L
Iron	130 mg/L
Manganese	130 mg/L
Natural Uranium	5.5 mg/L
Nickel	21 mg/L
Nitrate + Nitrite-N	1,360 mg/L
Selenium	0.5 mg/L
Sulfate	32,600 mg/L
Thorium-230	8,200 pCi/L
Notes: mg/L = milligrams per liter pCi/L = picocuries per liter	

4.2 Remedy Implementation

The June 1999 Soil Cleanup Methodology Report and RAP identified the following as soil contaminants of concern (COCs) for the Site: average radium-226 (^{226}Ra) (0-15 centimeters (cm)), average ^{226}Ra (>15 cm), average thorium-230 (0-15 cm), average thorium-230 (>15 cm), natural uranium, arsenic, cadmium, lead, molybdenum, nickel, selenium, vanadium and zinc. The RAP criteria for soil removal were designed to achieve concentrations of naturally occurring radioactive and metal constituents similar to those present before operations at Uravan. Attainment of these criteria would ensure no incremental risk to human health from inorganic constituents and that radiological doses would meet EPA standards for residential construction. Project area-specific characterization plans and remedial actions were developed to meet this goal, which was met in all areas except four inaccessible locations as described in the September 2007 Alternative Soil Standard Application (Mill Hillside, A-Plant North, River Ponds and County Road Y-11 areas).

Atkinson Creek Crystal Disposal Area

As of October 14, 1999, Umetco completed remedial actions (excavation and on-site disposal) at this area. CDPHE accepted the Final Completion.

Club Ranch Ponds Area

Umetco performed reclamation work in the CRPs Area in three phases starting in 1987. Phase 1 removed raffinate crystals from unlined earthen ponds. Phase 2 constructed lined ponds for contaminated groundwater and runoff treatment. Phase 3 removed the lined ponds and cleaned up the area to meet criteria specified in the RAP.

Compliance Report CR-401-7I verifies that final cleanup of contaminated material in the CRPs Area finished in 2006. Contaminated materials were placed in the B-Plant Repository. The report

also details the cleanup activities. Umetco completed grading activities by June 2007 and revegetation activities by November 2007. Umetco installed permanent fencing between October 22 and November 5, 2007.

CDPHE, EPA and NRC approved alternative soil standards for four inaccessible locations where ^{226}Ra is above the soil cleanup criteria. These areas are the Mill Hillside, A-Plant North, River Ponds and County Road Y-11. These areas are within the area to be transferred to DOE for long-term surveillance activities. The 2007 Alternative Soil Standards Application describes the alternative standard areas and supports the application for alternative soil standards.

River Ponds Area

Complete removal of the River Ponds started in 1988 and finished in mid-1989. These materials were placed into Tailings Piles 1, 2 and 3. Excavation was completed to the water table and all contaminated soil was removed. Umetco subsequently constructed rock berms to trap sediment carried by the San Miguel River during high flows. Vegetation has reestablished itself in the River Ponds Area. The RAP called for final reclamation by December 31, 1991. Umetco submitted a final construction report to the CDPHE in mid-1993. With the acceptance of the final construction report, remediation of the River Ponds Area was complete as of December 1993.

Tailings Piles

Remedial activities in the RAP for the tailings piles of Club Mesa included dewatering, pile reshaping, buttress protection, toe drain system maintenance, top and side slope cover construction, and stormwater drainage diversion.

Umetco has placed the side and top covers on Tailings Piles 1, 2 and 3. The stormwater diversion channel system has been constructed for Tailings Piles 1, 2 and 3. Geotechnical instrumentation was installed in the Tailings Piles. The top of Tailings Piles 1 and 2 is the final repository for tailings and contaminated soils from the valley areas and Club Mesa. Umetco completed placement of contaminated soils and other materials on Tailings Piles 1 and 2.

Umetco began B-Plant Repository construction, operations and placement of contaminated materials in 1998. A toe drain system was also installed in the B-Plant Repository Area. This capped repository accepted contaminated materials from final reclamation of the CRPs. It has a designed capacity of about 1.8 million cubic yards.

Club Mesa Area

Pursuant to the RAP, removal of neutralized sludge and other contaminated material began in June 1989 and finished in 1992. Initial removal of raffinate crystals from the Club Mesa began in summer 1990 and finished in mid-1992. Final removal of raffinate crystals resting on the bedrock finished in 1994. About 3,750,000 cubic yards of contaminated material were removed from the Club Mesa Area. Mines and portals encountered were sealed with earthen materials. This activity was completed by December 31, 1997, with CDPHE acceptance of the construction completion report. Final closure activities for the Club Mesa Area included construction of a

stormwater diversion structure and sediment collection areas, placement of clean fill rock mulch, and reseeding of the fill areas.

During 2000, Umetco drilled 17 borings into the mine workings on Club Mesa to evaluate and manage contained contaminated liquids. Five borings were selected for pumping and conveyance of mine workings liquid. Umetco extracted and transferred raffinate solution in the mine workings to the CRPs for evaporation. About 500,000 gallons of raffinate-contaminated liquid was pumped from the mine workings in 2000 and 2001.

Mill Areas

Remedial activities in the Mill Area began in 1987. Initial activities included removal of 160,000 cubic yards of Ore Stockpile, Barrel Storage, Heap Leach site and Bone Yard materials. Uranium and/or vanadium ores and mill reagents were processed at the NRC-licensed White Mesa uranium/vanadium mill in Utah. These activities are complete.

The mill process area consisted of the “A-Plant” and “B-Plant.” It included uranium and/or vanadium milling systems and ancillary facilities located along the San Miguel River valley floor at the base of Club Mesa and the facilities on the canyon face and lower bench next to the Tailings Piles. Mill decommissioning was conducted in accordance with a detailed plan approved by CDPHE. Decommissioning included management and handling of polychlorinated biphenyls (PCBs) and asbestos-containing materials, and demolition of over 50 major Uravan mill Site buildings and operations support structures.

Umetco began decommissioning the mill process systems in 1995. This involved demolition of mill circuits, ancillary mill operations facilities and structural foundations, and removal and cleanup of associated contaminated soils. Mill demolition and contaminated soils removal are both complete. Umetco completed contaminated soil removal in the A-Plant Area during the second quarter of 1999 and in the B-Plant Area in the third quarter of 1999. In 1998, Umetco constructed replacement runoff control ponds in the A-Plant Area. Umetco remediated and renovated the Community Center Building and the Boarding House in 2000. These buildings were later destroyed due to mold issues.

Tailings materials under County Road EE-22 were removed during 2001. Following removal activities, the area was inspected and approved by the CDPHE on-Site coordinator. The roadway was reestablished with borrow fill and placement of road-base gravel material. 4,760 cubic yards of contaminated materials were removed from the roadbed and placed in the B-Plant Repository.

Mill Area remediation continued with removal of contaminated soils during 2002. Contaminated soils and materials were placed in the B-Plant Repository. A-Plant Area and B-Plant Area confirmation investigation reports were approved and final reclamation grading and drainage activities finished in 2003.

Town and Adjacent Areas

All Uravan residents were relocated as of 1986. From 1987 to 1994, Umetco removed all housing structures (about 260 structures) from the town of Uravan and removed and transported contaminated soils (about 210,000 cubic yards) to the Tailings Piles. Umetco graded and revegetated the Town Area in 2000, after soil verification studies were completed and accepted. A historic kiosk and overlook parking lot were constructed for public viewing and information.

