Second Five Year Review Report

Kennecott South Zone

OU1 – Bingham Creek
OU4 – Bingham Reservoir
OU5 – Anaconda Tailings
OU10 – Copperton Soils
OU11 – Bingham Canyon

CERCLIS ID: UTD000826404

Copperton
Salt Lake County, Utah

September 2010

Prepared By:

US Environmental Protection Agency, Region 8
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Approved by: Date:

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9/29/10

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List of Acronyms

Ac	Acute
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ARCO	Atlantic Richfield Company
As	Arsenic
ASL	Above Sea Level
BRA	Baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminants of concern
cy	Cubic yards
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
HDR	HDR Engineering Inc.
IC	Institutional Control
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter
MOU	Memorandum of Understanding
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation & Maintenance
OU	Operable Unit
Pb	Lead
PRP	Potentially Responsible Party
ppm	Parts per million
RAO	Remedial Action Objective
RD/RA	Remedial Design/ Remedial Action
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
µg/L	microgram per liter
UAO	Unilateral Administrative Order
UDEQ	Utah Department of Environmental Quality
UGW	Utah Ground Water permit
UTA	Utah Transit Authority
VCP	Voluntary Cleanup Program

Executive Summary

The Environmental Protection Agency (EPA) has conducted the second Five-Year Review of the response actions implemented at Operable Units (OU) 1, 4, 5, 10, and 11 of the Kennecott South Zone Superfund Site (the Site) near Copperton in Salt Lake County, Utah. This review was conducted from August 2009 through July 2010, five years after the first Five-Year Review completed in June 2004.

A complete review with associated protectiveness statements was performed for OUs 1 and 5 (Bingham Creek and Anaconda Tailings, respectively). Treatment of the remaining OUs was limited to a summary of the OU status.

Operable Unit 1 consists of the Bingham Creek Channel and surrounding historic floodplain. The up- and down-stream limits include the Kennecott Large Bingham Reservoir on the west to the Jordan River on the east, a distance of about 10 miles.

The OU is divided into the Bingham Creek Channel and Bingham Creek Residential Soils, which include certain residential developments in the floodplain. During the early days of mining, wastes from mining and mineral processing (mine dumps, mill tailings, and smelter slag) were dumped directly into Bingham Creek or stored adjacent to the creek where they were subject to erosion and transport to the creek. The concentrations of arsenic and lead found in the Bingham Creek channel in a residential area averaged 202 milligrams per kilogram (mg/Kg) and 5,661 mg/Kg, respectively.

Operable Unit 5 includes the Anaconda Tailings, also known as Copperton Tailings, ARCO Copperton Tailings and Utah-Apex Tailings. The tailings consisted of approximately 3.5 million tons of lead, arsenic, zinc, and silver-bearing, fine grained sediments covering 96 acres along the south side of Bingham Creek. Average arsenic and lead concentrations were found to be 394 mg/Kg and 6,244 mg/Kg, respectively. These wastes are now consolidated into a 41 acre capped repository. Operable Unit 5 also includes Bastian Ditch which originates in the vicinity of the Anaconda Tailings and roughly follows Utah Highway 111 southward.

Response actions at OU1 and OU5 prior to issuance of the 1998 ROD were deemed to have adequately addressed risks to human health and the environment such that the ROD called for no further action. Response actions involved the excavation and consolidation of mine wastes and contaminated soils from OU1 and OU5 into capped repositories, one of which is located on OU5. Areas where mine waste and soils containing lead above land-use based cleanup levels remained were covered in place (residential areas) and/or subject to land use controls. Land use controls are the responsibility of local municipal and county government.

Although the residential area response actions at OU1 were conducted in accordance with the Action Memoranda (and therefore may be functioning as intended), it is not clear from the site files whether all residential properties ultimately were cleaned to the final lead standard of 1,100 mg/Kg.

This is due to an inconsistency in the lead action level required in the Action Memoranda for the Phase I residential removal action (2,500 mg/Kg) and the Phase II and III residential removal actions (1,100 mg/Kg). The OU1 ROD identifies the appropriate action level for lead in a residential setting as 1,100 mg/Kg. Therefore, if the Phase I residential cleanup achieved a lead standard of 2,500 mg/Kg, this portion of the remedy would not be functioning as intended by the ROD.

Land use controls and regular inspections of those response actions that left waste in-place are necessary to provide future protectiveness of the remedy. Future land development and disturbance of either capped or soil covered wastes by residents and by erosion may compromise the protectiveness of the remedy selected at OU1 and OU5.

Land use controls in OU1 and OU5 have not been fully implemented. Regular inspections of the Bingham Creek Channel response actions in OU1 were not performed. However, review of relevant documents and observations made at OU1 and OU5 during the Five-Year Review indicate the following:

- Response actions where waste was left in-place are in good condition.
- Limited development has occurred in OU1 since the first Five-Year Review and this development is under EPA or UDEQ oversight.
- No development or change in land use has occurred at OU5. Operable Unit 5 remains within Kennecott's secured property boundary and land use control is still under the control of ARCO, the parcel owner.

A protectiveness determination of the remedy at OU1 cannot be made at this time until further information is obtained. Further information will be obtained by determining what arsenic and lead concentration standards the fifty properties under the Phase I residential removal action were remediated to. It is expected that this additional information will be obtained by December 31, 2010, at which time a protectiveness determination will be made. In order for the remedy to be protective in the long-term, land use controls and annual inspections and maintenance of certain response actions required by decision documents must be fully implemented.

The remedy at OU5 currently protects human health and the environment through actions that isolate contaminants. However, in order for the remedy to be protective in the long-term, land use controls must be fully implemented.

It is anticipated that ARARs and cleanup levels will be evaluated for the entire Kennecott Site as part of the development of an Explanation of Significant Differences (ESD). The ESD will pertain to all RODs except OU2. This evaluation is expected to be completed in the spring of 2011.

A number of issues were identified and will be addressed as summarized in the following tables.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Kennecott South Zone		
EPA ID *(from WasteLAN)*: UTD000826404		
Region: 8	**State:** UT	**City/County**: Copperton/Salt Lake County

SITE STATUS	
NPL status: Final ☐ Deleted X Other (specify) proposed and withdrawn	
Remediation status (choose all that apply): Under Construction X Operating X Complete	
Multiple OUs? X YES NO	**Construction completion date**: NA not on NPL
Has site been put into reuse? X☐YES NO	

REVIEW STATUS	
Reviewing agency: x EPA State ☐ Tribe ☐Other Federal Agency	
Author name: Rebecca Thomas	
Author title: Project Manager	**Author affiliation:** US Environmental Protection Agency
Review period: August 2009 through July 2010	
Date(s) of site inspection: 7/25/09, 10/6/09, 11/18/09, 12/01/09	
Type of review: X Post-SARA ☐Pre-SARA ☐NPL-Removal only ☐Non-NPL Remedial Action Site X NPL State/Tribe-lead ☐Regional Discretion	
Review number: 1 (first) X2 (second) 3 (third) ☐Other (specify)	
Triggering action: ☐ Actual RA Onsite Construction at OU #___ ☐Actual RA Start ☐ Construction Completion X Other (specify) – 5-years from the date of the first 5YR.	
Triggering action date: For OUs 1, 4, 5, 10, and 11 the trigger date is 5-years from the date of the 1st FYR (June 2004).	
Due date: June 2009	

*["OU" refers to operable unit.]

Five-Year Review Summary Form, cont'd.

Issues:

Item No.	Issues	Affects Current Protectiveness	Affects Future Protectiveness
Bingham Creek - Operable Unit No. 1			
1	Bingham Creek Channel annual inspection and reporting was not performed.	No	Yes
2	A maintenance and reporting program for Bingham Creek Channel response actions has not been developed or implemented.	No	Yes
3	Land use controls have not been implemented (including finalization and approval by EPA Region 8 and UDEQ) by West Jordan and South Jordan Cities and Salt Lake County.	No	Yes
4	A cleanup goal has not been identified at OU1 for arsenic under recreational, open space, commercial or industrial land uses or for lead under a commercial land use.	No	Yes
5	It is unclear what arsenic and lead cleanup levels were achieved at the residential properties addressed under the 1991 Action Memorandum (Phase I).	Yes	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	No	Yes
Anaconda Tailings - Operable Unit No. 5			
1	Land use controls have not been implemented by Salt Lake County. In addition, reporting on land use control performance was not required but are necessary to ensure that Institutional Controls (ICs) are functioning.	No	Yes
2	A one acre sized uncapped/uncovered waste pile is present at the toe of the Large Bingham Reservoir dam. Arsenic and lead concentrations at the surface of this feature are unknown.	No	Yes
3	ARCO is not required to provide reports of their operation, monitoring and maintenance activities for the cap at their repository. Reporting is necessary to demonstrate and document that such activities are occurring between Five-Year Reviews.	No	Yes
4	Segments of the Bastian Ditch may still contain tailings.	No	Yes
5	A cleanup goal has not been identified at OU5 for arsenic under recreational, open space, commercial or industrial land uses.	No	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	No	Yes

Five-Year Review Summary Form, cont'd.

Recommendations and Follow-up Actions:

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current/	Future
Bingham Creek - Operable Unit No. 1							
1	Bingham Creek Channel annual inspection and reporting was not performed.	EPA will begin annual inspection of response actions in the channel and will prepare a report for the site files.	EPA	EPA/UDEQ	6/30/11	No	Yes
2	A maintenance and reporting program for Bingham Creek Channel response actions has not been developed or implemented.	EPA and UDEQ will coordinate with local authorities to define roles for this portion of the remedy.	EPA/ UDEQ	EPA/UDEQ	6/30/11	No	Yes
3	Land use controls have not been implemented (including finalization and approval by EPA Region 8 and UDEQ) by West Jordan and South Jordan Cities and Salt Lake County.	EPA will provide the Cities and County with mapping showing the location of wastes remaining in-place. The Cities and County will develop, formalize and implement land use controls for OU1.	EPA/ UDEQ	EPA/UDEQ	6/30/11	No	Yes
4	A cleanup goal has not been identified at OU1 for arsenic under recreational, open space, commercial or industrial land uses or for lead under a commercial land use.	Select appropriate cleanup levels and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/UDEQ	EPA/UDEQ	Spring 2011	No	Yes
5	It is unclear what arsenic and lead cleanup levels were achieved at the residential properties addressed under the 1991 Action Memorandum (Phase I).	Determine what arsenic and lead concentration standard the fifty properties under Phase I were remediated too.	UDEQ/EPA	UDEQ/EPA	12/31/10	Yes	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	Perform ARARs review and document in ESD.	UDEQ/EPA	UDEQ/EPA	Spring 2011	No	Yes

Recommendations and Follow-up Actions (cont'd):

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current/	Future
Anaconda Tailings - Operable Unit No. 5							
1	Land use controls have not been implemented by Salt Lake County. In addition, reporting on land use control performance was not required but is necessary to ensure that ICs are functioning.	Develop, formalize and implement land use controls for OU5 and report on their implementation and functionality.	UDEQ/EPA	EPA/UDEQ	6/30/11	No	Yes
2	A one acre sized uncapped/uncovered waste pile is present at the toe of the Large Bingham Reservoir dam. Arsenic and lead concentrations at the surface of this feature are unknown.	Develop a land use change restriction.	ARCO	EPA/UDEQ	6/30/11	No	Yes
3	ARCO is not required to provide reports of their operation, monitoring and maintenance activities for the cap at their repository. Reporting is necessary to demonstrate and document that such activities are occurring between Five-Year Reviews.	UDEQ will perform annual inspections and will document the condition of the remedy.	UDEQ	EPA/UDEQ	12/31/10	No	Yes
4	Segments of the Bastian Ditch may still contain tailings.	Develop a land use change restriction.	EPA/ UDEQ	EPA/UDEQ	6/30/11	No	Yes
5	A cleanup goal has not been identified at OU5 for arsenic under recreational, open space, commercial or industrial land uses.	Select appropriate cleanup levels and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/ UDEQ	EPA/UDEQ	Spring 2011	No	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	Perform ARARs review and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/ UDEQ	EPA/UDEQ	Spring 2011	No	Yes

Protectiveness Statement(s):

The following protectiveness statements apply to OU1 and OU5.

OU1

A protectiveness determination of the remedy at OU1 cannot be made at this time until further information is obtained. Further information will be obtained by determining what arsenic and lead concentration standards the fifty properties under the Phase I residential removal action were remediated to. It is expected that this additional information will be obtained by December 31, 2010, at which time a protectiveness determination will be made. In order for the remedy to be protective in the long-term, land use controls and annual inspections and maintenance of certain response actions required by decision documents must be fully implemented.

OU5

The remedy at OU5 currently protects human health and the environment through actions that isolate contaminants. However, in order for the remedy to be protective in the long-term, land use controls must be fully implemented.

Other Comments:

In order for land use controls to be fully implemented at OU1 and OU5, accurate mapping of waste or contaminated soils left in-place must be developed.

A. INTRODUCTION

A.1. Purpose of the Review

The purpose of Five-Year Reviews is to determine whether response actions at a site are protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and makes recommendations to address them.

A.2. Authority for Conducting the Five-Year Review

The U.S. Environmental Protection Agency (EPA) is preparing this second Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §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 five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

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

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

The response actions conducted at the Site resulted in Site conditions that do not allow for unlimited use and unrestricted exposure. Therefore a Five-Year Review is required by statute.

A.3. Who Conducted the Five-Year Review

The EPA Region 8 conducted the second Five-Year Review of response actions implemented at Kennecott South Zone Site Operable Units 1, 4, 5, 10 and 11 near the town of Copperton, Utah. This review was conducted from August 2009 through July, 2010. This report documents the results of the review.

HDR Engineering, Inc. (HDR) of Denver, Colorado was retained by EPA Region 8 to provide technical support during preparation of the Five-Year Review Report.

