1552127 - R8 SDMS

All on the Concurrence Chain for the ESD or 5 Year Review Report for VB/I-70:

The ESD and the 2nd 5-Year Review Report for VB/I-70 are being routed for your concurrence.

Both documents have been reviewed by team members and HQ and should be considered FINAL with the exception of inserting the final numbers related to the number of properties sampled/not sampled or cleaned up/not cleaned up. The "blanks" are noted in the documents by XX and highlighted in gray.

The reason that the numbers are not yet in there is that some "late blooming" property owners have come forward since we filed the Notices of Environmental Conditions in June 2014 and have agreed to give us access for sampling or cleanup. In the short term (like right now) the Program has agreed to sample/cleanup their properties while we still have the contractor available.

The contractor is out sampling as I write this (*Thursday afternoon, Sept. 11th*) and we have asked for a very short turn-around time from the lab. So the final numbers are a moving target.

If you will concur on the enclosed document (*as Richard already has*) on the condition that the final numbers will be inserted just prior to signature by Martin Hestmark, that will allow the document to reflect the actual property numbers and keep moving thru the concurrence chain.

I am out of the office on Agency travel the entire week of September 22nd so I will finalize and insert the #s when I return to the office on Monday, September 29th.

EACH DOCUMENT SHOULD BE RETURNED TO ME ONCE IT HAS BEEN CONCURRED ON BY ALL PRIOR TO MARTIN'S SIGNATURE.

Thank you.

Paula Schmittdiel
Remedial Project Manager

PLEASE READ THIS MESSAGE BEFORE CONCURRING

SECOND FIVE-YEAR REVIEW REPORT

Vasquez Boulevard / I70 Superfund Site
City and County of Denver, Colorado
CERCLIS ID: COD002259588

September 2014

Prepared by

U.S. Environmental Protection Agency
Region 8
Denver, Colorado

Martin Hestmark
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation

Date

R Sisk 8ENF-L 9/10/19

Steve Whorton EPR-SR 09/16/14

SJ Bol ECEJ 9/19/14

Savendschen 8ENF-RC 9/23/14

EPF-RC 9/24/14

SECOND FIVE-YEAR REVIEW REPORT

Vasquez Boulevard / I70 Superfund Site
City and County of Denver, Colorado
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Denver, Colorado

_____ _____

Martin Hestmark **Date**
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation

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LIST OF ACRONYMS

ASARCO American Smelting and Refining Company Incorporated
ARAR Applicable or Relevant and Appropriate Requirement ATSDR
Agency for Toxic Substances and Disease Registry
CDC Centers for Disease Control and Prevention
CDPHE Colorado Department of Public Health and Environment
CEASE Clayton, Elyria, and Swansea Environmental Coalition
CERCLA Comprehensive Environmental Response Compensation and Liability Act
CFR Code of Federal Regulations
COCs Contaminant of Concern
EPA Environmental Protection Agency
FS Feasibility Study
FYR Five-Year Review
IEUBK Integrated Exposure, Uptake, and Biokinetic Model
IRIS Integrated Risk Information System
NCP National Contingency Plan
NPL National Priorities List O&M Operation and Maintenance
OSWER Office of Solid Waste and Emergency Response
OU Operable Unit
PPM Parts per Million
RAO Remedial Action Objective
RCRA Resource Conservation and Recovery Act
RA Remedial Action
RI Remedial Investigation
RPM Remediation Project Manager
ROD Record of Decision
SARA Superfund Amendments and Reauthorization Act
USEPA United States Environmental Protection Agency
VB/l-70 Vasquez Boulevard and 1-70

EXECUTIVE SUMMARY

The EPA Region 8 has conducted the second five-year review of the remedial actions implemented at the Vasquez Boulevard/Interstate 70 Superfund Site, located in the City and County of Denver, Colorado. The review was conducted from May, 2014 through June, 2014. The five-year review is a statutory review that covers the period from October1, 2009 to September 30, 2014.

The VB/I-70 Site includes approximately 4.5 square miles in the north-central section of the City and County of Denver, Colorado (Figure 1). For the purposes of the remedial investigation and remedy development, the EPA segregated the Site into three operable units. Operable Unit 1 (OU1) is defined as residential yards within the VB/I-70 Site with levels of lead or arsenic in soil that present an unacceptable risk to human health. The remedial action at OU1 has been implemented. Operable Unit 2 (OU2) consists of the area where the former Omaha & Grant Smelter operated and includes all environmental media impacted by releases of hazardous substances from the smelter. Operable Unit 3 (OU3) is the area where the former Argo Smelter operated, and includes all environmental media impacted by releases of hazardous substances from that smelter. Separate remedial investigations are presently being conducted at OU2 and OU3, and separate remedial actions will be implemented for OU2 and OU3.

The remedy at OU1 is protective of human health and the environment. Contaminated soils in residential yards have been excavated and disposed off-site and institutional controls have been implemented for the small number of residential properties where access to sample and/or clean-up was not granted.