Materials in the Town Dumps were characterized in accordance with the RAP requirements. Mill-related contamination was identified in the Town Dumps. Umetco excavated, removed and placed these materials (about 260,000 cubic yards) in the B-Plant Repository. Final grading and seeding of the area finished in 2000.

Umetco identified about 65,000 cubic yards of dispersed deposits next to Uravan. These areas include portions of Colorado Highway 141, Montrose County Road Y-11 and EE-22, the Mill Hillside, and Water Storage Ponds next to Hieroglyphic Canyon. Umetco removed and disposed of these deposits in the B-Plant Repository. Umetco excavated and removed remnant tailings from the entrance road to the Site and Town of Uravan, and from within the Town of Uravan. Umetco placed these tailings in the B-Plant Repository. Remediation and reclamation of these areas is complete. In 2006, in a coordinated effort between the CDOT, CDPHE and Umetco, a significant source of contamination was removed from beneath Colorado Highway 141. Simultaneously, CDOT reconfigured the road to improve safety. In addition, a series of process ponds next to Colorado Highway 141 were remediated. EPA partially deleted the Colorado Highway 141 portion of the Site from the NPL in the spring of 2007.

Stream and stormwater drainage deposits include sediments in Atkinson Creek and Hieroglyphic Canyon streambeds. Radiological surveys indicate no significant contamination within the Atkinson Creek Streambed. Remediation of contaminated materials in the Hieroglyphic Canyon streambed near its confluence with the San Miguel River was finished in 1994. Assessment of the upper reach of Hieroglyphic Canyon indicates no significant contamination in the streambed. Excavation of streambed contaminated materials would result in significant environmental impacts to the waterway and its ecology. Umetco identified discrete deposits of radioactive soils near the mouth of Hieroglyphic Canyon. They were excavated, removed and placed in the Club Mesa Tailings Repositories. Umetco characterized windblown material north and south of the Tailings Piles footprints.

A land transfer/Omnibus Agreement was executed between Montrose County and Umetco during the second quarter of 2012. Parcel No. 1 (Ball Park Parcel) was transferred to Montrose County during the third quarter of 2012. As part of the Agreement, a new bridge was constructed to provide access from Colorado Highway 141 to Montrose County Road EE-22. The new bridge opened on December 23, 2014. According to the 2014 Annual Report, a small amount of non-licensed material (coal ash), with radiation levels slightly above background, were uncovered during County Road EE-22 bridge replacement activities. The report indicated occupational dose monitoring was not conducted during the removal of the coal ash materials. These materials were determined to not be licensed materials, they were below the subsurface background levels for

^{226}Ra, and they did not have the potential to generate exposures above 10 percent of the annual occupational limits due to the material's radiation levels and the short duration of work activities.

Burbank Quarry

Umetco began placing raffinate crystals in the Burbank Quarry in 1989 and completed the work in 1992. Umetco capped the raffinate crystals with an earthen cover in accordance with the RAP. The side slope was completed in 1993. The toe drain was installed in 1998. The top cover was completed in 1999. The Burbank Quarry – Uravan UMTRCA Title II activity was completed by 2000.

DOE used the upper portion of the Burbank Quarry Repository for disposing of Title I radioactive materials from the nearby Naturita processing site. About 600,000 cubic yards of radioactive materials were placed in the Burbank Quarry repository. A multi-layered cover, identical to the Uravan Tailings Piles covers, was constructed on top of the contaminated materials. Permanent drainage diversion structures and control features were constructed for stormwater management. The Burbank Quarry Repository – DOE UMTRCA Title I activity was completed in 1998.

Borrow Areas on Club Mesa

The Site has three borrow areas. Two are located on Club Mesa, including one above the Burbank Repository. The third is located in the San Miguel River Valley on the east side of Colorado Highway 141, across from the CRPs. The borrow areas on Club Mesa, which includes the Kaiser Quarry, were expanded in 1992, 1997, 2002 and 2003.

The Kaiser Quarry produces sandstone suitable for erosion protection materials. The Kaiser Quarry is west of the Club Mesa Area within Umetco's patented Kaiser Claim Boundary. All of the borrow areas are operated in compliance with the Mine Land Reclamation Permits.

Hillside Seepage and Tailings Liquids

Umetco improved the Hillside Seepage Collection System in 1998. When seepage collection was complete, it was decommissioned in 2003. This system intercepted over 38 million gallons of seepage. The toe drain collection system was capped and sealed. Compliance Report CR-426-4 indicates that concrete from ditches and diversion ponds was removed and at least two feet of sandstone rock rubble was placed to prevent erosion.

Ponded Liquids

CRPs were constructed to manage liquids from the Tailings Areas, Toe Berm Seepage and Tailings Dewatering Liquids Collection System, Hillside Seepage Collection System, and any other contaminated liquid collected as part of remedial activities. Umetco collected liquids and transferred them to the CRPs for evaporation. Umetco has fully remediated the Club Ranch Ponds and River Area Ponds.

Surface Runoff

The Site's stormwater management system manages surface runoff. The sizing and materials of construction are consistent with the requirements of the RAP.

Groundwater

Umetco installed the groundwater extraction system in 1991. Umetco upgraded it in 1996 and 1998. Groundwater pumping began in 1991. In 1997, the groundwater cleanup effort was evaluated and an optimized system developed to extract contaminated liquids from low-permeability zones in the Kayenta-Wingate Aquifer. The change in groundwater withdrawal successfully reduced contaminant concentrations.

The groundwater extraction and CRP System has removed about 15,000 tons of contaminants from the groundwater flow regime. This action has helped reduce contaminant loading to the San Miguel River system. Throughout the groundwater remedial action, Umetco modified the groundwater monitoring procedures with CDPHE approval to ensure optimum performance of the extraction program and to monitor compliance with groundwater protection standards.

The Kayenta-Wingate Aquifer reached steady state conditions by 2002. The groundwater performance evaluations showed that future groundwater extraction would not significantly enhance aquifer restoration. In 2003, CDPHE approved a groundwater ACL application. ACLs were proposed for 11 groundwater constituents at the Site. The ACLs were developed using a point of exposure in the San Miguel River. The ACL application implemented a monitoring program that consisted of quarterly monitoring with annual performance evaluations for a period of three years. After three years of monitoring and annual evaluations, the program showed that there were no contaminants in the Kayenta-Wingate Aquifer above the ACLs. The ACL monitoring program was terminated. Currently, as required by the ACL application, groundwater is monitored in accordance with the anticipated DOE long-term monitoring for the Site.

DOE will implement long-term monitoring of groundwater when it assumes ownership of the Site. The monitoring will ensure that the groundwater plume under the CRPs Area continues to naturally attenuate in accordance with the groundwater mixing model and that the ACLs are not exceeded. DOE will assess the effectiveness of groundwater remediation in the future.

Partial Deletions

On February 18, 2005, EPA deleted a portion of the Site from the NPL. This partial deletion pertains to 9.84 acres containing two historic structures, the Boarding House and the Community Center. On September 4, 2007, EPA deleted a one mile section of Colorado Highway 141 between mile posts 75 and 76 from the NPL, totaling approximately 7 acres.

4.3 Operation and Maintenance (O&M)

The RAP includes Addendum A: Outline for Quality Control/Quality Assurance, Monitoring and Performance Evaluation Plan, which describes the groundwater monitoring schedule for the Site.