A.4. Other Review Characteristics

The status of response actions at the OUs addressed in this Five-Year Review varies and so the treatment of each OU also varies, as follows:

- OU1 Bingham Creek - This OU is in post-construction operation and maintenance (O&M) with wastes remaining in-place. Therefore, this OU is subjected to a full review including a protectiveness statement.
- OU4 Large Bingham Reservoir - Performance measures at this OU are limited to compliance with a Utah ground water permit. Therefore, the assessment is limited to degree of permit compliance.
- OU5 Anaconda Tailing - This OU is in post-construction O&M with wastes remaining in-place. Therefore, this OU is subjected to a full review including a protectiveness statement.
- OU10 Copperton Soil - Conditions at this OU allow for unrestricted land use. Therefore, no further five-year reviews are necessary and the assessment is limited to that subject.
- OU11 Bingham Canyon - All but three of the historic mining facilities comprising this OU have been either buried or subsumed by the open pit of the active mine operation. Therefore, the assessment is limited to this subject.

B. BINGHAM CREEK – OU1

B.1. Site Chronology

Table 1 summarizes the important events and relevant dates in the Site's chronology.

Table 1 - Chronology of Site Events

Date	Activity
Aug-90	PA/SI at Bingham Creek
May-91	Action Memo, Phase 1, removal action at residential areas along Bingham Creek, Fund-lead, excavate contaminated soils down to depth of 18" and replace with clean fill.
May-91	AOC, CERCLA-VIII-91-1 1, Kennecott agrees to build a soils repository and haul the excavated soils to their repository.
Dec-91	Completion of Phase 1 removal, cleanup of 52 residences. The interim removal action level is 2500 ppm lead in soils.
Jan-93	Action Memo, Phase 2, cleanup of the Bingham Creek Channel
Feb-93	UAOs issued to Kennecott and ARCO, CERCLA- VIII-93-10, removal of top 3 feet or more of contaminated sediments, haul contaminated sediments to repositories, regrade and revegetate channel.
Dec-95	Completion of Phase 2 removal. The removal action level is 2000 ppm lead in sediments.
Jun-95	Action Memo, Phase 3, cleanup of remainder of residences along Bingham Creek using final action level of 1100 ppm lead in soils.
Jul-95	UAO issued to ARCO, CERCLA- VIII- 95-19, excavation of contaminated soils down to maximum depth of 18", removal of soils to ARCO's repository, regrade with fill, and revegetate with sod for residences.
Dec-97	Completion of Phase 3 removal. The removal action level (final) was 1100 ppm lead in soils.
Sep-98	Record of Decision, No Further Action Required
Dec-98	RD/RA Consent Decrees with Kennecott and ARCO
Jun-04	First Five-Year Review
2005	Repair to erosional feature identified during the First Five-Year review.

B.2. Background

Location and Setting

Operable Unit 1 consists of the Bingham Creek Channel and surrounding historic floodplain. The up- and down-stream limits include the Kennecott Large Bingham Reservoir on the west to the Jordan River on the east, a distance of about 10 miles (See Map of OU1 in Appendix A). The creek course travels easterly from the Large Bingham Reservoir through Salt Lake County towards the Jordan River.

The OU is divided into the Bingham Creek Channel and Bingham Creek Residential Soils, which include certain residential developments in the floodplain.

Bingham Creek Channel:

The channel transects an eastward, gently-sloping alluvial plain that extends from the foot of the Oquirrh Mountains front to the Jordan River. Elevation ranges from 5,300 feet above sea level (ASL) at the Large Bingham Reservoir to 4,300 feet ASL at the confluence of the creek with the Jordan River.

The upper part of the creek channel is located on private land used for farming, mining, and industrial purposes. Portions of the lower part of the creek channel are located on public lands used for open space and recreation, but is bounded by suburban residential, commercial, industrial, and agricultural development. Other portions of the creek channel are located on privately owned residential property. In some cases, the creek has been rerouted in man-made ditches, channels, and culverts with suburban development occurring on the historic channel.

Bingham Creek is generally an intermittent, losing stream that flows only during peak runoff periods or during major storm events. However, as the channel progresses east of 3200 West, various springs discharge groundwater into the creek. In the lower creek section, Bingham Creek flows most of the year.

The channel course, over time, has meandered and overflowed during flood events that have been caused by natural and human-caused events. Historically, the creek has abandoned old channels and formed new channels spreading contaminated alluvial and waste materials across broad areas. The principal aquifer under the creek is recharged along the foothills of the Oquirrh Mountains and discharges downgradient at the Jordan River. Ground water is being addressed as part of another operable unit (OU2).

Bingham Creek Residential Soils:

The Bingham Creek Residential Soils area consists of certain residential development areas in the floodplain of Bingham Creek. Located in the cities of South Jordan and West Jordan, numerous residences were built on the floodplain or over historic channels.

Since most of the historic flow of the creek was diverted by early farmers and ranchers, some creek-borne contaminants were also found near irrigation ditches. Neighborhoods affected include Jordan View Estates, Meadow Green, Fahnian Ranchettes, Vista West, Sugar Factory, and Brookside. Approximately 125 individual residences were addressed as part of three removal actions. Most of these residences were located within 2 blocks of the creek channel.

Site History and Extent of Contamination

During the early days of mining, wastes from mining and mineral processing (mine dumps, mill tailings, and smelter slag) were dumped directly into Bingham Creek or stored adjacent to the creek where they were subject to erosion and transport to the creek. Mining wastes contained elevated levels of lead and arsenic.

Over the years, especially during flood events, these mining and processing wastes washed downstream where they were deposited in creek channels and floodplain.
Lands traversed by Bingham Creek were originally agricultural, but with the growth of Salt Lake City suburbs, several residential neighborhoods were built along the creek, on floodplains, and over historical creek channels.

Concentrations of arsenic and lead found in the Bingham Creek channel in a residential area averaged 202 milligrams per kilogram (mg/Kg) and 5,661 mg/Kg, respectively.

Baseline Risk Assessment

Human Health:

The summary of site risks in the OU1 ROD included the following conclusions:

- A strong relationship exists between arsenic and lead concentrations in soil with arsenic levels about 4% of lead concentrations.
- Other contaminants such as cadmium were present at low levels, below any plausible residential risk-based concentration for soils.
- An evaluation of lead concentrations in soil and clean-up levels was made with the intent of being protective under a residential land use scenario. A range of values were developed using the Integrated Exposure Uptake Biokinetic Model. The following Site-specific parameters were used to help make a risk management decision for the cleanup values.
    - Bioavailability of lead in soil using a juvenile swine model.
    - Relationship between the concentration of lead in soil and house dust.
    - Exposure frequency and duration.
    - Garden vegetable uptake of metals from soil.
- Arsenic was also evaluated and a value was selected that would be protective under a residential land use scenario. This value was developed using the Site-specific measurements listed above under the discussion of lead.

Regulators and Stakeholders developed cleanup goals. In the development of these cleanup goals there were many issues considered including an extensive blood lead and urinary arsenic study conducted in the area.

The range of lead and arsenic concentrations proposed for the cleanup goal was presented to a delegation of Bingham Creek residents at a public meeting. Reasons for uncertainties were explained and residents preferred the clean-up values of 1,100 mg/Kg for lead and 100 mg/Kg for arsenic. As a result, final lead and arsenic cleanup levels were established for residential land use, including vacant land within residential neighborhoods.

Vacant lands outside residential areas were evaluated on the basis of current and future land use. As discussed in Section B.3., response actions conducted in these vacant lands (Bingham Creek channel), employed a lead cleanup level of 2,000 mg/Kg. The ROD concluded that this cleanup level was sufficiently protective for open space, recreational and industrial land uses.

Ecological Risk:

At the time of the ROD the majority of Kennecott South Zone, including OU1, had land uses that provided relatively little habitat for wildlife where meaningful contact with hazardous constituents would occur. Thus, a qualitative ecological risk evaluation was performed as part of a Phase III Endangerment Assessment. In addition, Kennecott conducted a site-wide ecological risk assessment for areas of the larger Kennecott South Zone and North Zone which have substantial wildlife habitat. Although wildlife occasionally visits the area, the land is not primarily wildlife habitat.

Bingham Creek is generally an intermittent, losing stream that flows only during peak runoff periods or during major storm events. However, as the channel progresses east of 3200 West, various springs discharge groundwater into the creek. In the lower creek section, Bingham Creek flows most of the year.

The 1998 OU1 ROD states that "the creek serves mainly as a drainage ditch and does not support aquatic life." Aquatic impacts in the Jordan River are possible following storm events or floods. The Jordan River is not covered under the OU1 decision documents and impacts there were not evaluated. Thus, EPA concluded in the OU1 ROD that there are no actual or threatened releases from OU1 (as well as OU 4, 5, 10, 11 and 17) that pose a present or potential future threat to the environment.

B.3. Response Actions

Decision Documents and Responsible Party

The Kennecott South Zone Site (including OU1) was proposed for the National Priorities List (NPL) on January 18, 1994. Utah Department of Environmental Quality (UDEQ) and EPA withdrew the proposal to list the Kennecott South Zone Site on the NPL in 2008.

In September 1995, the UDEQ, EPA and Kennecott entered into a Memorandum of Understanding (MOU). Pursuant to the terms of the MOU, Kennecott agreed to complete numerous cleanup projects for both the South Zone and nearby Kennecott North Zone Site. Upon Kennecott's completion of the cleanup projects, EPA agreed to take no further action related to final listing of the sites.

On July 2, 2008 EPA Region 8 issued, with concurrence from UDEQ, a request to EPA Headquarters to withdraw the proposed listing of the South Zone Site. Notice within the Federal Register in early September signifies the South Zone's withdrawal.

The following summarizes decision documents and the responsible parties' specific to OU1.

Bingham Creek Channel:

Contaminated tailings were removed from Bingham Creek channel and a number of road crossings and utility corridors were cleaned up in accordance with a January 1993 Action Memorandum. Kennecott and ARCO participated in portions of this work under provisions of the following Orders:

- Unilateral Administrative Order (UAO), Docket No. CERCLA-VIII-93-10, February 18, 1993
- Administrative Order on Consent (AOC), CERCLA VIII 92-01, 1992

Bingham Creek Residential Soils:

Surface soils contaminated with mining wastes were excavated and removed from residential properties in the Bingham Creek floodplain in accordance with May 1991 and June 1995 Action Memoranda. Kennecott and ARCO participated in portions of this work under provisions of the following Orders:

- AOC, Docket No. CERCLA-VIII-91-11, May 20, 1991.
- UAO, CERCLA VIII-95-19 July 21, 1995 (amended October 31, 1995).

A ROD was issued in 1998 for OU1 (as well as other OUs in the Kennecott South Zone). The ROD selected No Further Action. However, as discussed below in the Summary of Response Actions, O&M and other activities are required under the Action Memoranda after the date of the ROD.

Summary of Response Actions

All response actions at OU1 were conducted as time critical removal actions and include.

Bingham Creek Channel:

- Remove mine wastes containing lead over 2,000 mg/Kg to a minimum depth of three feet from Large Bingham Reservoir dam to the downstream side of Brookside Trailer Park.
- Cover remaining contamination and re-contour the creek bed.
- Remove mine wastes from road and utility creek crossings.
- Haul excavated wastes to Kennecott Bluewater Repository or Anaconda Tailings (OU5).

Bingham Creek Residential Removal:

- Excavate soil from 52 properties containing lead above 2,500 mg/Kg and from 75 properties containing lead above 1,100 mg/Kg to a maximum depth of 18-inches and replace with clean soil (conducted in 1991 and 1995-7, respectively).
- Haul excavated wastes to Kennecott Bluewater Repository or Anaconda Tailings (OU5).

Based on UDEQ review of site files, it remains uncertain whether the 52 properties described above were ultimately subjected to further removal action(s) to meet the final lead standard of 1,100 mg/Kg and the arsenic standard of 100 mg/Kg. This is discussed further in sections B.6, B.7 and B.8.

At the time of the ROD, the lower portion of Bingham Creek drainage, located in the Jordan River floodplain was (and still is) used for agriculture, ranching, and industry with no plans to develop this area for residential use. The City of West Jordan is obligated under the Action Memoranda to manage this area through land use planning, zoning, and building permit authorities.

Operation, Maintenance, Monitoring and Reporting

Various documents in the administrative record identify the need for, or an obligation for, local governments or private parties to inspect and maintain response actions and to prepare report on such activities as part of the long-term supervision and operation of the remedy.

The responsibilities, responsible party and controlling document(s) include:

Annual Inspection and Maintenance of the Bingham Creek Channel:

- A January 28, 1993 Action Memorandum states that "*it is anticipated that State, City and County governments will be involved to ensure long-term maintenance of the response action".*
- 1992 AOC with ARCO required inspection and repairs to response actions in the channel for five-years. The 2004 Five-Year Review Report stated that the five-year maintenance period had recently expired and that Salt Lake County had assumed the responsibility for repairs to the channel (as well as the implied need to inspect the channel for necessary repairs). The County accepted responsibility to ensure long-term control over land redevelopment through their existing ordinances and other land use controls in a November 4, 1998 letter to EPA and UDEQ.
- The 2004 Five-Year review Report states that *"in the future, the channel itself will be inspected by EPA contractors (on an annual basis)".*

Based on these statements, it appears that annual inspection of the channel since at least 2004 is the responsibility of EPA and Salt Lake County has agreed to maintain land use controls. The level of compliance with these obligations is discussed in Section B.6. Although the 2004 Five-Year review identified the County as responsible for repairs to the channel, the County has not formally been asked to accept this responsibility.

Control of Land Uses (Bingham Creek and Residential Soils):

- A November 4, 1998 letter from Salt Lake County to EPA and UDEQ identifies the County as responsible for long-term management of properties cleaned-up in unincorporated areas of the County. Management is to include use of existing county ordinances involving land use planning, zoning, and building permits.

- The 1998 OU1 ROD states that the Cities of West Jordan and South Jordan have agreed to supervise long-term management of the site using existing authorities for land use planning, zoning and building permits.
- The 2004 Five-Year Review Report reiterated the responsibilities of the Cities discussed in ROD and explained that the City of West Jordan has received a Brownfields Grant to design a long-term plan for Lower Bingham Creek and nearby areas.