Since remedial actions have not been implemented at all operable units at the site, no site-wide protectiveness determination is made in this review.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Vasquez Blvd. / I70 Superfund Site		
EPA ID: CO0002259588		
Region: 8	**State:** CO	**City/County:** Denver/Denver

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

REVIEW STATUS	
Lead Agency: EPA	
Author Name: Paula Schmittdiel	
	Author Affiliation: EPA
Review Period: May 1, 2014 to June 30, 2014	
Date(s) of Site Inspection: Not Performed because additional properties were cleaned up in 2013 - 2014 and no changes in land use have occurred since then.	
Type of review: Statutory	
Review Number: Second	
Triggering Action Date: September 30, 2009	
Due Date: September 30, 2014	

ISSUES/RECOMMENDATIONS
OU(s) without Issues/Recommendations Identified in the Five-Year Review: OU1
Remedial actions at OU2 and OU3 have not been selected and implemented and are not being reviewed in this report.

PROTECTIVENESS STATEMENTS		
OU: OU1	**Protectiveness Determination:** Protective	**Addendum Due Date:** N/A
The remedy at OU1 is protective of human health and the environment. Contaminated soils in residential yards have been excavated and disposed off-site and institutional controls have been implemented for the small number of residential properties where access to sample and/or clean-up was not granted		

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has conducted a five-year review (FYR) for the Vasquez Boulevard and Interstate 70 (VB/I-70) Superfund Site (Site), which is located in the City and County of Denver, Colorado. The purpose of a five-year review is to determine whether the remedy for OU1 at a site is 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 identify recommendations to address them.

The EPA has prepared this five-year review report pursuant to 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 EPA is the lead agency for this action and is conducting the FYR. The Colorado Department of Public Health and Environment (CDPHE) is the support agency. This review was conducted from May1, 2014 through June 30, 2014. This is the second FYR for the Vasquez Blvd/I-70 Site. The triggering action for this statutory review was the signing of the first FYR on September 30, 2009. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2.0 OU1 CHRONOLOGY OF EVENTS

Table 1. Chronology of Events – OU1

Date	Event
July 1993	State of Colorado and ASARCO Incorporated entered into a consent decree for the Globe Superfund Site. As part of that settlement agreement, ASARCO agreed to remediate soils in residential properties surrounding the Globe Plant where levels of cadmium, lead, and/or arsenic exceeded acceptable limits established by the State
1997	CDPHE begins a limited soil sampling program in the Elyria and Swansea neighborhoods in the future VB/I-70 Superfund Site
1998	CDPHE requests the EPA participation in the VB/I-70 project. The EPA mobilizes an Emergency Response team to conduct an extensive soil sampling effort and time-critical removal actions for the houses where soil poses immediate health risks to local residents
Mar – Aug 1998	The EPA conducts Phase I and Phase II soil sampling on residential properties
Sep 1998	The EPA issues an Action Memorandum for a time-critical removal action
July 22, 1999	The EPA places the VB/I-70 Site on the National Priorities List (NPL)
Aug 1999 – Nov 2000	The EPA conducts residential soils Remedial Investigation and Phase III soil sampling
2001	Remedial Investigation and Feasibility Study Reports finalized
Mar 6, 2003	The EPA issues an Action Memorandum for non-time-critical removal action
Mar 14, 2003	Design for soil removal completed
Mar 27, 2003	Community health program remedial design completed
May 2003	The EPA releases Proposed Plan outlining its preferred cleanup option
July 2003 – Mar 2004	The EPA conducts non-time-critical soil removal actions
Sep 25, 2003	Record of Decision signed
Jan 21, 2004	Consent Decree finalized between ASARCO, CDPHE and the EPA
Mar 31, 2004	Remedial Action started for OU1
July 2004	Community health program development started
Dec 2004	Community health program development completed
Jan 2005	Training of community health workers completed
Feb 2005 – Feb 2007	First home visit, community health program completed
June 2005 – Sep 2006	Conducted biomonitoring clinics
2006	ASARCO completes removal of soil from 100 properties per Consent Decree
2008	Remedial Action completed for OU1
Sep 25, 2008	Remedial Action Report approved
Sep 30, 2009	First Five Year Review Report signed
May – June 2013	Last Chance letter sent to owners of properties not sampled or cleaned up
July 2012 – Sept 2013	Additional soil sampling conducted at previously unaddressed properties
Aug – Oct 2013	Soil remediation completed at 20 previously unaddressed properties
June 25, 2014	Filed Notices of Environmental Conditions at City & County of Denver Clerk and Recorder's Office for unaddressed properties
Sept 2014	Explanation of Significant Differences signed for OU1

3.0 BACKGROUND

3.1 Location and Operable Units

The VB/I-70 Site is located in the north-central section of the City and County of Denver, Colorado (Figure 1). For the purposes of the remedial investigation and remedy development, the EPA divided the Site into three operable units. Separate investigations have been or are being conducted, and separate remedies have been or will be implemented for each operable unit. The operable units are:

Operable Unit 1 (OU1): OU1 is defined as residential yards within the VB/I-70 Site with levels of lead and/or arsenic in soil that present an unacceptable risk to human health. OU1 was the EPA's highest priority at the VB/I-70 Site because it had the highest potential for human exposure to contaminants of concern located in the residential yards. The EPA is the lead agency for remedial response activities at OU1. The EPA and CDPHE signed the Record of Decision (ROD) detailing the final remedy for OU1 in 2003. Remedial action was initiated on March 31, 2004.