Addendum A also describes quality control and quality assurance for soil and water remedies. Based on discussions with CDPHE, a revised groundwater sampling program began during the first quarter of 2008. Wells CRP-1, CRP-25 and CRP-19A would be sampled annually during the third quarter. Surface water is monitored at three locations. The RAP, individual quality plans by project number, the Soil Cleanup Methodology Manual and the Uravan ACL Application outline the requirements for verifying the remedial activities. The sampling program included:

- Conducting exposure surveys.
- Acquiring confirmatory soil sample(s) for all Site contaminants, wherever contamination was suspected or known to occur.
- Complete sampling of borrow materials for all Site contaminants.
- Sampling of groundwater and surface water for Site contaminants.

Monitoring results have been documented by individual project area as the segments were completed.

No O&M costs were estimated in the RAP, as amended. The PRP's contractor, AECOM, provided annual O&M costs (Table 3).

Table 3: Annual O&M Costs

Year	Amount
2010	$261,688.85
2011	$281,928.95
2012	$273,534.73
2013	$230,967.67
2014	$239,173.34

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2010 FYR for the Site stated the following:

The remedy at the Site is currently protective of human health and the environment. Remedial activities have:

- *Capped and revegetated radioactive tailings.*
- *Disposed of raffinate crystals.*
- *Eliminated process ponds.*
- *Pumped and treated groundwater.*
- *Secured tailing waste along the San Miguel River.*
- *Dismantled two mills and placed all old building demolition materials in a secure area.*
- *Excavated contaminated soil, disposed of them in a secure area and replanted the area.*
- *Dismantled and cleaned up the town of Uravan.*

The Site is unused and secured. Two recently identified areas with elevated radiological activity are not easily accessed due to fencing and location. In order for the remedy to remain protective in the long term, the following issues must be addressed:

- *EPA should assess the Site to determine what institutional controls are necessary to prevent inappropriate land uses that could compromise the repository caps and to restrict groundwater use.*
- *For licensing purposes, NRC should approve the alternative soil standards application in the areas where remedial activities did not meet soil cleanup goals.*
- *Umetco should complete a characterization investigation of the two areas found with elevated radiological activity.*
- *Groundwater ACLs should be re-evaluated based on new state standards for molybdenum and uranium.*

EPA has made a determination that a decision document is needed to accurately reflect and document all of the activities and cleanup goals associated with the Site.

The 2010 FYR included five issues and recommendations. This report summarizes each recommendation and its current status below.

Table 4: Progress on Recommendations from the 2010 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Evaluate the Site to determine what institutional controls to restrict land uses may be appropriate.	EPA, DOE, CDPHE, Umetco, Montrose County	09/30/2012	Institutional controls will be addressed after the forthcoming ROD and during transfer of the Site to DOE and Montrose County.	Incomplete
Evaluate the Site to determine what institutional controls to restrict groundwater uses may be appropriate.	EPA DOE	09/30/2012	Institutional controls will be addressed after the forthcoming ROD and during transfer of the Site to DOE and Montrose County.	Incomplete
NRC should approve the soil alternative standard application for licensing purposes.	NRC	09/30/2011	NRC approved the soil alternative standard application.	5/18/2012

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Complete a characterization investigation of the areas with elevated radiological activity.	Umetco	01/01/2011	Small amounts of licensed materials identified in Hieroglyphic Canyon and the F Block area were removed during first quarter of 2014 and placed at the Energy Solutions repository in Tooele, Utah. Removal activities were conducted under a Radiation Work Permit with appropriate occupational monitoring to ensure exposures are maintained as low as reasonably achievable (ALARA). The volume of material removed during 2014 was about 340 cubic yards.	3/5/2015
The groundwater ACLs were based on effects to the river and need to be re-evaluated based on the new uranium and molybdenum standards.	CDPHE	09/30/2011	CDPHE modified the molybdenum standard in 2012 to 0.21 milligrams per liter (mg/L) and uranium was not re-evaluated since the ACLs were based on effects to the river.	Incomplete

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 8 initiated the FYR in January 2015. The EPA remedial project manager (RPM) Frances Costanzi led the EPA Site review team, which also included the EPA community involvement coordinator (CIC) Cynthia Peterson and contractor support provided to EPA by Skeo Solutions. In March 2015, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In September 2015, EPA published a public notice in the *Daily Sentinel* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Cynthia Peterson, EPA, and Warren Smith, CDPHE, and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of the advertisement.

EPA will make the FYR report available to the public once it has been finalized. Copies of this document will be placed in the Site information repository: EPA Superfund Records Center, located at 1595 Wynkoop Street, Denver, CO 80202-1129. The Naturita library is only 15 miles away, and will be considered as an additional Site information repository. Upon completion of the FYR, EPA will place a public notice in the Grand Junction, Colorado *Daily Sentinel* newspaper to announce the availability of the final FYR report in the Site's information repository. A copy of the report will also be posted to EPA Region 8's Uravan Web page (http://www2.epa.gov/region8/uravan-uranium-project-union-carbide), along with the previous FYRs.

6.3 Document Review

This FYR included a review of relevant, Site-related documents including the Consent Decree, RAP and recent monitoring data. Appendix A includes a complete list of the documents reviewed.

ARAR Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund remedial actions must meet any federal standards, requirements, criteria or limitations that are determined to be ARARs. ARARs are those standards, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARs, EPA's approach to determining if a remedial action is protective of human health and the environment involves consideration of TBCs along with ARARs.

Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the maximum contaminant levels specified under the Safe Drinking Water Act as well as the ambient water quality criteria enumerated under the Clean Water Act. The remedy selected for this Site was designed to meet or exceed all chemical-specific ARARs and meet location- and action-specific ARARs.

Soil Cleanup Levels

According to the RAP, as amended, cleanup levels for soil COCs were based on 40 CFR 192. Subpart D of 40 CFR 192 established radioactivity limits for uranium byproduct materials pursuant to Section 84 of the Atomic Energy Act of 1954, as amended. The soil cleanup level for ^{226}Ra established in the RAP was compared to the current standards 40 CFR 192, Subpart D (Table 5). Cleanup levels were designed to achieve concentrations of naturally occurring radioactive and toxic constituents similar to those before operations at the Site. Nevertheless, the RAP notes that the as low as reasonably achievable (ALARA) principle applies to soil radium

cleanup at the Site. This review did not find evidence suggesting any of the assumptions used in the development of soil cleanup levels have changed since the RAP.

Table 5: Previous and Current Standards for Soil COCs

COC	RAP Cleanup Level[a] (pCi/g)	Current Standard[b] (pCi/g)	ARARs Change
^{226}Ra (0-15 cm bgs)[c]	5	5	None
^{226}Ra (>15 cm bgs)[d]	15	15	None

Notes:
pCi/g = picocuries per gram
bgs = below ground surface
a. Values are relative to background level averaged over an area of 100 square meters.
b.40 CFR 192 Subpart D obtained at: http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=c69e617ee8b863dca06458e3bfef993f&mc=true&n=sp40.25.192.d&r=SUBPART&ty=HTML, accessed 5/15/15.
c. The concentration criterion for surface soil (0-15 cm bgs) averaged over an area of 100 square meters is a health-based standard.
d. The concentration criterion for subsurface soil (greater than 15 cm bgs) was developed to allow use of field measurements to locate and remediate discrete deposits of high-activity tailings (typically 300 pCi/g to 1,000 pCi/g) in subsurface locations.