Based on these statements, the Cities of West Jordan and South Jordan have been responsible for land use controls within city limits at least since the last Five-Year Review. Salt Lake County has similar responsibilities for unincorporated portions of OU1. Level of compliance with these obligations is discussed in Section B.6.

B.4. Progress Since Last Five-Year Review

The First Five-Year Review included the following protectiveness statement:

> *"The remedy at OU1 is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled."*

Only one issue was identified during the last Five-Year Review (2004). It involved an erosion gully located where drainage from Trans Jordan Landfill access road and Route 111 discharges into Bingham Creek. Trans Jordan Landfill in cooperation with South Jordan City and Kennecott agreed to make the repair.

Based on a communication with Doug Bacon of UDEQ, the repair was completed before the end of 2005 and involved installation of a new drainage culvert and riprap. Photo Nos. 28-30 in Appendix B illustrates the post-repair condition.

Based on discussions with West Jordan and South Jordan Cities, as well as Utah Transit Authority (UTA), certain development planning and infrastructure construction activities have occurred since the last Five-Year Review. These include:

- West Jordan instituted a soils ordinance within the past year requiring developers to enlist in UDEQs Voluntary Cleanup Program (VCP) if there is contamination known or detected on the property intended to be redeveloped. However, the ordinance is undergoing revision and the existing ordinance has not been reviewed by EPA or UDEQ.
- South Jordan described a "hazardous Geologic Map" that is in development by the city engineering department. This map reportedly will illustrate "sensitive land areas" within the city to support land use controls. However, EPA and UDEQ have not been involved in the development of this document or other activities related to land use controls.
- UTA is constructing a Light Rail project in West Jordan traversing portions of OU1 and incorporating the historic Union Pacific rail line not previously addressed during removal actions. UDEQ has been providing oversight of this project.

B.5. Five-Year Review Process

Administrative Components

This is the second Five-Year Review for OU1. The Five-Year Review was led by Rebecca Thomas, EPA Project Manager. The following Team Members participated in the review:

- Doug Bacon, UDEQ Remedial Project Manager
- Scott Everett, UDEQ Toxicologist
- David Allison, UDEQ Community Involvement Coordinator

EPA Contractors:

- Kenneth Napp, HDR Engineering, Inc.

This Five-Year Review consisted of the following activities: a review of relevant documents, a site inspection and meeting with representatives of EPA, UDEQ and Kennecott. The schedule for the review was extended through March 2010.

Community Notification and Involvement

A display ad to announce the Five-Year Review and to invite public input was published in the Salt Lake Tribune and Deseret News on Oct. 2, 2009 and in the West Valley Journal on Oct. 15, 2009.

Superfund community involvement staff from UDEQ conducted interviews with various Kennecott South Zone stakeholders during the period, September to December, 2009. These interviews are valuable to the five-year review process. Respondents provide their views regarding the Kennecott South Site cleanup and its continued protectiveness. Often, EPA and UDEQ discover new information from these interviews to be considered in the five-year review. A summary of the interviews is provided as Appendix C.

Document Review

In performing this Five-Year Review, the following documents were reviewed:

- First Five-Year Review Report, Kennecott South Zone OU3 Butterfield Canyon Creek, Herriman Residential and Agricultural lands, OUs 6, 7, 17 and 18, September 30, 2009.
- Letter from EPA to Masters at Mountain View Development Company regarding requirements to ensure development is consistent with the OU1 remedy. April 8, 2009.
- First Five-Year Review Report for Kennecott South Zone OU1, 4, 5, 10, 11, 17, prepared by EPA, June 2004.
- Preliminary Remediation Goals for Addressing Risks to Human Health from Exposure to Chemicals in Kennecott Soil, prepared by EPA, December 1999.

- Letter from Salt Lake County to EPA regarding long-term management of Bingham Creek properties. November 4, 1998
- EPA Record of Decision, Kennecott (South Zone) OU1, November 3, 1998.
- Action Memorandum for a Time-Critical Removal Action at the Bingham Creek Channel – Phase Two Site. January 28, 1993.

The following individuals provided supplemental technical information:

- Rebecca Thomas - EPA
- Doug Bacon - UDEQ

Data Review

No analytical or other data relevant to this Five-Year Review was collected during the review period. Analytical data collection was not required under the remedy. Annual inspections and other elements of the institutional control portion of the remedy that might have resulted in reports or data were not performed as discussed in Section B.6.

Site Inspection

The Site Inspection was performed on July 25, 2009, by the following personnel:

- Rebecca Thomas, EPA Remedial Project Manager
- Doug Bacon, UDEQ Remedial Project Manager
- Dave Allison, UDEQ Community Relations
- Brian Vinton, North American Mine Services Inc.(contractor to Kennecott Utah Copper)

The purpose of the Site Inspection was to observe current Site conditions and remedy elements. The Site Inspection consisted largely of a drive-by tour of the most readily observable portions of the Bingham Creek Channel from the Jordan River, upstream to the Anaconda Tailings (OU5).

Where observed, the stream banks appeared heavily vegetated with no obvious erosional features. The channel itself is approximately 10 miles long and so observation of the entire channel was not possible during a one-day Site inspection. As discussed in Section B.3., the remedy for OU1 includes an annual inspection of the entire channel by EPA as well as Salt Lake County.

Portions of the residential area of OU1 subjected to response actions to address contaminated yard soils were also observed from roadways during the Site visit. Other than a residential development under construction (2690 West 8410 South in West Jordan), all properties observed appeared in good condition and were well maintained. As discussed in Section B.6., the new residential development is being constructed consistent with the OU1 remedy.

Additional site visits were made by Doug Bacon, the UDEQ Project Manager during the period from September to December 2009. One of these visits (December 1, 2009) was made to address specific questions about the site condition that arose during the preparation of this report.

Portions of the Bingham Creek channel that were not seen during the July 25, 2009 Site Inspection were observed by UDEQ personnel on October 6 and December 1, 2009. The condition of the channel appeared to be good, including the response actions that left mine waste in-place. Photographs of the channel and surrounding lands taken on July 25 and December 1, 2009 are provided as Photo Nos. 1-10 in Appendix B.

In addition, two development activities have occurred since the first Five-Year Review. These include:

- UTA light rail project in West Jordan.
- Masters at Mountain View development at 2690 West 8410 South in West Jordan.

The UTA and Masters at Mountain View projects are being constructed with oversight by UDEQ and EPA, respectively.

B.6. Technical Assessment

Question A: Is the Remedy Functioning as Intended by the Decision Documents?

No, the remedy is not functioning as intended by the decision documents.

The decision documents for the Site include:

- 1991 Action Memorandum (Phase I - Bingham Creek Channel Response Action)
- 1993 Action Memorandum (Phase II - Residential Response Action)
- 1995 Action Memorandum (Phase III - Residential Response Action)
- 1998 OU1 ROD

Remedy elements identified in decision documents are summarized below. An assessment of remedy element functionality is also provided.

1. Bingham Creek channel covered wastes.

   This response action was constructed in accordance with the 1991 Action Memorandum. Its condition at the time of the July 25, 2009 Site Inspection (and during subsequent observations made by UDEQ) appeared good with stable and heavily vegetated banks. As discussed below under Item No.2, annual inspections of the channel have not been formally conducted by EPA since the last Five-Year Review. However, the channel condition observed during this Five-Year Review shows that this remedy element is functioning as intended.

2. Maintenance, Monitoring and Reporting of Bingham Creek channel covered wastes.

Based on information summarized in Section B.3., annual inspections (and reporting) must be performed, with EPA currently holding the position of responsibility. Salt Lake County accepted responsibility to ensure long-term control over land redevelopment through their existing ordinances and other land use controls in a November 4, 1998 letter to EPA and UDEQ.

Based on the information available, such inspections, maintenance and reporting have not been performed on a regular basis. Therefore, this remedy element is not functioning as intended in the 1993 Action Memorandum and as described in the First Five-Year Review.

3. Bingham Creek Residential Removal.

This response action was constructed in accordance with the 1993 and 1995 Action Memoranda. Under the response actions, contaminants of concern in soil present above action levels identified in the Action Memoranda were removed to a depth of 18-inches and replaced with clean fill. Therefore, the response action will remain functioning as intended under the Action Memoranda unless the clean backfill is breached such that contaminants above action levels (if any) are present at the surface.

Although the response actions were conducted in accordance with the Action Memoranda (and therefore may be functioning as intended), it is not clear from the site files whether all properties ultimately were cleaned to the final arsenic standard of 100 mg/Kg or the final lead standard of 1,100 mg/Kg. This is due to an inconsistency in the lead action level required in the Action Memoranda for the Phase I removal action (2,500 mg/Kg) and the Phase II and III removal action (1,100 mg/Kg).

The OU1 ROD identifies the appropriate action level for lead in a residential setting as 1,100 mg/Kg. Therefore, if the Phase I residential cleanup achieved a lead standard of 2,500 mg/Kg, this portion of the remedy would not be functioning as intended by the ROD.

This is discussed further in sections B.7 and B.8.

4. Bingham Creek Land Use Controls.

Based on information summarized in Section B.3., land use controls on incorporated and unincorporated portions of OU1 are the responsibility of the Cities and County, respectively. These controls may, for example, regulate future development or residential homeowner activities such as excavations. Although documents reviewed for this report indicate the Cities and County have accepted

the responsibility, interviews with city officials indicate that land use controls have not been formalized and therefore, are not fully implemented.

It is also possible that the Cities and County do not possess accurate mapping to show the locations of waste remaining in-place. Therefore, this remedy element is not functioning as intended by the decision documents.

Interviews with the Cities and County and various recent site inspections indicate that, with one exception, no dwellings or other buildings have been constructed in OU1 since the last Five-Year Review. The single exception is the Masters at Mountain View development located at 2690 West 8401 South in West Jordan. This development is occurring with EPA involvement to ensure the development is consistent with the remedy. In addition, UTA is constructing light rail in West Jordan City. This work is being conducted under oversight from UDEQ and is being implemented consistent with the remedy.

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

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

Exposure Assumptions and Toxicity Data

Cleanup levels set in the OU1 ROD are similar (and generally lower) to those adopted for identical land uses at several OUs in the Kennecott South Zone that underwent a Five-Year Review in 2009 (September 30, 2009). These include OU3 Herriman Residential & Agricultural Lands. At this OU, residential arsenic and lead cleanup levels are 100 mg/Kg and 1,200 mg/Kg, respectively. The cleanup levels for these chemicals in the OU1 ROD for residential land use are 100 mg/Kg and 1,100 mg/Kg.

Given the similarity in residential cleanup levels for lead and arsenic between OU3 and OU1, certain conclusion regarding the current protectiveness of these cleanup levels published in the OU3 Five-Year Review were incorporated into the following discussion.

Human Health

Changes in Exposure Pathways:

The OU1 ROD set cleanup levels for arsenic and lead for developed and undeveloped residential lands. It also established the adequacy of lead levels previously used in response actions in open space, recreational and industrial lands at the Kennecott South Zone Site.

However, an arsenic cleanup goal was not identified in the ROD for open space, recreational or industrial land uses. Therefore, a cleanup goal should be set for an exposure scenario involving arsenic and these land uses. In addition, the potential exists for commercial land uses in OU1.

No cleanup levels were set for this land use in OU1. Therefore, cleanup levels should be set for a commercial worker exposure pathway.

Changes in Toxicity, and Other Contaminant Characteristics:

There have been no changes in toxicity factors or characteristics for contaminants of concern (COCs) that were used to develop cleanup levels.

Changes in Risk Assessment Methods:

There has been no change to standardized methodology that could affect the protectiveness of response actions.

Expected Progress Towards Meeting RAOs:

Because past removal actions were designed to achieve final remedial cleanup goals, no further action was selected as the remedy for OU1 and no RAOs were identified.

Ecological Assessment:

EPA concluded in the OU1 ROD that there are no actual or threatened releases from OU1 (as well as OU 4, 5, 10, 11 and 17) that pose a present or potential future threat to the environment. Therefore, ecological impacts were not considered further in this Five-year review.

Cleanup Levels

ARAR-Based Cleanup Levels:

Site cleanup levels are risk-based concentrations. However, all ARARs including any potential ARAR-based cleanup levels will be evaluated for the entire Kennecott Site as part of the development of an Explanation of Significant Differences (ESD) that will pertain to all RODs except OU2. This evaluation is expected to be completed in the spring of 2011.

Risk-Based Cleanup Levels:

Surface Soils/Mine Waste:

Risk-based cleanup levels were identified in the OU1 ROD as well as subsequent documents related to remedial design. These risk-based cleanup levels include:

1. Arsenic - A cleanup level of 100 mg/Kg was established for residential land use only. This standard is generally still adequate to ensure protectiveness for public health and the environment. No arsenic cleanup level was established for other land uses including recreational, open space, commercial or industrial. Therefore, a cleanup level should be set for an exposure scenario involving arsenic and these land uses.

2. Lead - A cleanup level of 1,100 mg/Kg was established for residential land use and a cleanup level of 2,000 mg/Kg was established for open space, recreational and industrial lands. This standard is generally still adequate to ensure protectiveness for public health and the environment. No lead cleanup level was established for commercial land use

which is a plausible future land use at OU1. Therefore, a cleanup level should be set for an exposure scenario involving lead and this land use.

Review of existing cleanup levels and establishment of arsenic and lead cleanup levels for land uses discussed above will be documented in the ESD to be completed in the spring of 2011.

Other ARARs

Since no further response action was required under the 1998 ROD (unless redevelopment proposals are submitted), EPA did not list any federal or state ARARs under the ROD for continued remedial work.

All ARARs will be evaluated for the entire Kennecott Site during preparation of the ESD discussed above.

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 during the Five-Year Review that could call into question the current protectiveness of the remedy.

Technical Assessment Summary

According to the information collected and reviewed, the physical response actions are functioning as intended by decision documents. However, some inspection, maintenance, and land use control elements of the response actions are not functioning as intended by decision documents.