Operable Unit 2 (OU2): OU2 consists of the area where the former Omaha & Grant Smelter operated and includes all environmental media impacted by releases of hazardous substances from the smelter. The Omaha & Grant Smelter was located on the property now home to the Denver Coliseum and other businesses. The City and County of Denver conducted a remedial investigation (RI) for the OU to assess potential heavy metals contamination in the soils, groundwater, surface water and sediments at, and adjacent to OU2. Additional groundwater sampling was conducted by the EPA in 2012 and 2013 because the evaluation of groundwater in the RI left unanswered questions. A proposed plan that presents remedial action alternatives and ROD documenting the selected remedial action are scheduled to be completed in 2015. Because remedial action has not started, OU2 will not be evaluated as part of the FYR.

Operable Unit 3 (OU3): OU3 is the area where the former Argo Smelter operated and includes all environmental media impacted by releases of hazardous substances (primarily heavy metals) from that smelter. The majority of the OU3 area is paved and has been extensively redeveloped since the smelter stopped operating. The EPA has initiated the remedial investigation and feasibility study for OU3, to evaluate if smelter generated wastes were buried on the Site and whether they pose a health risk to future construction workers or groundwater. The EPA issued a proposed plan presenting remedial action alternatives in November, 2007. However, current groundwater data was insufficient and additional sampling is being conducted by the EPA. A new proposed plan and a ROD are planned for 2016. Because remedial action has not started, OU3 will not be evaluated as part of the FYR.

Each operable unit has a unique physical location and historic operation. Thus, actions taken at one operable unit have been taken independently of actions at other portions of the Site. The current status of remedial investigation activities at OU2 and OU3 have had no adverse effect on remedial activities conducted at OU1. OU1 is the only operable unit at the VB/I-70 Site where remedial action has been initiated, and is therefore the focus of this five-year review.

3.2 Land and Resource

The VB/I-70 Site includes approximately 4.5 square miles in the north-central section of the City and County of Denver, Colorado (Figure 1). OU1 encompasses approximately four largely residential neighborhoods in north-central Denver: Swansea, Elyria, Clayton, and Cole. OU1 also includes the southwest portion of the Globeville neighborhood and the northern portion of the

Curtis Park Neighborhood. These neighborhoods are located to the east of the former Argo Smelter (OU3) and the former Omaha and Grant Smelter (OU2), as well as the recently closed ASARCO Globe Smelter (AGS) Site. The AGS site is adjacent to OU1 and is being addressed under a State consent decree with the ASARCO Multi-State trust and encompasses all of the Globeville neighborhood except the southwest portion of the neighborhood which was included in VB/I-70 OU1 instead.

There are approximately 4,500 residential properties, most of which are single-family homes in OU1 of the VB/I-70 site. However, multifamily and commercial/industrial properties also exist in OU1. According to the 2010 census, approximately 17,177 people live within OU1, including approximately 1685 children 5 years old or younger.

3.3 History

The VB/I-70 Site came to the attention of the EPA following studies directed by CDPHE at the adjacent AGS Site in 1997. On July 15, 1993, the State of Colorado and ASARCO Incorporated entered into a Consent Decree to resolve a suit filed by the State of Colorado for damages to natural resources under CERCLA. As part of that settlement agreement, ASARCO agreed to remediate soils in residential properties surrounding the AGS Site where levels of cadmium, lead, and/or arsenic exceeded cleanup limits established by the State in the Record of Decision for the AGS Site.

The 1993 Consent Decree required ASARCO to collect soil samples from residential yards in the Globeville neighborhood of the AGS Site and to expand the remediation area until it established the extent of contamination from the AGS Site. In conducting the investigation, ASARCO continued to find random occurrences of arsenic at elevated levels in residential yards at increasingly greater distances from the ASARCO Globe smelter.

3.4 Initial Response and Basis for Taking Action

3.4.1 Time-Critical Removal Action

In 1997, CDPHE began a limited soil sampling program in the Elyria and Swansea neighborhoods, located just east of Globeville neighborhood, across the South Platte River. These results indicated that high concentrations of arsenic and lead in soil extended far beyond the Globeville neighborhood. Accordingly, CDPHE requested the EPA's assistance in immediately responding to the elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods. In 1998, the EPA's first action at the Site was to mobilize an Emergency Response team to conduct an extensive soil sampling effort and time-critical removal actions for the houses where soil concentrations posed immediate health risks to local residents.

The Emergency Response consisted of three phases. Phase I included an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties that were potential time-critical soil removal and replacement candidates. Phase I sampling occurred during March and April 1998. The EPA also collected soil samples from schools and parks located within the initial study area. Samples were analyzed for arsenic, lead, cadmium and zinc. From the Phase I data, the EPA identified 37 properties as potentially requiring time-critical removal action.