Groundwater Cleanup Levels

According to the RAP, cleanup levels for groundwater COCs were based on 40 CFR 192.32(a)(2). In 2001, the RAP was updated and 12 contaminants were removed from the list of groundwater COCs. CDPHE updated the RAP again in 2005, reducing the list of groundwater COCs further to include cadmium, fluoride, nickel, selenium, uranium (natural), vanadium, zinc, ^{226}Ra and gross alpha. As shown in Table 6, current groundwater protection standards for cadmium and selenium have become more stringent since the 2005 RAP Amendment. However, the more stringent standards do not affect current protectiveness. Groundwater is not currently in use at the Site. The groundwater discharges to the San Miguel River.

Table 6: Summary of Groundwater Protection Standards Evaluation

COC	2005 RAP Standard[a] (mg/L)	Current Federal Standard[b] (mg/L)	Change in ARARs
Cadmium	0.05	0.01	more stringent
Fluoride	4.0	4.0[d]	None
Nickel	background[c]	NA	NA
Selenium	0.05	0.01	more stringent
Natural Uranium	0.044	0.044	None
Vanadium	background[c]	NA	NA
Zinc	5.0	5.0[d]	None
Radium-226	5 pCi/L	5 pCi/L[e]	None
Gross Alpha	15 pCi/L	15 pCi/L	None

COC	2005 RAP Standard[a] (mg/L)	Current Federal Standard[b] (mg/L)	Change in ARARs

Notes:
a. Values obtained from Table 5.4.3.2-2 from 2005 RAP which cites the values are consistent with federal regulation 40 CFR 192.
b. Values obtained from 40 CFR 192 subpart A Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites, accessed 5/8/15 at: http://www.ecfr.gov/cgi-bin/text-idx?SID=8caedef1df9be4d133de157eb310cb8c&mc=true&node=ap40.25.192_104.1&rgn=div9.
c. Background to be determined by methodology adopted pursuant to Addendum A of the 2005 RAP.
d. In absence of a value from 40 CFR 264 value obtained from EPA's National Primary Drinking Water Regulations, accessed 5/8/15 at: http://water.epa.gov/drink/contaminants/index.cfm.
e. Combined radium-226 and radium-228.
NA = not applicable as a standard has not been established.

In 2003, CDPHE approved a groundwater ACL application for 11 contaminants at the Site. The ACLs were based on protection of surface water quality in the San Miguel River. To determine if the ACLs remain valid, the surface water quality criteria used as the basis of the ACLs were reviewed. As shown in Table 7, the surface water quality standards have not changed since the 2005 RAP Amendment.

Table 7: Summary of Surface Water Standards Used in the ACL Development

COC[a]	2005 RAP Standard[a] (mg/L)	Current Standard[b] (mg/L)	ARARs Change
Aluminum	0.087	0.087	None
Ammonia	0.06	0.06	None
Cadmium	0.002	0.002	None
Iron	1.0	1.0	None
Manganese	1.0	1.0	None
Nickel	0.16	0.16	None
Nitrite + Nitrate	100	100	None
Selenium	0.005	0.005	None
Sulfate	576	576	None
Thorium-230	60	60	None
Uranium (natural)	3.2	3.2	None

Notes:
a. COC and surface water criteria from the Application for ACL Limits, Uravan Project Site, Umetco Minerals Corporation, July 2003, and adopted in the 2005 RAP.
b. Current surface water quality criteria obtained at: https://www.colorado.gov/pacific/sites/default/files/Regulation-31.pdf (accessed 5/11/15).

According to the RAP, CDPHE also applied the agricultural use criteria for monitoring the groundwater remediation for the River Valley-Kayenta-Wingate Aquifer. A comparison of agriculture use criteria in the RAP to the current criteria show that, except for molybdenum, none of the criteria has changed. CDPHE modified the molybdenum standard in 2012 to 0.21 mg/L.

Institutional Control Review

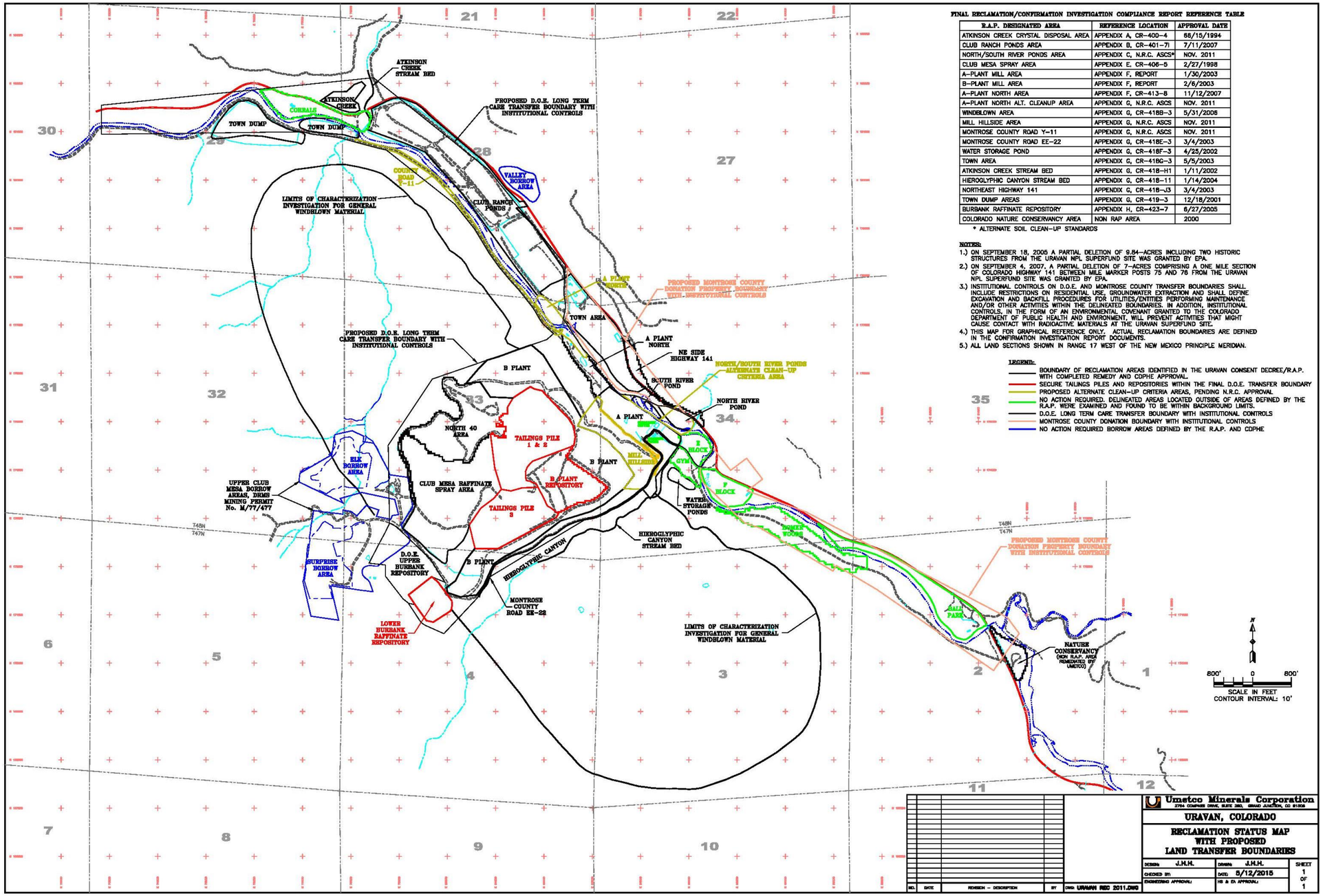
Table 8 lists the institutional controls associated with areas of interest at the Site. No institutional controls are currently in place at the Site to restrict groundwater or land use, though waste remains in place on the Site. Institutional control requirements will be finalized in the

forthcoming ROD and implemented when the Site property is transferred to DOE and Montrose County. Parcel numbers are available for some, but not all, portions of the Site. Figure 4 shows a draft map of proposed land transfer boundaries, which will help inform the final institutional controls at the Site.