B.7. Issues

Based on information collected during this Five-Year Review Report, the following issues are identified in Table 2:

Table 2 - Issues for OU1

Item No.	Issues	Affects Current Protectiveness	Affects Future Protectiveness
1	Bingham Creek Channel annual inspection and reporting was not performed.	No	Yes
2	A maintenance and reporting program for Bingham Creek Channel response actions has not been developed or implemented.	No	Yes
3	Land use controls have not been implemented (including finalization and approval by EPA Region 8 and UDEQ) by West Jordan and South Jordan Cities and Salt Lake County.	No	Yes
4	A cleanup goal has not been identified at OU1 for arsenic under recreational, open space, commercial or industrial land uses or for lead under a commercial land use.	No	Yes
5	It is unclear what arsenic and lead cleanup levels were achieved at the residential properties addressed under the 1991 Action Memorandum (Phase I).	Yes	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	No	Yes

B.8. Recommendations and Follow-Up Actions

The recommendations and follow-up actions for the issues are summarized below in Table 3:

Table 3 - Recommendations and Follow-Up Actions for OU1

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current/	Future
1	Bingham Creek Channel annual inspection and reporting was not performed.	EPA will begin annual inspection of response actions in the channel and will prepare a report for the site files.	EPA	EPA/UDEQ	6/30/11	No	Yes
2	A maintenance and reporting program for Bingham Creek Channel response actions has not been developed or implemented.	EPA and UDEQ will coordinate with local authorities to define roles for this portion of the remedy.	EPA/UDEQ	EPA/UDEQ	6/30/11	No	Yes
3	Land use controls have not been formalized (including finalization and approval by EPA Region 8 and UDEQ) by West Jordan and South Jordan Cities and Salt Lake County.	EPA will provide the Cities and County with mapping showing the location of wastes remaining in-place. The Cities and County will develop, formalize and implement land use controls for OU1.	EPA/UDEQ	EPA/UDEQ	6/30/11	No	Yes
4	A cleanup goal has not been identified at OU1 for arsenic under recreational, open space, commercial or industrial land uses or for lead under a commercial land use.	Select appropriate cleanup levels and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/UDEQ	EPA/UDEQ	Spring 2011	No	Yes
5	It is unclear what arsenic and lead cleanup levels were achieved at the residential properties addressed under the 1991 Action Memorandum (Phase I).	Determine what arsenic and lead concentration standard the fifty properties under Phase I were remediated too.	EPA/UDEQ	EPA/UDEQ	12/31/10	Yes	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	Perform ARARs review and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/UDEQ	EPA/UDEQ	Spring 2011	No	Yes

B.9. Protectiveness Statement

A protectiveness determination of the remedy at OU1 cannot be made at this time until further information is obtained. Further information will be obtained by determining what arsenic and lead concentration standards the fifty properties under the Phase I residential removal action were remediated to. It is expected that this additional information will be obtained by December 31, 2010, at which time a protectiveness determination will be made. In order for the remedy to be protective in the long-term, land use controls and annual inspections and maintenance of certain response actions required by decision documents must be fully implemented.

B.10. Next Review

The Site requires ongoing Five-Year Review in accordance with CERCLA § 121 (c). The next five-year review for the Site will be performed no later than September 2015, five-years from the date of this review.

C. ANACONDA TAILINGS - OU5

C.1. Site Chronology

Table 4 summarizes the important events and relevant dates in the Site's chronology.

Table 4 - Chronology of Site Events

Date	Activity
Jan-93	UAO issued to ARCO, for EE/CA and removal (CERCLA VIII 93-06)
1997	Completion of response action
Sep-98	ROD
Dec-98	RD/RA Consent Decree with ARCO
1998-2003	Annual O&M reports submitted to EPA
Jun-04	First Five-Year Review.

C.2. Background

Location and Setting

Anaconda Tailings, also known as Copperton Tailings, ARCO Copperton Tailings and Utah-Apex Tailings, consists of approximately 3.5 million tons of lead, arsenic, zinc, and silver-bearing, fine grained sediments consolidated into a repository comprising 41 acres adjacent to Bingham Creek (See Map of OU5 in Appendix A). Land use is industrial/mining and since response actions have been completed, is used for open space. The nearest residential neighborhood is Copperton, about 3/4 mile away. The site is fenced and is not accessible to the general public.

Operable Unit 5 also includes Bastian Ditch which originates in the vicinity of Anaconda Tailings and roughly follows Utah Highway 111 southward nearly to the location of Butterfield Creek. The ditch is no longer in use. However, remnants can be seen along the south side of Anaconda Tailings and on Kennecott lands south of Anaconda Tailings. Current land use along the ditch is industrial and agricultural and the nearest residential neighborhood is Copperton, 3/4 mile away (at northern end of the ditch).

Site History and Extent of Contamination

Anaconda Tailings Impoundment:

Anaconda Tailings Site was originally a tailings pond constructed in 1914 to trap tailings produced by Utah Apex and Bingham New Haven Mills upstream in Bingham Canyon. Tailings were sluiced to the site via flumes. The pond allowed most tailings to settle out. Water, containing acids, heavy metals, and residual tailings, was then sent back to Bingham Creek or used by farmers for irrigation. Erosion, seepage and tailwaters from the tailings created contamination along Bingham Creek as well as in Bastian Ditch, discussed below.

There was approximately 1.3 to 1.5 million cubic yards of tailings present on the site. Average arsenic and lead concentrations were found to be 394 mg/Kg and 6,244 mg/Kg, respectively. Concentrations of lead at percent levels were found frequently at depth in the tailings.

Tailings showed some acid generating potential and evidence of some migration of metals in the acidic zone was found. However, deeper tailings samples showed neutralizing potential. During an investigation of the original tailing impoundment, subsurface soil and ground water provided no evidence of impacts to ground water from the site.

Ground water quality in the area is poor due to a sulfate and metals plume associated with upgradient sources. Groundwater is being addressed under a 2000 ROD.

Bastian Ditch:

The Bastian Ditch was constructed in the 1880's when water was diverted from Bingham Creek near the Oquirrh foothills to the Bastian Sink vicinity. The ditch conveyed irrigation waters to ranch and farm land south of Bingham Creek and ultimately carried water as far south as Copper Creek. The ditch captured tailings (originating from the Anaconda Tailings) that entered the creek upstream of the diversion. Ditch remnants could be seen along the south side of Anaconda Tailings and on Kennecott lands south of Anaconda Tailings.

Subsequent sampling showed scattered elevated lead values in the southern extension of the ditch system.

Baseline Risk Assessment

See Section B.2.

C.3. Response Actions

Decision Documents and Responsible Party

See Section B.3. for a general discussion of NPL status and enforcement history.

Tailings deposited in Bastian Ditch were removed by Kennecott and ARCO on their respective lands (west of Route 111) in accordance with decision documents under provisions of the following Orders:

- UAO, CERCLA VIII 93-06, January 15, 1993.
- AOC, CERCLA VIII 98-09, 1998.

Anaconda Tailings were consolidated and capped by ARCO in accordance with Decision Documents under provisions of the following Order:

- UAO, CERCLA VIII 93-06, January 15, 1993.

ARCOs obligations under the 1993 administrative order have been satisfied. Further, EPA and ARCO entered into a consent decree resolving ARCO's liability for the Bingham Creek Channel (OU 1); the Anaconda/ARCO Tailings (OU 5); and the Bastian Ditch and Bastian Sink (OU 17). See Consent Decree between the United States of America and Atlantic Richfield Company, Civil Action No. 2:95-cv-0698 entered by the U.S. District Court on December 16, 1999 ("ARCO CD").

There are no outstanding financial assurance issues.

A ROD was issued in 1998 for OU5 (as well as other OUs in the Kennecott South Zone). The ROD selected No Further Action. However, as discussed below in the Summary of Response Actions, O&M and other activities are required under Action Memoranda after the date of the ROD.

Summary of Response Actions

All response actions at OU5 were conducted as time critical removal actions and include.

Anaconda Tailings Impoundment:

- Consolidate tailings containing lead at or above a concentration of 2,000 mg/Kg from a 96-acre parcel on OU5 as well as soils excavated from ARCO projects along Bingham Creek to a repository on the western end of OU5. The repository is situated on 41 acres of the original 96 acre site.
- Cap consolidated mine wastes with a high-density polyethylene liner, clay, and vegetated soils.

- Install run-off and run-on controls, including a retention basin designed to withstand a 100-year storm event.

Bastian Ditch:

- Excavate mine wastes and either place them in the repository described above or transport to Bluewater Repository.

Operation, Maintenance, Monitoring and Reporting

ARCO agreed to perform long-term maintenance of the capped repository. There are upgradient and downgradient ground water monitoring wells to insure the cap is effective in prevention of leaching.

However, the requirement for five-years of ground water monitoring (under the 1993 UAO) was satisfied at the time of the first Five-Year Review. In addition, Salt Lake County agreed to use its authorities in land use planning, zoning, and building permits to insure cap integrity is not compromised.

The Site inspection (Section C.5.) indicated that maintenance of the capped facility is occurring. However, the lack of reporting requirements precludes any document review associated with cap maintenance.

C.4. Progress Since Last Five-Year Review

The First Five-Year Review included the following protectiveness statement:

> *"The remedy at OU5 is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled."*

No issues were identified in the first Five-Year Review requiring resolution.

Since the first Five-Year Review, ARCO has been conducting regular inspections of response action features in OU5. However, no reporting has been performed.

C.5. Five-Year Review Process

Administrative Components and Community Notification and Involvement

See Section B.5.

Document Review

- Action Memorandum for a Time-Critical Removal Action at the ARCO Tailings Site, Salt Lake County, Utah. August 5, 1993.

Also see Section B.5.

Data Review

No analytical or other data relevant to this Five-Year Review was collected during the review period.

Site Inspection

Two Site Inspections were performed on July 25, and November 18, 2009, by the following personnel:

- Rebecca Thomas, EPA Remedial Project Manager
- Doug Bacon, UDEQ Remedial Project Manager
- Dave Allison, UDEQ Community Relations
- Brian Vinton, North American Mine Services Inc.(contractor to Kennecott Utah Copper)
- Steve Anderson, Anderson Engineering (contractor to ARCO)

The Site inspection of OU5 was limited due to inaccessibility of the capped repository (locked gate), which was observed from a distance. Therefore, Doug Bacon of UDEQ conducted a more thorough inspection of OU5 on November 18, 2009. The purpose of the inspection was to visually verify stability of the repository cap, successful growth of vegetation, and condition of run-on/run-off controls.

The inspection revealed that the repository and cap are stable. There were no visible gullies or erosional cuts in the cap surface. Photographs of the repository taken on July 25 and November 18, 2009 are provided as Photo Nos. 11-26 in Appendix B. There were a few minor gopher holes located along the southern repository boundary just east of the run-off control ditch. Depth of gopher holes could not be determined, but no visible tailings were seen. Vegetative cover on the repository cap is primarily grasses, with a few rabbit brush or sage plants.

Run-off control ditches (surrounding the repository) were vegetated and showed very little signs of use. Precipitation that percolates through the soil cover and to the gravel drainage blanket above the repository clay layer is directed towards drainage ditches. Water then is directed to a sediment basin designed to withstand the maximum flood event for this area. The sediment basin, its emergency overflow channel and drainage pipe were all in good condition.

Although the July 25th Site Inspection was limited, one feature of interest was noted. A one-acre pile of consolidated and uncapped wastes was present at the toe of Large Bingham Reservoir dam. Concentrations of arsenic and lead at the surface of this pile reportedly are not known. This feature is identified on a Map of OU5 presented in Appendix A and in Photo No. 27 in Appendix B.

C.6. Technical Assessment

Question A: Is the Remedy Functioning as Intended by the Decision Documents?

No, the remedy is not functioning as intended by the decision documents.

Site decision documents include:

- 1993 Action Memorandum
- 1998 OU1 ROD

Remedy elements identified in decision documents are summarized below. An assessment of remedy element functionality is also provided.

1. Condition of Response Action

   Based on the results of the Site Inspection, the cap and surface water control features are in good condition. Therefore, this remedy element is functioning as intended.

   The suspected uncharacterized one-acre area of consolidated material just east of the Large Bingham Reservoir Dam is of potential concern. Although the site is currently secured, knowledge of chemical concentrations at the surface would be helpful during development of land use controls discussed below.

2. Land Use Controls

   Based on information summarized in Section C.3., land use controls on OU5 are the responsibility of Salt Lake County.

   Although documents reviewed for this report indicate the County has accepted responsibility, interviews with County officials indicate that land use controls have not been formalized and are not fully implemented. It is also likely the County does not possess accurate mapping to show locations of waste remaining in-place. Therefore, this remedy element is not functioning as intended by decision documents.

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

Human Health:

Changes in Exposure Pathways:

These have been no changes in land use or potentially exposed populations. Therefore, there have no changes in exposure pathways.

Changes in Toxicity, and Other Contaminant Characteristics:

There have been no changes in toxicity factors or characteristics for COCs that were used to develop cleanup levels.

Changes in Risk Assessment Methods:

There has been no change to standardized methodology that could affect protectiveness of the response action.

Expected Progress Towards Meeting RAOs:

Because past removal actions were designed to achieve final remedial cleanup goals, no further action was selected as the remedy for OU5 and no RAOs were identified.

Ecological Assessment:

EPA concluded in the OU1 ROD that there are no actual or threatened releases from OU5 (as well as OU 1, 4, 10, 11 and 17) that pose a present or potential future threat to the environment. Therefore, ecological impacts were not considered further in this Five-Year Review.

Cleanup Levels:

ARAR-Based Cleanup Levels:

Site cleanup levels are risk-based concentrations. However, all ARARs including any potential ARAR-based cleanup levels will be evaluated for the entire Kennecott Site as part of the development of an ESD that will pertain to all RODs except OU2. This evaluation is expected to be completed in the spring of 2011.

Risk-Based Cleanup Levels:

Surface Soils/Mine Waste:

The 1993 Action Memorandum identified 2,000 mg/Kg lead as the concentration above which mine wastes at OU5 were consolidated and capped. The 1998 ROD recognized this concentration as protective for open space, recreational and industrial land uses.