The Phase II sampling occurred in July and August 1998. Additional soil samples were collected from residential properties that had a maximum surface soil concentration equal to or greater

than 450 parts per million (ppm) for arsenic or 2000 ppm for lead; i.e., the removal action candidates. Those properties with one or more composite samples exceeding the removal action levels for either arsenic or lead were identified for soil removal. In all, the EPA sampled 1,393 properties as part of the Phase I and II programs. As a result of the Phase II sampling, the EPA identified 21 additional properties potentially requiring time-critical removal action.

In September 1998, the EPA issued an Action Memorandum that established the basis for conducting a time-critical removal action. The Action Memorandum required that soil be removed and replaced at any property with an average arsenic soil concentration greater than 450 ppm and/or lead soil concentration greater than 2000 ppm. These removal "action levels" were chosen to protect young children from adverse health effects related to short-term (sub-chronic) exposure. The EPA conducted soil removals at 18 properties in October and November of 1998.

Based on the results of the Phase I and Phase II sampling programs, the EPA determined that numerous residential properties within the VB/I-70 Site contained concentrations of arsenic or lead at levels that could present unacceptable health risks to residents with long-term exposures. Anticipating the need for long-term response, the EPA placed the VB/I-70 Site on the National Priorities List (NPL) on July 22, 1999.

The EPA conducted Phase III remedial investigation activities from August 1999 through November 2000. This sampling program supported the physio-chemical characterization of soils, the baseline human health risk assessment, and soil sampling of additional properties. During Phase III, 3,007 properties were sampled, including the re-sampling of properties sampled during Phases I and II. As part of the Phase III remedial investigation, sampling was conducted at discreet soil depths to evaluate where the highest soil concentrations occurred. The evaluation determined that soil concentrations were highest in the uppermost 2 inches of the soil profile, and supported soil removal down to a 1-foot depth limit. Based on the phase III data, 30 additional properties were identified for time-critical soil removal. In all, a total of 48 residential properties were remediated by the EPA using time-critical removal authority. Cleanup of the remaining 22 properties was performed during the remedial action.

3.4.2 Non-Time-Critical Removal Action

On March 6, 2003, the EPA issued an Action Memorandum that established the basis for conducting a non-time-critical removal action. The Action Memorandum required the removal and replacement of soil at any property that had an arsenic soil level greater than 240 ppm and/or lead soil levels greater than 540 ppm. These "action levels" were determined from the baseline risk assessment to address the properties that presented the highest risk of adverse health effects to children and adult residents. From the Phase III sampling results, the EPA identified 143 properties as requiring a soil cleanup, and in 2003, the EPA conducted cleanups at 133 of these properties. The properties not addressed by this non-time-critical removal action were included in the list of properties to be addressed by the remedial action under the OU1 ROD.

4.0 REMEDIAL ACTION

4.1 Remedy Selection

The ROD for OU1 was finalized on September 25, 2003 (EPA 2003). The Selected Remedy in the ROD for OU1 consisted of four components: a community health program, soil sampling, soil removal, and off-site disposal. An ESD modifying the Selected Remedy for OU1 was signed on September __, 2014. The ESD added institutional controls (described later in section 4.4 below) for the residential properties where EPA was unable to secure access for sampling and/or soil removal.

4.1.1 Soil Remedy

The following OU1-specific Remedial Action Objectives (RAOs) were developed for arsenic and lead in soil (EPA 2003).

<u>RAOs for Arsenic in Soil</u>

- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic at levels predicted to result in an excess lifetime cancer risk associated with ingestion of soil which exceeds 1 x 104 (one in ten thousand) using reasonable maximum exposure assumptions.
- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in a chronic or sub-chronic hazard quotient associated with ingestion of soil which exceeds 1, using reasonable maximum exposure assumptions.
- For children with soil pica behavior (see definition on page 7) who reside in the VB/I-70 Site, reduce the potential for exposures to arsenic in soil that result in acute effects.

<u>RAOs for Lead in Soil</u>

- Limit exposure to lead in soil such that no more than five percent of young children (72 months or younger) who live within the VB/I-70 Site are at risk for having blood lead levels higher than 10 micrograms per deciliter (ug/dL) from such exposure. This provides 95% confidence that children exposed to lead in soil will be protected.

  The ROD also adjusted the action levels identified for conducting the non-time critical removal actions from 540 ppm to 400 ppm for lead, and from 240 ppm to 70 ppm for arsenic. This change was based on results of public comment on the initial Proposed Plan, which suggested that the cleanup levels for OU1 should be the same as those adopted by the State of Colorado for the AGS Site. The adjusted ROD action levels were within the range of preliminary remediation goals identified in the Feasibility Study Report (MFG 2001) based on results of the Baseline Risk Assessment (EPA 2001). Soil removals would be conducted where the average concentrations from three composite soil samples taken at a property exceeded these levels.

  The ROD noted that the removed soil could be placed at the ASARCO Globe Plant facility (smelter) and used for cover and grading, because, as the ROD also stated, *"For purposes of this remedial action, and consistent with Section 300.400(e)(1) of the NCP, EPA has determined that the ASARCO Globe Plant is a suitable area in very close proximity to the contamination, which is necessary for implementation of the response action."* (EPA 2003). However, at the time that the ROD was signed, the decision to dispose of contaminated soil removed from OU1 at the smelter facility had not been finalized.