Table 8: Institutional Control (IC) Summary Table

Media	ICs Needed	ICs Called for in the RAP	IC Objective	Instrument in Place
Groundwater	Yes	No	Restrict installation of groundwater wells and groundwater use.	None
Soil	Yes	No	Restrict inappropriate land use that could compromise the remedy and result in exposure.	None

Figure 4: Draft Land Status Map with Proposed Land Transfer Boundaries



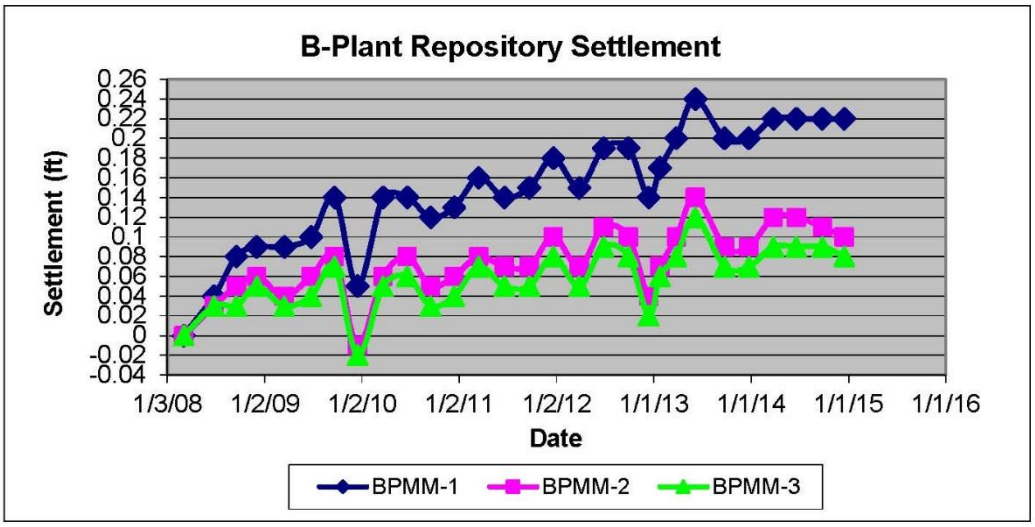
6.4 Data Review

Tailings Pile 1, 2, 3, B-Plant Repository and Burbank Repository

According to the 2010-2014 annual reports, PRP inspections of Tailings Piles 1, 2 and 3 and Burbank and B-Plant Repositories indicated no settlement or slope stability anomalies. All erosion protection and runoff dispersion/diversion installations are performing as designed with no damage or flaws detected.

On November 28, 2007, three surface settlement monuments were installed on the completed top surface of the B-Plant Repository. The 2010 and 2011 reports noted that small amounts of incremental/total settlement were measured. The 2012-2014 annual reports indicated that "inconsequential amounts of incremental/total settlement" were measured. However, a graph in the 2014 report demonstrates a gradual increase in settlement since 2008.

Figure 5: B-Plant Repository Settlement, 2008 to 2015



Source: Calendar Year 2014 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. May 2015.

San Miguel River Water Monitoring

The post-operational surface water monitoring set forth in the CDPHE-approved Application for Alternate Concentration Limits, Uravan Project Site, dated July 2003, was completed during the 2006 monitoring season. Monitoring continues by Umetco. In the future, DOE will be responsible for continuance of this monitoring program under the Draft DOE Long-Term Surveillance Plan.

Post-operational surface water monitoring for Site COCs was compared to established standards for the San Miguel River using trend analyses in the annual reports prepared by Umetco. The trend analyses for TDS, aluminum, cadmium, iron, manganese, selenium, uranium, sulfate and un-ionized ammonia show that the concentrations are well below the surface water standards at all monitoring stations. In addition, the analyte concentrations for each sampling station are

similar. These results demonstrate that remedial activities have reduced contaminant flux to the river to levels that have no significant impact on the river system.

Groundwater Performance Monitoring

Two groundwater wells and one background well are sampled in the Club Ranch area in accordance with the requirements set forth in the Uravan Groundwater Monitoring Procedure E-11, the ACL application dated July 2003 and the Draft DOE Long-Term Surveillance Plan. The monitoring wells are CRP-19A and CRP-25; the background well is CRP-1. If the mean concentration of ACL constituents in the monitoring wells exceeds the ACL for a specific constituent, the corrective action program as outlined in Groundwater Monitoring Procedure E-11 is to be implemented, which includes additional sampling of wells CRP-19B, CRP-19C and CRP-21. As shown in Table 9, none of the mean constituents exceeded ACLs during the FYR period.

Table 9: Mean Constituent Concentration Comparison with ACLs

Constituent	ACL (mg/L unless otherwise noted)	2010	2011	2012	2013	2014
Aluminum	7.9	0.25	0.3	0.18	0.07	0.17
Ammonium	6,900	390	407.5	399.5	425	405
Cadmium	0.26	0.021	0.018	0.018	0.021	0.02
Iron	130	0.15	0.02	0.12	0.02	0.11
Manganese	130	6.01	5.16	5.56	5.5	5.29
Natural Uranium	5.5	0.12	0.1	0.13	0.13	0.12
Nickel	21	0.125	0.09	0.08	0.11	0.14
Nitrate + Nitrite-N	1,360	13.6	12.85	9.87	15.55	11.25
Selenium	0.5	0.09	0.09	0.09	0.1	0.06
Sulfate	32,600	5,950	6,450	5,700	5,600	5,605
Thorium-230	8,200 pCi/L	0 pCi/L	0.015 pCi/L	< 0.16 pCi/L	0.15 pCi/L	0.08 pCi/L

6.5 Site Inspection

Site inspection participants met at the on-Site Umetco offices on Colorado Highway 141 in Uravan, Montrose County, Colorado to conduct the Site inspection on May 14, 2015.. Participants included:

- Frances Costanzi, EPA
- Shiya Wang, CDPHE
- Tom Gieck, AECOM/Umetco
- Susan Hayes, AECOM/Umetco
- Jim Heck, AECOM/Umetco
- Jason Smith, AECOM/Umetco
- Garry Bates, Kelly Service (PRP contractor)
- Art Kleinrath, DOE

- David Traub, SN3 (DOE contractor)
- Todd Bragdon, CDM Smith (EPA Contractor)
- Derek Wintle, CDM Smith (EPA Contractor)
- Treat Suomi, Skeo Solutions (EPA Contractor)
- Johnny Zimmerman-Ward, Skeo Solutions (EPA Contractor)

A completed Site inspection checklist is available in Appendix D.

Umetco personnel gave a safety briefing and a brief history of the Site using available historical photographs to show changes in Site conditions and point out areas of interest. Umetco personnel drove participants around the Site and on a neighboring mesa to observe the Site and take photographs. Site photographs are available in Appendix E.

The Site lies on both sides of the San Miguel River. The Umetco offices are the only buildings on Site. Portions of the Site are fenced and labeled with radioactive waste signs. Tailings piles are fenced and covered with stone caps. Fences were secure and the caps appeared to be functioning as designed.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the current landowners and regulatory agencies involved in Site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. All of the interviews took place after the Site inspection via email. The interviews are summarized below. Appendix C provides the complete interviews.