Given that there have been no changes to exposure pathways, toxicity or risk assessment methods that would affect calculation of a lead cleanup goal, this standard is generally still adequate to ensure protectiveness for public health and the environment under recreational, open space and industrial land uses.

No arsenic cleanup level was established for OU5. Therefore, a cleanup level should be set for arsenic under recreational, open space and industrial land uses. Review of existing cleanup levels and establishment of an arsenic cleanup level for recreational use will be documented in the ESD discussed above.

Other ARARs:

Since no further response action was required under the 1998 ROD (unless redevelopment proposals are submitted), EPA Region 8 did not list any federal or state ARARs under the ROD for continued remedial work.

All ARARs will be evaluated for the entire Kennecott Site during preparation of the ESD discussed above.

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

It is suspected that portions of Bastian Ditch containing tailings deposits were not subjected to response actions. These may include, but are not limited to:

- Where Route 111 crosses the ditch
- Where the ditch crosses the Trans-Jordan Landfill
- Segments south of 11800 South

These and other segments of the ditch are candidates for ICs that would include land use controls to minimize the possibility of unacceptable human exposure to COCs.

No other information has come to light during the Five-Year Review that could call into question current protectiveness of the remedy.

Technical Assessment Summary

According to information collected and reviewed, physical response actions are functioning as intended by decision documents. However, land use control portions of response actions are not functioning as intended by decision documents. In addition, ARCO is not required to provide reports of their operation, monitoring and maintenance activities for the cap at their repository. Reporting (including reports on cap stability) is necessary to demonstrate and document that such activities are occurring between Five-Year Reviews.

C.7. Issues

Based on the information collected during this Five-Year Review Report, the following issues are identified in Table 5:

Table 5 - Issues for OU5

Item No.	Issues	Affects Current Protectiveness	Affects Future Protectiveness
1	Land use controls have not been implemented by Salt Lake County. In addition, reporting on land use control performance was not required but is necessary to ensure that ICs are functioning.	No	Yes
2	A one acre sized uncapped/uncovered waste pile is present at the toe of the Large Bingham Reservoir dam. Arsenic and lead concentrations at the surface of this feature are unknown.	No	Yes
3	ARCO is not required to provide reports of their operation, monitoring and maintenance activities for the cap at their repository. Reporting is necessary to demonstrate and document that such activities are occurring between Five-Year Reviews.	No	Yes
4	Segments of the Bastian Ditch may still contain tailings.	No	Yes
5	A cleanup goal has not been identified at OU5 for arsenic under recreational, open space, commercial or industrial land uses.	No	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	No	Yes

C.8. Recommendations and Follow-Up Actions

The recommendations and follow-up actions for the issues are summarized below in Table 6:

Table 6 - Recommendations and Follow-Up Actions for OU5

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current/	Future
1	Land use controls have not been implemented by Salt Lake County. In addition, reporting on land use control performance was not required but is necessary to ensure that ICs are functioning.	Develop, formalize and implement land use controls for OU5 and report on their implementation and functionality.	EPA/UDEQ	EPA/UDEQ	6/30/11	No	Yes
2	A one acre sized uncapped/uncovered waste pile is present at the toe of the Large Bingham Reservoir dam. Arsenic and lead concentrations at the surface of this feature are unknown.	Develop a land use restriction.	ARCO	EPA/UDEQ	6/30/11	No	Yes
3	ARCO is not required to provide reports of their operation, monitoring and maintenance activities for the cap at their repository. Reporting is necessary to demonstrate and document that such activities are occurring between Five-Year Reviews.	UDEQ will perform annual inspections and will document the condition of the remedy.	UDEQ/ARCO	EPA/UDEQ	12/31/10	No	Yes
4	Segments of the Bastian Ditch may still contain tailings.	Develop a land use restriction.	EPA/UDEQ	EPA/UDEQ	6/30/11	No	Yes
5	A cleanup goal has not been identified at OU5 for arsenic under recreational, open space, commercial or industrial land uses.	Select appropriate cleanup levels and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/UDEQ	EPA/UDEQ	Spring 2011	No	Yes
6	ARARs have not been reviewed as part of this Five-Year Review.	Perform ARARs review and document in an ESD to be prepared for the entire Kennecott Site (except for OU2).	EPA/UDEQ	EPA/UDEQ	Spring 2011	No	Yes

C.9. Protectiveness Statement(s)

The remedy at OU5 currently protects human health and the environment through actions that isolate contaminants. However, in order for the remedy to be protective in the long-term, land use controls must be fully implemented.

C.10. Next Review

The Site requires ongoing Five-Year Review in accordance with CERCLA § 121 (c). The next five-year review for the Site will be performed by September 2015, five-years from the date of this review.

D. OTHER OPERABLE UNITS

The following sections of this report provide a brief discussion of the status of OUs 4, 10, and 11.

D.1. Large Bingham Reservoir - OU4

The current Large Bingham Reservoir replaced leaking and unlined reservoirs retired in 1991(See Map of OU4 in Appendix A). The exiting facility is triple lined and impounds storm water and mineral extraction process water and other waters managed by Kennecott Utah Copper in the South Zone. The performance of this facility is monitored through a Utah Ground water Permit (UGW 350006). Permit compliance involves meeting hydraulic head limitations in the reservoirs as well as ground water quality as measured in downgradient monitoring wells. Permit compliance is the only performance measure for OU4.

Based on a December 2, 2009, email from Dan Hall of UDEQ Division of Water Quality, Kennecott is in compliance with UGW 350006 for the Large and Small reservoirs of Bingham Canyon. The permit is up for renewal at the end of 2010.

D.2. Copperton Soils - OU10

Historical photographs revealed that the eastern end of the town of Copperton was constructed on a tailings deposit (See Map of OU10 in Appendix A). However, the 1998 ROD explained that the concentrations of hazardous substances were low and well beneath action levels for residential property.

Therefore, conditions at this OU allow for unrestricted use and no further five-year reviews of this OU are required.

D.3. Bingham Canyon - OU11

The Bingham Canyon OU consists of multiple historic mining sites located within the active Kennecott mine operation (See Map of OU11 in Appendix A). Some of these historic mine sites were at one time considered candidates for active cleanup. However, since the first Five-Year Review in 2004, all but three of the inventoried historic mining sites have been buried or subsumed by the open pit of the active mine operation. A report entitled "Oquirrh Mountain Mining and the Environment" by Dr. Eva Hoffman of USEPA (2005), provides the following site descriptions

The Yellow Cake Plant (facility ID #83) was located on property owned by Energy Fuels in the 1980s (until the property was acquired by Kennecott Utah Copper). The process was a uranium recovery plant that treated effluent from Kennecott's Precipitation Plant with an ion-exchange circuit. The plant was closed in 1989. In the early 90's Kennecott instructed the operator to remove everything from the property. The cleanup was performed by Energy Fuels Nuclear Inc., supervised by UDEQ's Division of Radiation Control and observed by Kennecott.

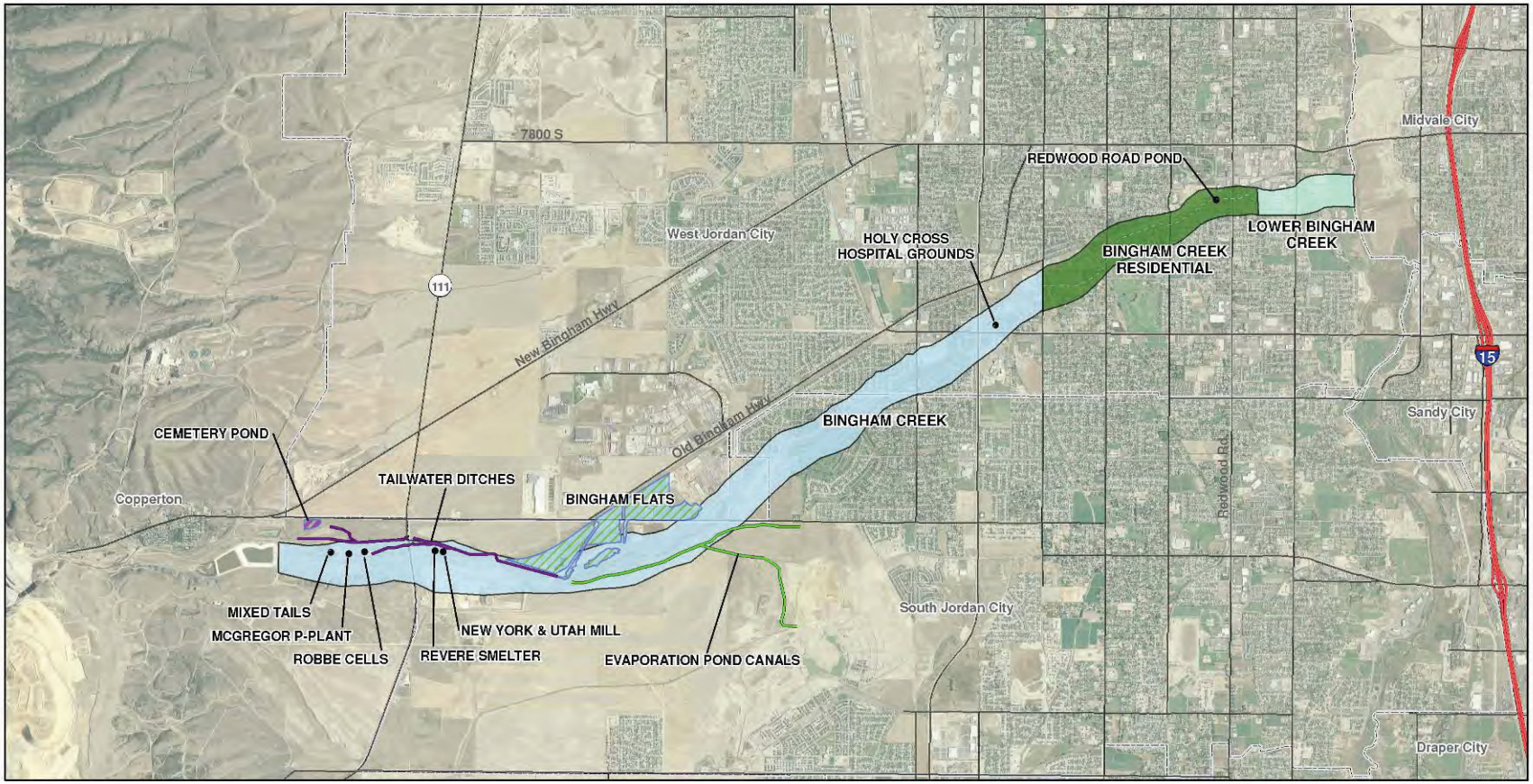
As noted in the 2005 report, the site is suitable for unrestricted land use and currently is the location for a materials storehouse operated by Kennecott.

The Lead Mine Mill (facility ID #1) was built in 1883 and operated until it burned in 1896. The milling process included the grinding and crushing of lead, silver and gold ores. A pyretic smelter was then erected at the site and operated until 1901. Kennecott reported to EPA that during operations the mill processed 70,000 tons of lead, silver and gold ore leaving approximately 46,667 tons of tailings containing at least 1400 tons of lead (Kennecott 104e, 1991). Due to the site being buried under the Precipitation Plant site, the site was closed out in the Bingham Creek ROD. The Lead Mine Mill will fall under the scope of the characterization and land use controls development actions being pursued by Kennecott at the Precipitation Plant site (OU24). Kennecott Utah Copper intends to negotiate land use controls (through an environmental covenant) with the Agencies under the pending North Zone & South Zone Consent Decree.

The C.W.Watson's Jig (facility ID #40.14) was located in the vicinity of the current Kennecott Utah Copper Precipitation Plant. The jig was used to collect placer gold in Bingham Creek Canyon in the early 1890s. The water and probable feed used by the jig was flumed from a tunnel (Watson) located 2,000 feet up gradient in Bingham Creek Canyon. In 1903 the site was used by Utah Copper Company for tailings storage. The Bingham Creek ROD gave the site a No Further Action status from CERCLA response action because of the site's inaccessibility or non-existence. The site does exist but is only accessible to mine workers.

The forthcoming ESD will evaluate the status of all historic features.

Appendix A - Maps



OU1

- BINGHAM CREEK
- BINGHAM CREEK RESIDENTIAL
- LOWER BINGHAM CREEK
- BINGHAM FLATS
- CEMETERY POND
- EVAPORATION POND CANALS
- TAILWATER DITCHES
- HISTORIC SITE/ WASTE STORAGE LOCATION

Note: All areas and sites are in approximate location.