In 2004, the EPA, CDPHE, and ASARCO entered into a Consent Decree (USDC 2004) that resolved ASARCO's liability at OU 1 of the VB/I-70 Superfund Site. The Consent Decree required ASARCO to conduct residential soil cleanups at 100 properties, provide a repository within the smelter facility for all residential soils removed during the remedial action, and conduct all operations and maintenance required at the repository as part of the AGS Site.

4.1.2 Community Health Program

The Community Health Program was composed of two separate, yet partially overlapping, elements. The first element addressed risks to children from non-soil sources of lead and from lead in soils above the action level of 400 ppm. The second element addressed children with soil pica behavior to reduce their risks to arsenic in soil above 47 ppm, the preliminary action level determined in the baseline risk assessment for children with soil pica behavior. Pica behavior is a rare behavior whereby children intentionally eat unusually large amounts of soil.

Participation in one or both elements of the program was strictly voluntary, and there was no charge to eligible residents and property owners for any of the services offered by the Community Health Program. The Community Health Program was implemented on an ongoing basis until the residential soil removal portion of this remedial action was completed. Each of these two main elements of the program is described below:

<u>Lead Exposure Risk Reduction</u>

The program for reduction of lead risks was intended to be general. That is, it was intended to assess risks from lead from any and all potential sources of exposure, with response actions tailored to address the various exposure sources identified. The lead program consisted of three main elements:

- Community and individual education about potential pathways of exposure to lead, and the potential health consequences of excessive lead exposure
- A biomonitoring program by which any child (up to 72 months old) could be tested to evaluate actual exposure
- A program that provides a response to any observed lead exposure that is outside the normal range. This response included any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure. If the source of lead was found to be from residential soils, the property received a high priority for soil removal. If the main source was judged to be non-soil related, responses would include education, counseling, and/or referral to environmental response programs offered by other agencies.

<u>Arsenic Exposure Reduction, Soil Pica Behavior</u>

The Community Health Program for arsenic was designed to focus specifically on the potential risks to young children that exhibit soil pica behavior. The program for arsenic consisted of three main elements:

- Community and individual education about identification and potential hazards of soil pica behavior and the potential health consequences of excessive acute oral exposure to arsenic
- A biomonitoring program by which any child could be tested to evaluate actual soil pica exposure to arsenic

- A program that provided a response to any observed inorganic arsenic exposures that are outside the normal range. This response included any necessary follow-up sampling, analysis, an investigation of a child's home to help identify the likely source of exposure, and to implement an appropriate response that would help reduce the exposure. If the source of arsenic was found to be from residential soils, the property received a high priority for soil removal. If the main source was judged to be non-soil related, responses would include education, counseling, and/or referral to environmental response programs offered by other agencies.

4.2 Remedy Implementation

4.2.1 Sampling Program

Prior to the ROD for OU1, the EPA had sampled approximately 75% of the residential properties within the VB/I-70 Site boundary for lead and arsenic. Because the spatial pattern of lead and arsenic contamination varied throughout the Site, it was not possible to assess if a specific property required a soil removal without data from that property. Therefore, the EPA implemented a program of on-going soil sampling at residential properties within the Site boundaries that were not previously tested or where testing was not adequate. Most of the sampling program was conducted before 2008. A limited sampling program was initiated in 2012 and completed in 2014 in an attempt to sample, and conduct a soil removal if necessary, for the estimated 180 residential properties where the owners had previously refused to grant EPA access to sample.

The soil sampling program began with the identification of properties that required sampling. Once the EPA obtained access from the property owner, the EPA collected soil samples from the property and analyzed for lead and arsenic. The results were evaluated to determine if the property needed soil removal. The soil sampling results were also provided to the property owner. If a soil removal was needed, the property was listed for soil removal.

4.2.2 Residential Soil Removal

The EPA removed all accessible soils to a depth of 12 inches at properties where soil removal was needed. The depth determination for soil removal was determined during the Remedial Investigation/Feasibility Study (RI/FS). The results of the RI/FS were that lead and arsenic concentrations in soil reduced with depth, and at six inches depth, lead and arsenic concentrations in soil were below levels of health concern. Based on the study results, it was concluded that the primary mechanism for the distribution of contamination at the site may have been primarily from aerial dispersion from smoke stake emissions although other sources could not be excluded. From the sampling results, EPA determined that the removal of 12 inches of soils from residential properties would result in removal of site contaminants. Once soil excavation was completed, the excavation areas were backfilled with clean soil, and pre-remediation yard features restored. Based on remedial investigation data, the EPA estimated that soil removal would occur at a total of 853 residential properties within OU1 (508 properties for arsenic only, 108 properties for both lead and arsenic, and 237 for lead only). Actual properties remediated totaled 820.

Soil removals in residential yards began with the time-critical removal action in 1998, continued with the non-time-critical removal action in 2003, then the remedial action began in 2004 with

the bulk of the soil removals completed in 2006. A small number of additional residential yard soil removals were conducted in 2008, 2013, and 2014. The Table 2 is a summary of the number of properties remediated each year.