Frances Costanzi: Frances Costanzi is the EPA RPM for the Site. She indicated that the project is complex with multiple overlapping authorities and that the monitoring data supports that the remediation has performed well. She believes a lot of good work has been completed at the Site and that the project team is now working on the final aspects of the remediation. Ms. Costanzi stated that institutional controls are the main remaining area where work needs to be done, both to select institutional controls in a decision document, and then to implement the selected institutional controls. Ms. Costanzi has received no complaints or inquiries regarding the Site.

Shiya Wang: Shiya Wang is the CDPHE project manager for the Site. She believes the remedy currently in place is performing well based on routine monitoring results and Site inspections under the Radioactive Materials License. She noted that all remedial work required under the Consent Decree and RAP has been completed and is well documented. Ms. Wang indicated discussions regarding long-term institutional controls and future land uses between the State, Umetco, EPA, DOE, Montrose County and BLM are ongoing. Ms. Wang has received no complaints or inquiries regarding the Site since the 2010 FYR.

Thomas Gieck: Thomas Gieck is an AECOM employee and the Remediation Leader for the Site. Mr. Gieck stated that the project has gone well and that any construction issues that came up were resolved during implementation of the remedy. He indicated that the Site will be transferred

to the state or federal government for long-term care and some parcels satisfying cleanup criteria will be transferred to Montrose County.

Jason Smith: Jason Smith is the contractor for the PRP. Mr. Smith stated that the remediation has gone very well and that the remediation has resulted in long lasting protection for human health and the environment.

7.0 Technical Assessment

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

Yes. The RAP, as amended, acted as the functional equivalent of an EPA RI/FS and ROD during remediation. EPA has determined that a decision document is needed to accurately reflect the activities and cleanup standards associated with the Site, as well as to document selection of institutional controls. The review of Site documents and the Site inspection indicate that the remedy is functioning as intended by the RAP, as amended, and Consent Decree. On February 18, 2005, EPA deleted a portion of the Site from the NPL. This partial deletion pertains to 9.84 acres previously containing two historic structures, the Boarding House and the Community Center. On September 4, 2007, EPA deleted the 7-acre Colorado Highway 141 portion of the Site from the NPL.

To date, remedial activities have capped and revegetated nearly 10 million cubic yards of radioactive tailings; disposed of 530,000 cubic yards of raffinate crystals; eliminated process ponds; pumped and treated groundwater; secured 12 million yards of tailing waste along the San Miguel River; dismantled two mills and placed old building demolition materials in a secure area; excavated contaminated soil, disposed of it in a secure area and replanted the area; and dismantled and cleaned up the town of Uravan. There has been a slight, steady increase in settlement since 2008 at the three surface settlement monuments installed on the completed top surface of the B-Plant Repository.

The RAP, as amended, did not call for institutional controls. They will be assessed during the finalization of the ROD because waste is left in place on Site and no administrative mechanisms currently prevent inappropriate future uses at the Site. Umetco intends to transfer large portions of the Site to the DOE Legacy Management program, which will potentially address the land use control issue in the future because this will include the areas where contamination remains above acceptable levels. Portions of the Site without contamination are also anticipated to be transferred to BLM, which intends to allow access to its portion of the Site. A small portion of the Site, primarily along roadways, will be transferred to Montrose County once institutional controls are in place.

According to the 2014 Annual Report, a small amount of non-licensed material (coal ash), with radiation levels slightly above background, was uncovered during County Road EE-22 bridge replacement activities. The report indicated occupational dose monitoring was not conducted during the removal of the coal ash materials because these materials were determined to not be licensed materials, they were below the subsurface background levels for ^{226}Ra, and they did not

have the potential to generate exposures above 10 percent of the annual occupational limits due to the material's radiation levels and the short duration of work activities.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. CDPHE updated the RAP in 2005, reducing the list of the groundwater COCs to include cadmium, fluoride, nickel, selenium, uranium (natural), vanadium, zinc, ^{226}Ra and gross alpha. Current groundwater protection standards for cadmium and selenium have become more stringent since the 2005 RAP Amendment. However, the more stringent standards do not impact current protectiveness. Groundwater is not currently in use at the Site. The groundwater discharges to the San Miguel River and meets the alternate concentration limits.

The PRP excavated and placed contaminated soils above cleanup level in a capped landfill on Site. These cleanup levels remain valid. Four discrete, inaccessible areas of the Site (about 40 acres total) could not meet the soil cleanup level of 5/15 pCi/g ^{226}Ra in soil. A September 2007 Alternate Soils Standards Application from CDPHE to the NRC stated that CDPHE believes the areas were cleaned to a level that is ALARA and protective of public health; EPA and NRC approved the application. Three of the areas are in the footprint of the area to be transferred to the DOE Legacy Management program. The fourth area, a county road, will also be under an institutional control with the county. Final exact outer boundaries of the area to be transferred to the DOE Legacy Management program are still being negotiated by the county, BLM and DOE based on road access and uranium leases in the area.

The EPA is reviewing exposure assumptions, toxicity data, cleanup levels and RAOs in the forthcoming RI/FS.

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

No other information has come to light that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

The RAP, as amended, acted as the functional equivalent of an EPA RI/FS and ROD during remediation. EPA has determined that a decision document is needed to accurately reflect activities and cleanup levels associated with the Site. The review of Site documents and the Site inspection indicate that the remedy is functioning as intended by the RAP, as amended, and Consent Decree. Contaminated materials have been excavated from areas of the Site and placed in capped landfills on Site. The ROD will include a requirement for institutional controls, which will be implemented as the property is transferred to DOE and BLM.

8.0 Issues, Recommendations and Follow-up Actions

Table 10 provides recommendations to address the current Site issues.

Table 10: Current Site Issues and Recommendations

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
No ROD is yet in place and no institutional controls are in place restricting land and groundwater use.	Finalize the site remedy in a ROD and implement institutional controls consistent with the ROD.	EPA and CDPHE	EPA	09/30/2017	No	Yes
Coal ash, a non-licensed material, contamination was found when Umetco built a bridge across the San Miguel River at Montrose County Road EE-22.	Determine extent of coal ash contamination and determine if remediation is necessary.	PRP	EPA and CDPHE	09/30/2016	No	Yes
There has been a slight, steady increase in settlement since 2008 at the three surface settlement monuments installed on the completed top surface of the B-Plant Repository.	Determine if settlement at the B-Plant Repository is affecting the cap.	PRP	EPA and CDPHE	09/30/2016	No	Yes

9.0 Protectiveness Statement

The remedy at the Site currently protects human health and the environment. Contaminated materials have been excavated from areas of the Site and placed in capped landfills on Site and contaminated groundwater has been pumped and treated to protect the river. For the remedy to be protective over the long term, the following actions need to be taken:

- Finalize the Site remedy in a ROD and implement the institutional controls consistent with the ROD.
- Determine extent of coal ash contamination and determine if remediation is necessary.
- Determine if settlement at the B-Plant Repository is affecting the cap.

10.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Alternative Soil Standards Application. Uravan, Colorado. Umetco Minerals Corporation. Grand Junction, Colorado. September 2007.

Appendix to the Confirmation Investigation Report. A-Plant North. Uravan, Colorado. Umetco Minerals Corporation. October 2007.

Calendar Year 2010 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. March 2011.

Calendar Year 2011 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. March 2012.

Calendar Year 2012 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. May 2013.