N

0 4,000 8,000 Feet

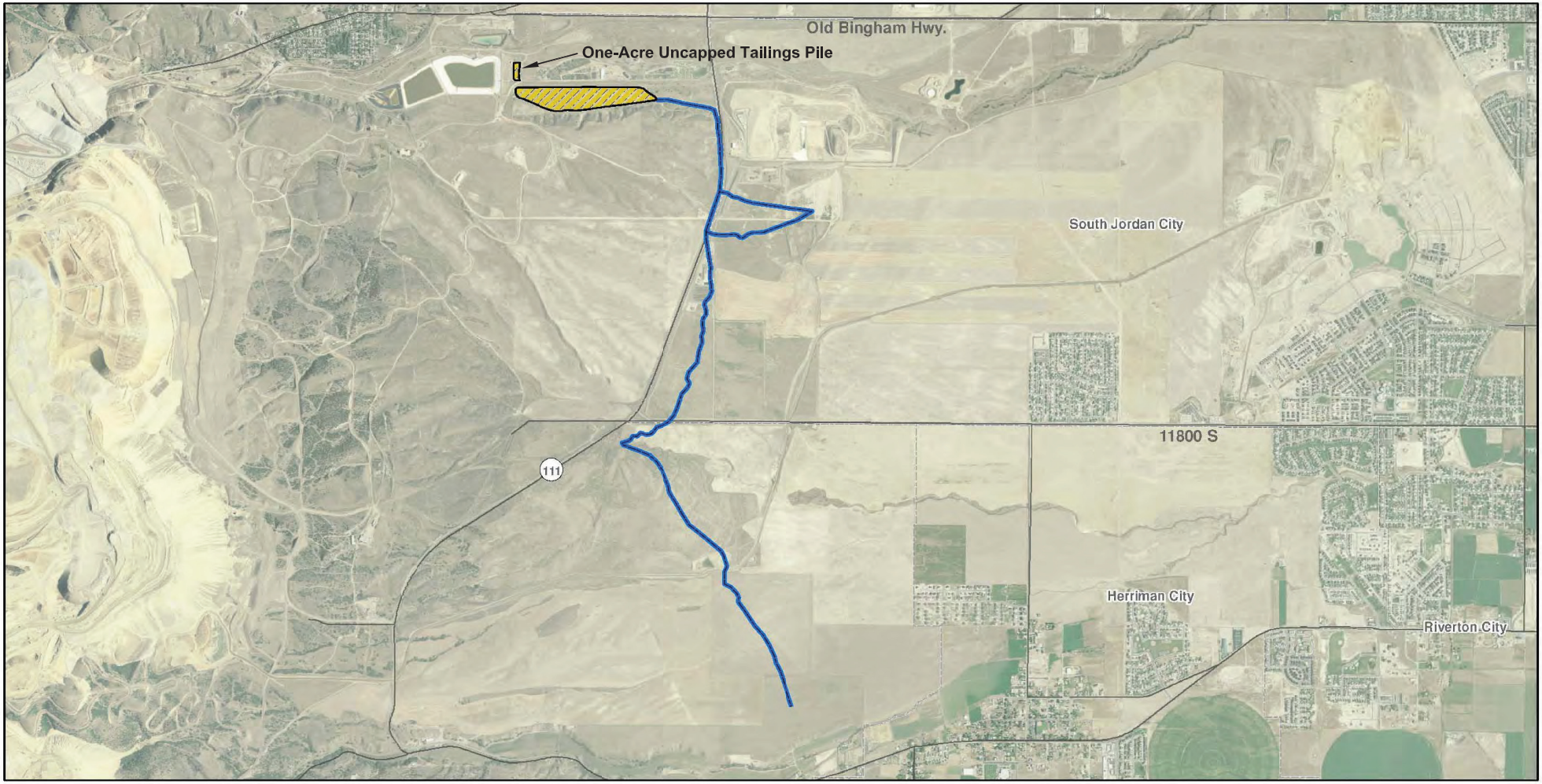
RioTinto

KENNECOTT SOUTH ZONE
OPERABLE UNIT 1
BINGHAM CREEK

ENVIRONMENTAL RESTORATION GROUP

Drawing Number: OU1_72309

Date: 7/09
Drawn By: JI
Project Mgr: BV
Rev:



OU5

ANACONDA (ARCO) TAILINGS (APPROXIMATE LOCATION)

BASTIAN DITCH (APPROXIMATE LOCATION)

N

0 3,000 6,000 Feet

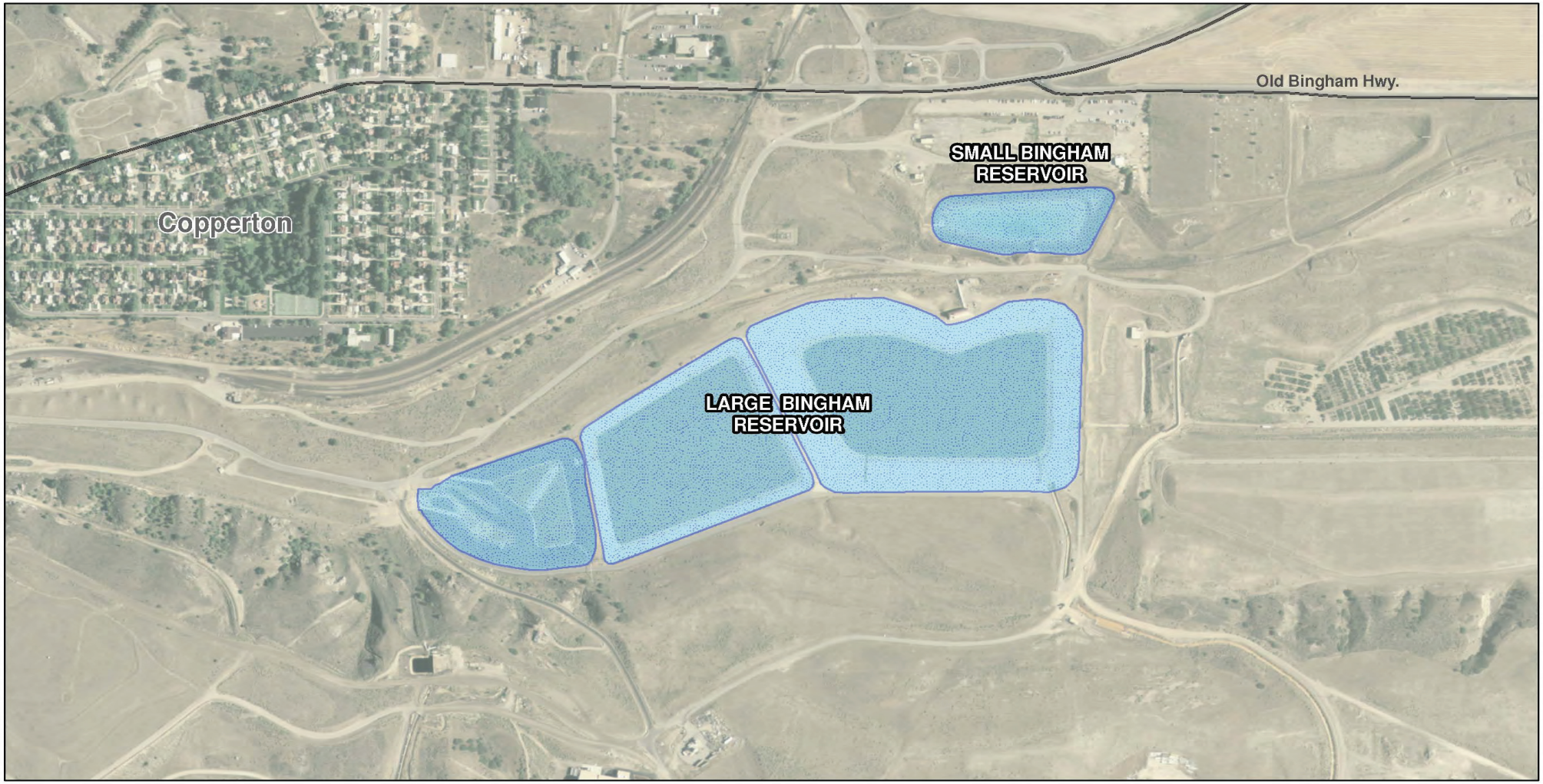
Rio Tinto

KENNECOTT SOUTH ZONE
OPERABLE UNIT 5
ARCO TAILINGS - BASTIAN DITCH

ENVIRONMENTAL
RESTORATION GROUP

Drawing Number: OU5_72309

Date: 7/09
Drawn By: JI
Project Mgr: BV
Rev:



OU4 - LARGE BINGHAM RESERVOIR

N

0 500 1,000 Feet

RioTinto

KENNECOTT SOUTH ZONE
OPERABLE UNIT 4
LARGE BINGHAM RESERVOIR

ENVIRONMENTAL RESTORATION GROUP

Drawing Number: OU4_72309

Date: 7/09
Drawn By: JI
Project Mgr: BV
Rev:

OU10 - COPPERTON SOILS
(APPROXIMATE LOCATION)

N

0 500 1,000
Feet

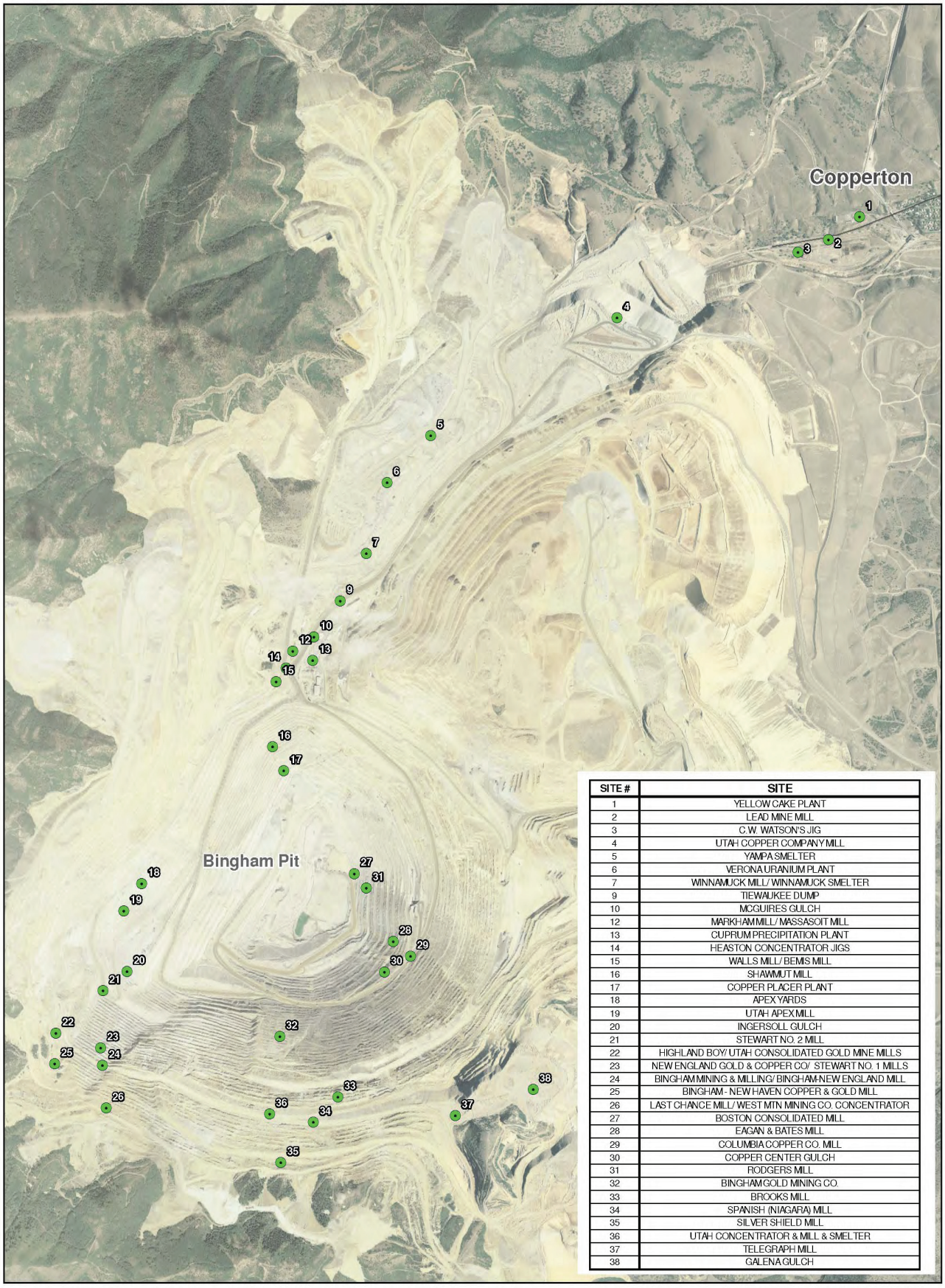
Rio Tinto

KENNECOTT SOUTH ZONE
OPERABLE UNIT 10
COPPERTON SOILS

ENVIRONMENTAL
RESTORATION GROUP

Drawing Number: OU10_72309

Date: 7/09
Drawn By: JI
Project Mgr: BV
Rev:



SITE #	SITE
1	YELLOW CAKE PLANT
2	LEAD MINE MILL
3	C.W. WATSON'S JIG
4	UTAH COPPER COMPANY MILL
5	YAMPA SMELTER
6	VERONA URANIUM PLANT
7	WINNAMUCK MILL/ WINNAMUCK SMELTER
9	TIEWAUKEE DUMP
10	MCGUIRES GULCH
12	MARKHAM MILL/ MASSASOIT MILL
13	CUPRUM PRECIPITATION PLANT
14	HEASTON CONCENTRATOR JIGS
15	WALLS MILL/ BEMIS MILL
16	SHAWMUT MILL
17	COPPER PLACER PLANT
18	APEX YARDS
19	UTAH APEX MILL
20	INGERSOLL GULCH
21	STEWART NO. 2 MILL
22	HIGHLAND BOY/ UTAH CONSOLIDATED GOLD MINE MILLS
23	NEW ENGLAND GOLD & COPPER CO/ STEWART NO. 1 MILLS
24	BINGHAM MINING & MILLING/ BINGHAM-NEW ENGLAND MILL
25	BINGHAM - NEW HAVEN COPPER & GOLD MILL
26	LAST CHANCE MILL/ WEST MTN MINING CO. CONCENTRATOR
27	BOSTON CONSOLIDATED MILL
28	EAGAN & BATES MILL
29	COLUMBIA COPPER CO. MILL
30	COPPER CENTER GULCH
31	RODGERS MILL
32	BINGHAM GOLD MINING CO.
33	BROOKS MILL
34	SPANISH (NIAGARA) MILL
35	SILVER SHIELD MILL
36	UTAH CONCENTRATOR & MILL & SMELTER
37	TELEGRAPH MILL
38	GALENA GULCH

OU11 - BINGHAM CANYON HISTORIC FACILITIES
(APPROXIMATE LOCATIONS)

N

0 1,000 2,000
Feet

Rio Tinto

KENNECOTT SOUTH ZONE
OPERABLE UNIT 11
BINGHAM CANYON
HISTORIC FACILITIES

ENVIRONMENTAL RESTORATION GROUP

Drawing Number: OU11_72309

Date: 7/09
Drawn By: JI
Project Mgr: BV
Rev:

Appendix B - Site Photographs

Photo No.1 – Lush vegetation on banks of Bingham Creek (OU1) approximately 1 mile upstream of confluence with Jordan River. View to East.

Photo No.2 – Bingham Creek channel 1300 West, view to the west.

Photo No.3 – Bingham Creek channel 1300 West, view to the east.