Table 2: Summary of Remediated Properties by Year

Year	No. of Properties Remediated
1998 (time-critical)	18
2000 (time-critical)	30
2003 (non-time-critical)	133
2004	326
2005	134
2005 – ASARCO	62
2006	56
2006 – ASARCO	38
2008	3
2013	20
2014	
Total	820

The additional sampling and soil removals conducted in 2012-2014 were undertaken to provide the small number of residential property owners that had previously denied access to EPA or new property owners that purchased after EPA had requested access years earlier the opportunity to have their properties sampled and remediated, if necessary. Out of the approximately 180 residential property owners contacted in this last effort, XX granted EPA access and 20 of those required soil removal.

During the first years of the remedial action, all contaminated soils were transported to the AGS Site for disposal. This soil was placed with soils removed during the AGS Site residential cleanup. ASARCO agreed to conduct all maintenance of the residential soils repository as part of the AGS Site actions (EPA 2008). Soils removed in 2013 and 2014 were transported to and disposed at a permitted solid waste landfill because the repository at the AGS Site had been closed.

After placement of clean soil in the remediated residential yards, the property was landscaped in accordance with the homeowner-agreed-upon restoration plan. If sod was included in the restoration plan, then the property was watered for a 30-day period to establish the new sod.

4.2.3 Community Health Program

The community health program was developed in consultation with an advisory stakeholders group for the VB/I-70 Site, and implemented by the City and County of Denver. The community health program consisted of two activities, providing biomonitoring services for children and conducting community outreach.

Biomonitoring: The primary goal of the biomonitoring program was to test young children and pregnant women to determine if they had been exposed to lead and/or arsenic. This was accomplished through the following tasks:

- Establishing and staffing periodic testing clinics in each neighborhood
- Collection and analysis of biomonitoring samples

- Reporting results to each participant
- Recommendations to parents for environmental and medical follow-up actions, if needed.

Thirty-eight clinics were held between November 2004 and October 2006. During this time, 661 individuals participated in the biomonitoring program. Health officials identified twenty children with elevated blood lead above 10 ug/dL, and 94 children were identified with elevated blood lead concentrations; i.e., concentrations ranging from 5 – 10 ug/dL. The 10 ug/dL value was adopted from EPA's OSWER Directive 9355.4-12, which determined that, in Superfund site cleanups, the EPA will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10 (ug/dL) (EPA 1994). The parents of children found with elevated blood lead concentrations were referred to organizations that were able to follow-up with the family on environmental and medical issues.

In addition, in accordance with the Community Health Program requirements in the ROD for lead, exterior lead-based paint assessments were conducted at all properties where soil was removed due to elevated lead concentrations. A total of 297 properties met the criteria for lead-based paint assessments. During the assessment, all structures including garages, fences, and sheds with chipping and peeling paint were tested for lead-based paint. If the EPA determined that there was sufficient peeling lead-based paint on the property to cause recontamination of the soil above the action level, then the EPA performed an exterior lead-based paint abatement at the property. As a result of the assessments conducted, 120 homes received exterior lead-based paint abatements. This work was performed in accordance with the Colorado "Regulation No. 19, Lead-Based Paint Abatement."

Community Outreach: The City of Denver conducted community outreach using a door-to- door canvassing outreach model, utilizing community health workers to provide individual health education. The community health workers were members of the VB/I-70 community that the City of Denver trained to provide health information concerning lead and arsenic exposure. The community health workers provided information on the following:

- Health effects of lead
- Health effects of arsenic
- Soil pica behavior
- Soil sampling and soil removal aspects of the remedy
- Biomonitoring program.

Community health workers conducted home visits at 94% of the homes within the site boundaries. In addition to home visits, outreach was conducted to realtors and contractors that live or work within the site communities by mailing them relevant information.

The Community Health Program ended in 2006, when the bulk of the sampling and soil removals were completed.

4.2.4 Community Participation

Due to the high degree of public interest, the large population impacted by OU1, and the cultural differences among the VB/I-70 OU1 neighborhoods, the EPA and CDPHE expanded community involvement to provide for extensive public input throughout the remedial process. Expanded public involvement included conducting a stakeholder assessment, establishment of a

stakeholders working group, providing funding for a technical assistance grant, and additional public meetings and fact sheet mailings. All materials were provided in both Spanish and English and all meetings were conducted with Spanish translation services.

In August 1998, the EPA formed a Working Group of stakeholders to provide an open forum for discussing all technical aspects of the EPA's RI/FS, risk assessment, ROD remedial design and remedial action. The Working Group addressed the Environmental Justice concern of having the community participate in decision making by providing direct access to decision makers. Through the Working Group, data and issues were discussed, allowing for community input into decision-making throughout the Superfund process.

The stakeholders attending the Working Group meetings included representatives from all parties that had an interest in OU1 of the VB/I-70 Site. The Working Group included representatives of the City and County of Denver; CDPHE; the Agency for Toxic Substances and Disease Registry (ATSDR); ASARCO; and representatives from the four Denver neighborhoods included in OU1. Stakeholders also included the Clayton, Elyria, and Swansea Environmental Coalition (CEASE), the recipient of a Technical Assistance Grant from the EPA.