Calendar Year 2013 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. May 2014.

Calendar Year 2014 Annual Summary Report. Uravan, Colorado. Umetco Minerals Corporation. May 2015.

Final Close-Out Report. Uravan Mill and Adjacent Areas Montrose County, Colorado. September 29, 2008.

Final Construction and Soil Confirmation Investigation Report. Colorado Department of Transportation Highway 141. Uravan, Colorado. Umetco Minerals Corporation. September 2006.

Fourth Five-Year Review Report. Umetco Minerals Corporation Uravan Superfund Site. Uravan, Colorado. Frontier Environmental Services, Inc. September 28, 2005.

Partial Deletion Federal Register Notice. Uravan Superfund Site. 75847-75850 Federal Register. Vol. 69, No. 243. December 20, 2004.

Quarterly Progress Reports 1st Quarter 2010-1st Quarter 2015. Colorado vs. Union Carbide Corporation/Umetco Minerals Corporation, Civil Action No. 83-C-2384. 2010-2015.

Second Five-Year Review Report. Umetco Minerals Corporation Uravan Superfund Site. Uravan, Colorado. Morrison Kundsey Corporation. March 13, 2000.

Soil Cleanup Program Methodology for Uravan, Colorado. Umetco Minerals Corporation. June 1999.

Third Five-Year Review Report. Umetco Minerals Corporation Uravan Superfund Site. Uravan, Colorado. Frontier Environmental Services, Inc. September 28, 2005.

Umetco- Uravan. Colorado License No. 660-02, Amendment 13. CDPHE. Radioactive Materials License. January 2013.

Uravan Remedial Action Plan (RAP) (With tracking of changes 1986-2005). (83-C-2384 Final Consent Decree, Order, Judgment and Reference to Special Master, with Appendices). Umetco Minerals Corporation. Revised May 2005.

Appendix B: Press Notice

Five-Year Review Planned for
the Uravan Uranium Project Superfund Site

The U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) are conducting the fifth five-year review of the remedy for the Uravan Uranium Project Superfund site (Site) in Montrose County, Colorado. The purpose of the five-year review is to ensure that the selected cleanup actions effectively protect human health and the environment. The five-year review is scheduled for completion by September 2015.

The 680-acre Site is the location of a former radium-recovery plant that began operations in 1912. From the 1940s to 1984, the plant operated as a uranium and vanadium processing facility.

Cleanup remedies at the Site include: capping and revegetating nearly 10 million cubic yards of radioactive tailings; disposal of 530,000 cubic yards of radioactive raffinate crystals; eliminating process ponds; pumping and treating contaminated groundwater; securing 12 million yards of tailings waste along the San Miguel River; dismantling the two mills and placing all building demolition materials in a secure area; excavating and disposing of contaminated soil in a secure area; replanting these areas; and dismantling and cleaning up the town of Uravan.

More information is available on the EPA's Website at: **http://www2.epa.gov/region8/uravan-uranium-project-union-carbide**

To request copies of administrative record documents contact: 1) EPA Record Center at 303-312-7273 or toll free (Region 8 only) at 800-227-8917 ext. 312-7273; or 2) CDPHE Hazardous Materials and Waste Management Division Records Center at 303-692-3331 or toll free (outside the 303 or 720 area codes) at 1-888-569-1831, ext. 3331, or email cdphe_cora_hmwmd@state.co.us.

EPA and CDPHE invite community participation in the five-year review process: Community members are encouraged to contact EPA and CDPHE staff with any information that may help the agencies make their determination regarding the protectiveness and effectiveness of the remedies at the site.

Warren Smith
CDPHE Community Involvement Manager
303-692-3373 or 1-888-569-1831 ext. 3373
Email: warren.smith@state.co.us

Cynthia Peterson
EPA Community Involvement Coordinator
303-312-6879 or 1-800-227-8917 ext. 312-6879
Email: peterson.cynthia@epa.gov

Appendix C: Interview Forms

Site Name: Uravan Uranium Project (Union Carbide) EPA ID No.: COD007063274
Subject's Name: Frances Costanzi Affiliation: EPA Region 8
Subject's Contact Information: costanzi.frances@epa.gov
Type of Interview (Circle one): In Person Phone Mail Other_____

1. What is your overall impression of the project?

   I think this is a complex project with multiple overlapping authorities. A lot of good work has been completed at the site and we working on the final aspects.

2. What effect has this site had on the surrounding community, if any?

   Since its initiation, the site has impacted the area in a very significant way. The residents who lived in the town of Uravan were relocated and the town was demolished. This obviously impacted the local residents in the town as well as in the surrounding communities. In more recent years and as the cleanup has been completed, I believe there has been less of an impact on surrounding communities.

3. How well do you believe the remedy is performing? Do you believe the monitoring data shows the remedy's effectiveness?

   Overall, I think the remedy is performing well. The monitoring data, which has been appropriately reduced at this phase of the cleanup, supports this.

4. Are you comfortable with the institutional controls required for the Site and their current status?

   No. The institutional controls are the main remaining area where work needs to be done, both to select institutional controls in a decision document, and then to implement the selected institutional controls.

5. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   No.

6. Are you aware of any changes in projected land use at or near the site?

   Not at this time.

7. Do you feel well informed about the site's activities and progress?

I think I am generally well-informed, although occasionally there is an activity conducted under the radiation license, such as a site-inspection, that I would have liked to known about prior to it occurring.

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   I think we are close to resolving all site-related concerns and encourage all involved to continue to work together to reach that endpoint.

Site Name: Uravan Uranium Project (Union Carbide) EPA ID No.: COD007063274
Subject's Name: Shiya Wang Affiliation: CDPHE
Subject's Contact Information: shiya.wang@state.co.us
Date: June 1, 2015
Type of Interview (Circle one): In Person Phone Mail Other: Email

1. What is your overall impression of the project?

   It is a complex project involving multiple regulatory authorities and involvement. It is also a very interesting project with its unique importance in history.

2. How well do you believe the remedy is performing?

   The remedy is performing very well based on the routine monitoring results and site inspections under the Radioactive Materials License. All remedial work required under the Consent Decree and RAP have been completed and are well documented. Things have been moving forward to closing out the project and the Site.

3. Are you comfortable with the institutional controls required for the Site and the current status of their implementation?

   Yes. The controls currently in place are working well. The discussion for necessary long-term institutional controls and future land uses continues between the State, Umetco, EPA, DOE, Montrose County and BLM.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents in the last five years?

   No.

5. Has your office conducted any site-related activities or communications in the last five years? If so, please give purpose and results of these activities.

   Yes, the Site is currently regulated by the State of Colorado under a Radioactive Materials License. They were mostly related to routine licensing and inspection activities, and the ongoing works for closing out the Site.

6. Are you aware of any changes to state laws or regulations that might affect the protectiveness of the remedy? Are you aware of any changes in projected land use at the site?

   I am not aware of any changes to the state laws or regulations since the last five-year review that might affect the remedy. The interagency discussion continues regarding the future land uses of the Site.

7. Do you feel well informed about the Site's activities and progress?

Yes.

8. Do you have any comments, suggestions, or recommendations regarding the Site's management or operation?

No.