Photo No.4 – Bingham Creek channel 2200 West, view to the east.

Photo No.5 – Bingham Creek channel 2700 West, view to east.

Photo No.6 – Bingham Creek channel near 2700 West, view to the west.

Photo No.7 – Bingham Creek channel 2700 West, view to the east.

Photo No.8 – View of north bank of Bingham Creek (OU1) at 4000 West. View to West.

Photo No.9 – Bingham Creek channel just 4400 West, view to the east.

Photo No.10 – Bingham Creek channel near 4400 West, view to the west.

Photo No. 11 –Bingham Creek Channel located north of OU5 and east of OU4 (Kennecott's Large Bingham Reservoir). This section of the Creek depicts conditions in the channel from OU5 to about 4000 West.

Photo No.12 – ARCO Tailings Repository (OU5). View to South.

Photo No.13 – ARCO Tailings Repository (OU5). View to Southeast.

Photo No.14 –Panoramic view of the eastern end of OU5. In the foreground is the run-on/run-off sedimentation basin and in the distance are the Oquirrh Mountains. The photo was taken from the emergency spill way of the basin looking west toward the OU5 tailings repository.

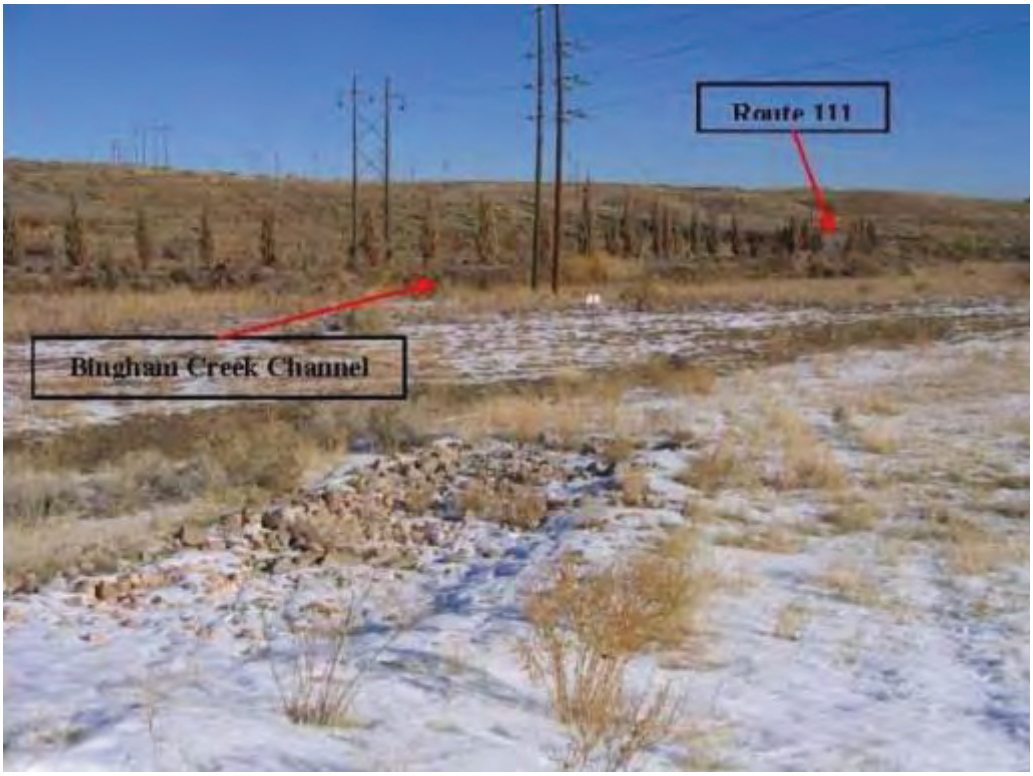


Photo No.15 - Spillway release channel (rip-rap) leading from the sedimentation towards the modern day channel of Bingham Creek. Route 111 is in the distance through the access road to Progressive Nursery.

Photo No.16 – Top of the emergency spillway of the sedimentation basin of OU5, and along the northern embankment (in the near distance) is the vertical drainage pipe.

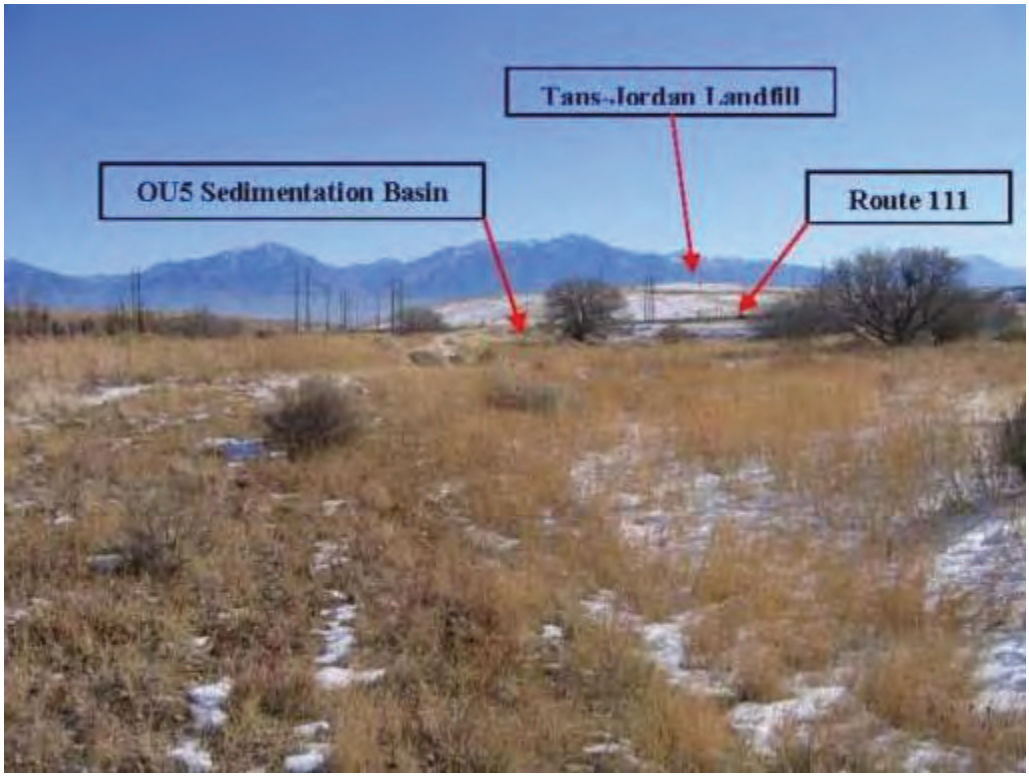


Photo No.17 – Northern run-off ditch used to direct precipitation from the repository to the sedimentation basin. .

Photo No.18 – Top and east slope of repository. The top of the repository is sloped to the south/southeast. The slope was stable, with very little erosional activity along it.

Photo No.19 – Monitoring wells, completed at different depths. These wells are located approximately at the northeast corner of the tailings repository at OU5.

Photo No.20 –Run-off control ditch that runs parallel to the southern boundary of the repository.

Photo No.21 – Southern run-off ditch as it straightens and heads north to connect to the north run-off ditch. This ditch is underlain by HDPE liner with rip-rap over the top.

Photo No.22 –Top surface of the tailings repository at OU5 (near the center of the approximate 41 acre repository).

Photo No. 23 – Top surface of the tailings repository (looking west). The photo was taken to document the planting rows still visible from the revegetation efforts in 1997. 12 years have expired since the revegetation effort and these rows help to document the stability of the cap on the repository.

Photo No. 24 – Northern embankment of the tailings repository at OU5 (view is to the west toward Bingham Canyon). Visible are some of the planting rows along the surface of the embankment.

Photo No. 25 –Northern embankment of the tailings repository at OU5 (view is to east). Though this slope appears not to be well vegetated, in the spring low lying grasses spring up with new growth.

Photo No. 26 - Northern embankment of the tailings repository at OU5 viewed from the northwest corner.

Photo No. 27 – Located on land whose ownership is not known currently (due east of Kennecott's Large Bingham Reservoir Zone 2 Dam) are piles of mixed soils with unknown characteristics. The land is about 1 acre in size and is within Kennecott secured property. The location of this feature is illustrated on a map provided in Appendix A.

Photo No. 28 - Area of the repaired erosional cut along Rt. 111 as it is today.

Photo No. 29 - Area of the buried drainage pipe leading off to Bingham Creek Channel (after Repair).

Photo No. 30 – View up Bingham Canyon illustrating the extent of encroachment of mine waste deposits. All historic facilities in this are (OU11) have been buried by mine waste deposits. View to West.

Appendix C - Summary of Community Interviews

Utah Department of Transportation
REGION 2
2010 South 2760 West
Salt Lake City, Utah 84104
801-975-4900

Reed Soper, Mountain View Corridor
Environmental Project Manager
Ed Rock, HDR Deputy Program Manager

November 19, 2009

BINGHAM CREEK FIVE-YEAR REVIEW QUESTIONS

1) What is your current knowledge of the Bingham Creek cleanup actions? The Utah Department of Transportation said its discovery and Phase I process located areas of concern while coordinating with local agencies during planning of the Mountain View Corridor freeway system. The Mountain View Corridor freeway system is located in western Salt Lake and northwestern Utah County traveling across an upper section of the Bingham Creek cleanup area. The Mountain View corridor will service 13 municipalities and will begin construction in late spring/early summer of 2010 on a 15-mile segment between 5400 South and Redwood Road (at approximately 16000 South).

To ensure construction activities do not interfere with communities, UDOT follows guidelines in accordance with the National Environmental Policy Act (NEPA). UDOT said UDEQ and EPA have reviewed the Environmental Impact Statements (EIS) during planning stages. Air quality was the primary environmental topic of concern.

2) Are there any concerns UDOT has regarding long term protectiveness of the remedy for properties where soils with elevated contaminants of concern (COCs) were left in place either at depth or at the surface? UDOT officials did not have any health or environmental concerns as construction plans will occur in a phased approach and will not involve subsurface digging into capped areas for some time (Phase I). UDOT will construct one lane frontage roads on top of capped areas where the freeway will eventually be built. Construction activities within areas of the Bingham Creek would not take place until Phase II when the freeway is constructed and pylons are buried for support. Any excavation requires permits and triggers mechanisms (in-house) to address any subsurface soil contamination in the future.

At this time, UDOT did not foresee any construction scenario which would require removal and disposal of large amounts of contaminated soil. UDOT said they would coordinate all activities with UDEQ and EPA as necessary. There is a 20–year completion schedule depending on how quickly funds are available. Also, all required safety and management plans (developed in house) are observed to protect workers onsite and surrounding communities.

3) Do you have any additional comments, suggestions or questions regarding the clean up? No additional comments were provided and contact information was exchanged for future dialogue and questions regarding the Bingham Creek cleanup areas.

Interviews conducted by Dave Allison and Doug Bacon, UDEQ.

South Jordan City
1600 W. Towne Center Dr. (10610 S.)
South Jordan, Utah 84095
(801) 254-3742 phone
Gary Whatcott, Assistant Manager/Municipal Services
Don Bruey, Public Works Director
Ana Paz, Associate Engineer
Jeremy Nielson, Deputy City Engineer
October 27, 2009

BINGHAM CREEK FIVE-YEAR REVIEW QUESTIONS

1) What is your current knowledge of the Bingham Creek (OU1) cleanup actions? South Jordan is aware of cleanup occurring in the upper portions of the Bingham Creek west of the City in undeveloped portions of South Jordan. Despite growing development interest in South Jordan there is no development plans in or near the Bingham Creek cleanup areas other than: 1) a proposed trail system near 4500 West and 9600 South, a location south of the Bingham Creek corridor, and 2) Mountain View Corridor, a UDOT road project. South Jordan wants to coordinate and link its trail system with one planned for the Daybreak area by Kennecott Land in the future.

2) Are there any concerns South Jordan City has regarding long term protectiveness of the remedy for properties where soils with elevated contaminants of concern (COCs) were left in place either at depth or at the surface? South Jordan did not have any health or environmental concerns as cleanup areas were located in undeveloped areas of the City. Also the city is not planning any immediate development near the Bingham Creek cleanup locations and no community concerns were ever raised over the last five years.

South Jordan does not have a formal Institutional Control process or reporting mechanism in place since the cleanup occurred in undeveloped areas. South Jordan said any development precautions would fall within the South Jordan building permit process. A hazardous Geologic Map is in development by the city Engineering Department to track any sensitive land areas in South Jordan for the future.

There are projects the City watches closely (but is not necessarily involved with) which may impact the Bingham Creek remedy areas. As noted above under #1, a major highway, the Mountain View Corridor, is planned for the west side of the Salt Lake Valley and within city limits of South Jordan which crosses the Bingham Creek Channel. Also the UTA Light Rail extension is in development which could impact areas of cleanup.

3) Do you have any knowledge of any actions or events that may have caused for a reduction of the protectiveness of the remedy? South Jordan has heard in stakeholder meetings the County and Kennecott Land have plans for an extensive park and trails system along the Bingham Creek Channel corridor in the near future. South Jordan expects the cleanup areas would be accounted for during development and consideration

made to trail and park locations in coordination with known soil characteristics in the Channel.

4) Do you have any additional comments, suggestions or questions regarding the clean up? South Jordan would appreciate more open dialogue with Kennecott Land and Salt Lake County concerning information on the status of parks and trails. South Jordan City would also like more information on areas that were cleaned up.

Interviews conducted by Dave Allison and Doug Bacon, UDEQ.

West Jordan City
8000 S. Redwood Rd.
West Jordan, Utah 84088
Phone: (801) 569-5070

Nate Nelson, City Engineer
Dave Murphy, Capital Improvement Projects
Bill Bailey, Building Official
September 10, 2009

BINGHAM CREEK FIVE-YEAR REVIEW QUESTIONS

1) What is your current knowledge of the Bingham Creek (OU1) cleanup actions? With the cleanup completed in 1999, West Jordan's primary role over the last five years was focus on maintaining the integrity of the cleanup areas. West Jordan City was involved with Phase I and II of the cleanup and the majority of residential properties. West Jordan is currently growing and experiencing development interest and has transportation light rail construction ongoing within areas of the Bingham Creek operable unit. Though noted was development interest, the City was not aware of any large development projects since the last five years within the site. The Engineering Department has experienced members on staff who worked on the cleanup with institutional knowledge of the cleanup activities.