4.3 Operation and Maintenance

Operation and maintenance activities are required for the institutional controls added to the remedy in the 2014 ESD. O&M activities include monitoring the ICs, reviewing property records for the properties that have either a recorded Notice of Potential Environmental Conditions or a recorded Notice of Environmental Conditions and preparing and mailing the annual informational letter.

4.4 Institutional Controls

Institutional controls were implemented in June and July, 2014 for the XX residential properties within OU1 where the property owner denied EPA access to sample and/or remove soil. The ICs were incorporated into the OU1 remedy by signing of the ESD. The IC for OU1 is an informational IC made up of two parts. The first part is either a Notice of Potential Environmental Conditions, for residential properties where EPA has not sampled, or a Notice of Environmental Conditions for properties where EPA has sampling results showing lead or arsenic levels above the action levels established in the ROD but where cleanup has not been conducted. These notices are filed with the City and County of Denver Clerk and Recorders Office in the title records and serve to notify present, prospective, and future owners of the potential for elevated levels of lead or arsenic in the properties' soils. The second part of the informational IC for OU1 is an informational letter that will be sent annually to the owner of record and to the property address to make sure that any tenants are informed. This annual informational letter provides the specific information EPA has on the property and provides information on how to minimize exposure to potentially contaminated soil.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second five-year review for the site. Since the first FYR in 2009, the EPA has addressed the recommendations (shown in the table below) for follow-up actions identified in the first FYR by implementing institutional controls and issuing an Explanation of Significant Differences (ESD).

Table 3. Recommendations for Follow-up Actions from 1st Five Year Review

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Affects Protectiveness (Y/N)	
				Current	Future
Institutional Controls for OU1 identified in the RA report are not yet implemented for properties where RA activities were not completed. These ICs may include notification of property owners, notifications tied to building permit applications, and notifications tied to property transfers since RA completion and in the future	Implement Institutional Controls for OU1 to possibly include notification of property owners, notification tied to building permit applications and notification tied to property title transfers where RA activities were not completed	EPA	TBD	Y	Y
ICs for OU1 not identified in the ROD	ROD change to incorporate ICs for OU1	EPA	TBD	Y	Y

ICs were implemented in June, 2014, when EPA filed either a Notice of Environmental Conditions or a Notice of Potential Environmental Conditions in each properties' title file at the City and County of Denver Clerk and Recorder's Officer for XX unaddressed properties. A copy of the filed notice was sent to the property owner of record. The annual informational letter will be sent to each owner as well as to the property address starting in January of 2015. The ICs implemented at OU1 were incorporated into the OU1 remedy by signing of the ESD in September, 2014.

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

The Five-Year Review team was led by Paula Schmittdiel of EPA Region 8, who is the Remedial Project Manager (RPM) for the VB/I-70 Site. Team members included Jennifer Chergo of the Region 8 Office of Communications and Public Involvement. Fonda Apostolopoulos of CDPHE assisted in the review as the representative for the support agency.

From May 1, 2014 to June 30, 2014 the review team established the review schedule whose components included:

- Review of relevant documents and data,
- Review of Applicable of Relevant and Appropriate Requirements (ARARs),
- Verification of institutional control requirements, and
- Preparation of the Five-Year Review Report.

6.2 Community Involvement and Interviews

Formal community interviews for this FYR were determined to not be necessary since the remedy had been completed at a majority of the residential properties 6-10 years earlier. During the period from 2012 -2014, EPA has made extended effort through letters, phone calls and neighborhood canvasing to reach the owners of the unaddressed properties to offer them the opportunity to have their properties sampled and/or cleaned up. The EPA's outreach activities during 2012-2014 which focused solely on those property owners at unaddressed properties was determined to be adequate for community interviews.

6.3 Site Inspection

The EPA did not perform site inspections of the VB/I-70 Site as part of this FYR because the contaminated soils removed from the residential properties in OU1 were disposed off-site and except for the residential properties where access was denied to sample or conduct a soil removal, all other residential properties have been remediated or sampled and found not to need remediation. For the small number of properties where access was denied, EPA has attempted to speak with the owners or visited those properties in its outreach efforts in the last two years which effectively serves as the site inspection for this review.

6.4 Applicable Relevant and Appropriate Requirements Review

The ARARs for the VB/I-70 OU1 Site were reviewed. The primary purpose of this review was to determine if any newly promulgated or modified requirements of federal and state environmental laws have significantly changed the protectiveness of the remedies implemented at the Site. The ARARs reviewed were those included in the ROD. The EPA evaluated changes in toxicity data and risk assessment methodologies by reviewing the input parameters used for determining the soil cleanup standards in the ROD to verify that none of these input parameters had changed. The results of the ARAR review are discussed in Section 7.2.

6.5 Document Review

The document review consisted of the review of relevant documents including the ROD (EPA 2003), the Consent Decree (USDC 2004), the Remedial Action Report (EPA, 2008), the Final Remedial Investigation Report (WGI 2001), Feasibility Study Report for Operable Unit 1 (MFG 2001), and the Baseline Human Health Risk Assessment (EPA 2001).

6.6 Data Review

There is no ongoing sampling or monitoring for the OU1 remedy, so there was no data that needed to be reviewed.