Interview Form
2015 Five-Year Review

Site Name: Uravan Uranium Project (Union Carbide) EPA ID No.: COD007063274
Interviewer Name: _____ Affiliation: _____
Subject's Name: ____Jason Smith _____ Affiliation: __Consultant _____
Subject's Contact Information: ___jason.c.smith@aecom.com_____
Time: _6:50_____ Date: __ 7-10-2015_____
Type of Interview (Circle one): In Person Phone Mail Other__email____
Location of Interview: __Umetco Offices, Grand Junction, Colorado_____

1. What is your overall impression of the project?
   Favorable. I believe that the input from stakeholders was well received and that development and execution of the remedial plan resulted in long lasting protection for human health and the environment.

2. Have any problems been encountered that required, or will require, changes to the site's remedial design?
   Not in the time frame that in which I have participated in the project.

3. Have any problems or difficulties been encountered that have impacted construction progress or implementability?
   Not in time frame in which I have participated in the project.

4. What effect has this site had on the surrounding community, if any?
   NA

5. How well do you believe the remedy is performing?
   Very well.

6. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?
   No I am not.

7. Are you aware of any changes in projected land use at or near the site?
   No I am not.

8. Do you feel well informed about the site's activities and progress?
   Yes I feel that the site's ownership communicates well on what the status of the remediation.

9. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?
   No I do not.

Site Name: Uravan Uranium Project (Union Carbide) EPA ID No.: COD007063274
Subject's Name: Thomas Gieck Affiliation: Umetco Minerals Corp./AECOM
Subject's Contact Information: 970-256-8889; gieckte@dow.com
Time: 9:30 AM Date: July 13, 2015
Type of Interview (Circle one): In Person Phone Mail Other_____

1. What is your overall impression of the project?

   Good, Completed

2. Have any problems been encountered that required, or will require, changes to the site's remedial design?

   Not that I am aware of.

3. Have any problems or difficulties been encountered that have impacted construction progress or implementability?

   Not that I am aware of – all construction issues were resolved during implementation.

4. What effect has this site had on the surrounding community, if any?

   It has been positive as long as I have been involved.

5. How well do you believe the remedy is performing?

   Very well – as designed.

6. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   No

7. Are you aware of any changes in projected land use at or near the site?

   No, statue/regulations require transfer of site to Federal Government or State for long-term care. Some parcels satisfying cleanup criteria will be transferred to Montrose County. No changes from 2010 FYR.

8. Do you feel well informed about the site's activities and progress?

   Yes

9. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   No

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Uravan Uranium Project (Union Carbide)	**Date of Inspection: 5/14/2015**
Location and Region: Uravan, CO/Region 8	**EPA ID: COD007063274**
Agency, Office or Company Leading the Five-Year Review: EPA Region 8	**Weather/Temperature: overcast and passing thunderstorms, 60s**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Thomas Gieck (Name) Remediation Leader (Title) 07/13/2015 (Date)
   Interviewed ☐ at site ☐ at office ☒ by email ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** Jason Smith (Name) Contractor (Title) 07/10/2015 (Date)
   Interviewed ☐ at site ☐ at office ☒ by email ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency CDPHE
Contact Shiya Wang _____ 6/1/2015 _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____Name _____ _____ _____
Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

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

Remarks: Follow the RAP requirements.

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

Remarks: Contingency plan/emergency response plan is under revision and the draft is with CDPHE.

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: NRC	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: Slight settlement in B Plant Repository			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
	IV. O&M COSTS			
1.	**O&M Organization**			
	☐ State in-house	☐ Contractor for state		
	☐ PRP in-house	☒ Contractor for PRP		
	☐ Federal facility in-house	☐ Contractor for Federal facility		
	☐ _____			

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From:	To:		
01/01/2010	12/31/2010	_____	☐ Breakdown attached
Date	Date	Total cost	
01/01/2011	12/31/2011	_____	☐ Breakdown attached
Date	Date	Total cost	
01/01/2012	12/31/2012	_____	☐ Breakdown attached
Date	Date	Total cost	
01/01/2013	12/31/2013	_____	☐ Breakdown attached
Date	Date	Total cost	
01/01/2014	12/31/2014	_____	☐ Breakdown attached
Date	Date	Total cost	

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

Describe costs and reasons: _____

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

A. Fencing

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

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signage on site

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

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

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

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ mm/dd/yyyy _____

Name Title Date Phone no.

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

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

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

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

Other problems or suggestions: ☐ Report attached

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

Remarks: Institutional controls will be finalized when the site property is transferred to BLM, County and DOE.

D. General

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

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

Remarks: _____

B. Other Site Conditions

Remarks: Site is in good condition.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: Slight settlement in B Plant Repository

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☐ Cover properly established
	☐ No signs of stress	☒ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Some small, native shrubs and plants on caps		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☐ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable	☒ N/A
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		

C. Letdown Channels ☒ Applicable ☐ N/A

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

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ No evidence of settlement
   Arial extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
   Material type:_____ Arial extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
   Arial extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☒ No obstructions
   ☐ Location shown on site map Arial extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☒ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Arial extent: _____
   Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

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

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

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

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

Remarks: _____

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

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

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

Remarks: _____

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

Remarks: _____

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

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

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

Remarks: _____

4.	**Dam**	☐ Functioning	☐ N/A
	Remarks: _____		
H. Retaining Walls		☐ Applicable	☒ N/A
1.	**Deformations**	☐ Location shown on site map	☐ Deformation not evident
	Horizontal displacement: _____	Vertical displacement: _____	
	Rotational displacement: _____		
	Remarks: _____		
2.	**Degradation**	☐ Location shown on site map	☐ Degradation not evident
	Remarks: _____		
I. Perimeter Ditches/Off-Site Discharge		☒ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☒ Siltation not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Vegetative Growth**	☐ Location shown on site map	☐ N/A
	☒ Vegetation does not impede flow		
	Area extent: _____		Type: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Discharge Structure**	☐ Functioning	☒ N/A
	Remarks: _____		
VIII. VERTICAL BARRIER WALLS		☐ Applicable	☒ N/A
1.	**Settlement**	☐ Location shown on site map	☐ Settlement not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Performance Monitoring**	Type of monitoring: _____	
	☐ Performance not monitored		
	Frequency: _____		☐ Evidence of breaching
	Head differential: _____		
	Remarks: _____		
IX. GROUNDWATER/SURFACE WATER REMEDIES		☒ Applicable	☐ N/A
A. Groundwater Extraction Wells, Pumps and Pipelines		☐ Applicable	☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☒ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

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

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon absorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

Contaminated materials have been excavated from areas of the Site and placed in capped landfills on site. Contaminated groundwater has been pumped and treated. The Site no longer has active remediation and the site property will be transferred to DOE, BLM and the County for long-term management.

B. Adequacy of O&M

	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. No issues were identified with O&M.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No remedy problems were identified. Institutional controls will need to be implemented to ensure long-term protectiveness.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

Appendix E: Photographs from Site Inspection Visit

Groundwater monitoring well at Club Ranch Ponds along the San Miguel River.

San Miguel River in foreground, looking towards Atkinson Creek Area.

View of Tailings Piles 1 and 2 (center) and B-Plant Repository (light-colored area on left). County Road Y-11 can be seen running along the San Miguel River (bottom).

Club Ranch Ponds Area along the San Miguel River. Umetco offices on site visible in bottom left corner.

Umetco offices on site along Highway 141, with County Road Y-11 and tailings piles on opposite side of the San Miguel River.

New County Road EE-22 bridge over the San Miguel River, looking toward F Block.

DOE Burbank Repository and signage.

New fencing at Elk Borrow Area to keep range cattle out.

Locked fence and signage to access Tailings Piles 1 and 2.

Drainage in foreground with Tailings Piles 1 and 2 in background.