2) Do you have any *personal* concerns regarding the clean up? Are you aware of any *community* concerns? No one expressed any health or environmental concerns from the cleanup. The City only receives a rare community inquiry with property or home transactions. The City is confident cleanup areas are well documented and development procedures are place (though not formally accepted by the Agencies) to maintain the remedy.

3) Are there any concerns West Jordan City has regarding long term protectiveness of the remedy for properties where soils with elevated contaminants of concern (COCs) were left in place either at depth or at the surface? Anyone developing or utility work occurring within sensitive areas is coordinated via permits through the City of West Jordan's engineering department. West Jordan City expressed a need to work with EPA and UDEQ to approve their Institutional Control ordinances and program. West Jordan is confident the building review process and requirements for testing (if necessary) are universally applied for all proposed developments. West Jordan has developed a GIS overlay map with a residential grid to keep track of the properties that were originally cleaned up.

4) Did West Jordan adopt an Institutional Controls Plan the City had drafted and if so, please explain how the plan continues to be implemented? West Jordan has documented the cleanup areas and instituted a soils ordinance a year ago to deal with cleanup areas. West Jordan's soil ordinance requires developers to enlist in the Utah Department of Environmental Quality's (UDEQ) Voluntary Cleanup Program (VCP). However, a revised ordinance has yet to be approved by the City's Planning and Zoning

Commission as well as UDEQ and EPA. West Jordan felt this could be done quickly as draft language is developed just not formally approved.

5) Do you have any knowledge of any actions or events that may have caused for a reduction of the protectiveness of the remedy? The only area of concern for the city is the Utah Transportation Authority (UTA) Light Rail project for West Jordan. Consistent coordination is required within the cleanup zone and the City is reliant upon timely reporting from UTA. West Jordan assumes UDEQ oversight is involved with the UTA to prevent a release or note any soil disposal actions.

6) Does West Jordan City have records on their maintenance activities for the area?

West Jordan said they have all of the closure remediation reports associated with the cleanup available to the public as well as residential property clean letters on file.

7) Do you have any additional comments, suggestions or questions regarding the clean up? No additional comments other than scheduling future meetings with EPA and UDEQ to finalize language for their soil ordinance plan.

8) Does West Jordan City know of anyone else that the Agencies should interview? West Jordan suggested coordinating with Salt Lake County and also could provide some residential contacts for interviews**.**

Interviews conducted by Dave Allison and Doug Bacon, UDEQ.

Steve Anderson, Anderson Engineering (ARCO's Contractor)
Chuck Stillwell, ARCO
Utah Department of Environmental Quality
168 North 1950 West
Salt Lake City, Utah 84116

August 6, 2009

BINGHAM CREEK FIVE-YEAR REVIEW QUESTIONS

1) What is your current knowledge of the Bingham Creek (OU1) and Anaconda Tailings (OU5) cleanup actions? Anderson Engineering was contracted by the Atlantic Richfield Company (ARCO) to address portions of the cleanup of Operable Units (OU) 1 and all of OU5. ARCO's work in Bingham Creek Phase III included approximately 76 properties in the Jordan View Estates, Meadow Green, Fahnian Ranchettes, Vista West, Sugar Factory, and Brookside areas. ARCO was also involved with portions of the Bingham Creek Channel cleanup work (Bingham Creek Phase II and lower Bingham Creek). OU5 involved the Anaconda (ARCO) Tailings repository located adjacent to Bingham Creek. ARCO still has the responsibility to perform long-term maintenance of the capped repository.

Removal Actions were conducted in 1995 by ARCO to address the problems associated with mining wastes beginning with the streambed channels of Bingham Creek and over flow areas. ARCO cleaned up the streambed to 2500 ppm lead soils and came back in following years to do some repair and energy reduction work to avoid erosion.

Chuck Stillwell, ARCO Project Manager, and Steve Anderson of Anderson Engineering, were on hand for all of the removal work at OU1 and OU5. As residential properties became the focus, ARCO removed all soils above 1100 ppm lead and 100 ppm arsenic, down to 18-inches in depth with clean top soil on approximately 76 properties.

2) Do you have or know of any community concerns? Anderson said the project went smoothly, with no difficulties and nothing has changed the remedy. The only recent follow up activities include maintenance of the capped repository located in OU5 and monitoring inspections. Mr. Anderson and Mr. Stillwell were not aware of evidence documenting negative impacts to the protectiveness of the remedial action at this time. Recently the community has not presented or discussed with either ARCO or Anderson Engineering any health or environmental concerns. A year after the cleanup was completed Anderson received an occasional call regarding property transactions and provided (upon request) data from the previous sampling program. No Further Action/Clean Letters were provided to every property owner whose property was cleaned up to the prescribed remedy.

3) In your opinion, do you have any knowledge of actions or events that may have caused for a reduction of the protectiveness of the remedy? Other than some minor repair work in some areas a few years ago no reason has risen to suspect the remedy is

not functioning at OU1. As for OU-5, ARCO knows of no events causing maintenance issues at the capped repository and associated migration controls. Mr. Anderson mentioned he was aware of recent construction work near the 9000 South portion of the Bingham Creek streambed by the Utah Department of Transportation (UDOT) and was curious if the Agencies or local communities were involved in overseeing their work. The UDOT project was the only activity Mr. Anderson knew of that might excavate into buried impacted soils in OU1.

4) Was ARCO or its contractor(s) involved with the discussions concerning long term protectiveness of the remedy, for properties where soils with elevated contaminants of concern (COCs) were left in place either at depth or at the surface? Mr. Anderson said discussions were coordinated with the regulators and Salt Lake County Flood Control, no specific policies were established. Mr. Anderson also noted he has only been called twice concerning properties that were not sampled in OU1 and wondered if the local communities would require developers to address potentially impacted soils. Mr. Anderson stated 11 volumes of post removal, closure, and O&M inspection reports were provided to West Jordan and Salt Lake County to detail cleanup specifications that would be useful for developing Institutional Controls. As the responsibility for maintaining the remedy in OU1 was apparently passed to the County and local communities, Mr. Anderson really could not comment on what level of involvement occurs by local jurisdictions when redevelopment takes place in the post-remedy cleanup areas of OU1.

5) Do you have any additional comments, suggestions, or questions regarding the cleanup work? Mr. Anderson and Mr. Stillwell thought speaking with Salt Lake County would help with ensuring that the remedy in OU1 is protected and that the County still has existing documentation on the remedies for both OU1 & OU5. No other comments were provided.

Interviews conducted by Dave Allison and Doug Bacon, UDEQ.

Piper Rhodes, Sr. Environmental Specialist – Kennecott Land
Ben Franciscotti, Manager Community Construction - Kennecott Land
Ehud Ardon, North American Mine Services (Kennecott Land Contractor)
Jeff Haws, Landscape Planner/Architect - Kennecott Land
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Questions -

1) Is Kennecott Land aware that the sections of Bingham Creek within the Daybreak property were cleaned up to the established commercial land use standard established by EPA for the removal action (2000 mg/kg lead)? With a long history of Kennecott reclamation in the area, Kennecott Land by necessity, is aware and coordinates all development/construction within the company to handle areas of previous cleanups that are under redevelopment.

2) What are Kennecott Land's current development plans for the Bingham Creek corridor? Kennecott Land officials have future plans for a park, ball fields, and trail system within areas near the Bingham Creek channel. The plans are three years out or more as financing becomes available. Kennecott Land does not intend to undertake any other redevelopment of the Bingham Creek corridor that would be beyond a commercial/park type land use. Kennecott Land is working with the city of South Jordan and Salt Lake County on future plans to coordinate linking respective trail systems.

3) Does Kennecott Land have data documenting metals concentrations potentially above what may be appropriate for the intended land use? Kennecott Land has all pertinent data from Kennecott Utah Copper and makes the data available online for their project managers.

4) Is Kennecott Land coordinating with the local jurisdiction on the redevelopment plan for the Bingham Creek corridor? Presentations were made to South Jordan and West Jordan cities as well as at stakeholder meetings to communicate development activities by Kennecott Land.

5) Is Kennecott Land intending to complete acquisition of the UP freight line west of 5600 West and paralleling the north boundary of Daybreak within the area of the Daybreak Commerce Park? If so, will Kennecott Land be pursuing a removal of the rail and the rail bedding material after acquisition? At this time, no determinations have been made by Kennecott Land regarding the removal of the railway. However, any soil removal would be performed under an approved work plan with oversight by the Agencies (EPA & UDEQ). Coordination with other local jurisdictions and interested stakeholders would also take place prior to implementing said work plan.

8) If Kennecott Land is intending to develop the Bingham Creek corridor as a park or recreational area, what long term institutional controls (if any) does Kennecott

Land foresee being needed to ensure that this land use remains in place? Kennecott Land expressed a corporate philosophy of eliminating any restrictions on property and wants to avoid Institutional Controls. That said, any redevelopment would need to ensure that soils comply with the Agencies' accepted residential land use standards for lead and arsenic, for the Daybreak Community. Any remediation efforts would address soils above the residential land use standards. Kennecott Land said cooperation with local authorities, county, city and regulatory agencies can expedite information exchange necessary to ensure continuous dialogue so all are informed about remedial activities.

9) Do you have any additional comments, suggestions or questions regarding the clean up? Kennecott Land said they would check with South Jordan City to make sure they were aware of future park and trail plans and any remediation work performed by Kennecott Land would be coordinated with Kennecott Utah Copper's Environmental Division, as well with UDEQ and EPA.

Interviews conducted by Dave Allison and Doug Bacon, UDEQ.

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Max Johnson, SLCO Planning and Development
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Craig Anderson, SLCO District Attorney
Scott Baird, SLCO Flood Control
John Hoggan, Salt Lake Valley Health Dept.
Amy McClelland, GIS Specialist

December 10, 2009

BINGHAM CREEK FIVE-YEAR REVIEW QUESTIONS

1) What is your current knowledge of the Bingham Creek (OU1) cleanup actions? Salt Lake County (SLCO) officials from the Planning and Engineering Departments said they were aware of the Bingham Creek cleanup activity, primarily through the Flood Control Dept. and coordination efforts during the years of remediation. SLCO said any issues regarding the Bingham Creek cleanup areas are usually referred to UDEQ or EPA with the expectation that these agencies are the appropriate authorities with detailed information on the cleanup areas.

2) Do you have any *personal* concerns regarding the clean up? Are you aware of any *community* concerns? No one representing the various divisions of SLCO expressed any health or environmental concerns regarding the cleanup and no issues have occurred over the last five years from the community. However, internal coordination as it pertains to documentation on the past removal/remedial actions, at SLCO and the regulating entities is becoming more important. SLCO officials feel development pressures along the West Bench of the Salt Lake Valley could impact remediated areas if not managed in detail.

SLCO officials said through staff turnover and time, only a general knowledge of cleanup actions exists with the long term employees of the individual departments. SLCO currently relies on UDEQ and EPA oversight when their customers have questions or seek development approval. SLCO wishes to incorporate the cleanup history (where appropriate) to make planning, engineering and land management decisions for this area under their existing authorities.

No one at SLCO wants any mistakes due to a lack of documentation. Establishing both an institutional controls program and the necessary document repository would require some internal research, sharing, and coordination of departmental information. How the cleanup areas are documented (as an information source at SLCO) and who addresses within the planning, development, and engineering departments during redevelopment proposals, needs clarification at SLCO.

3) Are there any concerns SLCO has regarding long term protectiveness of the remedy for properties where soils with elevated contaminants of concern (COCs) were left in place either at depth or at the surface? No situations have come up to date as far as SLCO knows. SLCO understands that (where applicable based on jurisdiction) local cities generally use their building permit or ordinances to control development actions within OU1 Bingham Creek. SLCO expressed a need to work with EPA and UDEQ to develop and approve institutional control ordinances similar to what the cities have in place or are developing. SLCO wants to develop a GIS overlay map with a residential grid to keep track of the cleanup areas (both residential properties and undeveloped segments on Bingham Creek).

4) Did SLCO adopt an Institutional Controls Plan and if so, please explain how the plan continues is implemented? Nothing is implemented to date although the SLCO emphasized an intention to do so, to address recent development issues in the West Bench areas of the Salt Lake Valley. SLCO says they currently require seismic evaluations on properties and could easily require land management tools to address development along Bingham Creek.

The SLCO District Attorney worked on the Bingham Creek cleanup from the beginning, has detailed knowledge of the existing protective requirements, and was involved with discussions for institutional controls with Kennecott, EPA and UDEQ years ago. SLCO did not see any reason discussions couldn't begin as early as next year to develop land use control language or a possible ordinance(s). SLCO said developing a management philosophy for remediated areas is necessary to keep track of areas in a rapidly developing Salt Lake West Bench. SLCO said by mapping areas, using title search and survey records, or incorporating a checklist process, there are many ways SLCO can assist with transparency about previous remediation work and can assist with ensuring the protectiveness of the selected remedy for OU1 Bingham Creek.

5) Do you have any knowledge of any actions or events that may have caused for a reduction of the protectiveness of the remedy? The current area of concern for SLCO is a 150 acre residential development that is located north of the OU1 Bingham Creek site (but is crossed by a historic rail line used as an ore haulage route). SLCO expects the developer to follow all general safety measures and will look for any areas of concern within OU1.

6) Does SLCO have records on their maintenance activities for the area?

The SLCO District Attorney said he has all of the documentation associated with the Bingham Creek cleanup and would share with interested departments to assist them with an understanding about past work.

7) Do you have any additional comments, suggestions or questions regarding the clean up? No additional comments were provided. The representatives did discuss scheduling future meetings with EPA and UDEQ to develop possible land use controls to be managed by SLCO.

Interviews conducted by Dave Allison and Doug Bacon, UDEQ