7.0 TECHNICAL ASSESSMENT

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

Yes. The selected remedy as modified by the 2014 ESD provides for soil removal where possible for residential yards with off-site disposal and an informational institutional control for residential properties where sampling and/or soil removal is not consented to by the property owners. Out of approximately 4,500 residential properties in OU1, XX did not require remediation, 820 had soil removed and XX did not consent to sampling and/or soil removal and have had an informational IC implemented for the property. Thus, all residential properties in

OU1 have been addressed as set out in the selected remedy and the remedy is functioning as intended by the decision documents.

There are also no opportunities for optimization because the physical remedy has been completed.

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

Yes. There have been no changes in the ARARs and no new standards or to-be-considered standards affecting the protectiveness of the remedy have been identified.

The EPA evaluated changes in toxicity data and risk assessment methodologies by reviewing the input parameters used for determining the soil cleanup standards in the ROD to verify that none of these input parameters have changed. The cleanup levels identified for remedial action in the ROD for both lead and arsenic were conservative, in that the cleanup levels adopted were lower than levels originally proposed to be protective based on the Baseline Human Health Risk Assessment (EPA 2001). The non-pica-behavior, risk-based cleanup level calculation for arsenic was determined to be 240 ppm. However, based on public and CDPHE comments received, the EPA reduced the cleanup level to 70 ppm, consistent with clean-up levels at the adjacent AGS Site. Even though the site-specific risk-based cleanup level was not adopted for cleanup of OU1, the risk factors used to perform the risk assessment were reviewed to determine if the values have changed since the risk assessment was performed. The baseline risk assessment used an oral slope factor for arsenic of 1.5 mg-kg/day and a chronic reference dose of 0.0003 mg/kg/day. Review of the EPA's Integrated Risk Information System (IRIS) database indicates that these input values have not changed, so that the risk calculations performed for arsenic are still valid.

The EPA used its Integrated Exposure, Uptake, and Biokinetic Model (IEUBK) for calculating the risk-based cleanup level for lead at OU1. The risk-based cleanup level calculated for lead was 1,100 ppm, which the EPA subsequently reduced to 540 ppm (i.e., the middle of the range of soil concentrations) to be more conservative. However, based on public comments received on the proposed plan, the lead cleanup level was changed to 400 ppm, which is the soil cleanup level obtained by using the default input parameters in the IEUBK model. For this FYR, the default input parameters in the IEUBK model were reviewed to verify that these values had not changed since completion of the ROD. The review indicates that the default values used for the IEUBK model have not changed, and therefore the 400 ppm default soil cleanup level adopted in the ROD is still valid. Based on the above discussion, the risk assessment methodologies and exposure estimates employed at the time of the ROD have not changed.

There have been no significant changes in the residential neighborhoods that comprise OU1 so there are no expected changes to the physical conditions or exposure pathways that would affect the protectiveness of the remedy.

In June 2014 during the FYR, the EPA concluded that the exposure assumptions, toxicity data, cleanup levels, risk assessment methodologies and RAOs used at the time of remedy selection are still valid.

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

No.

7.4 Technical Assessment Summary

The remedy is functioning as intended by the ROD for those residential properties where soil sampling was performed and contaminant concentrations were below the action levels, and for those properties where soil was found above the action levels and soil removals were performed. The EPA has changed the remedy to include informational institutional controls for the XX properties with soil contamination above action levels that have not been remediated and XX properties that were not sampled for contaminants during the remedial action due to a lack of access from those property owners, The additional informational institutional controls in the form of Notice and the annual Letter are tied to a specific property address. The Notice was filed in the property record at the City and County of Denver Clerk and Recorder's Office to ensure that a future owner would also be aware of the potential risk of soil contamination. A Letter to the property owner as well as to the property address (should there be a tenant) will be mailed annually which will alert both of the potential for soil contamination and provide information on how to minimize the potential for exposure to potentially contaminated soils. With the implementation and monitoring of these institutional controls, the EPA expects the remedy will be protective at these otherwise unaddressed properties.

There have been no changes to the physical condition of the site that would affect the protectiveness of the remedy. ARARS for soil contamination cited in the ROD have been met. There are no changes to the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodologies that could affect the protectiveness of the remedy. There is no new information that calls into question the protectiveness of the engineering controls of the remedy.

8.0 ISSUES

There are no issues identified in this FYR.

9.0 RECOMMENDATIONS FOR FOLLOW-UP ACTIONS

There are no recommendations for follow-up identified in this FYR.

10.0 PROTECTIVENESS STATEMENT

The remedy at OU1 is protective of human health and the environment. Contaminated soils in residential yards have been excavated and disposed off-site and institutional controls have been implemented for the small number of residential properties where access to sample and/or clean-up was not granted.

11.0 NEXT FIVE-YEAR REVIEW

The next five-year review for the Vasquez Blvd/Interstate 70 Site is required by September 2019, five years from the date of this review.

12.0 REFERENCES

ASARCO LLC. 2006. *Remedial Action Notice of Completion Report, Operable Unit One, Vasquez Boulevard/Interstate 70 Superfund Site, Denver, Colorado.* June.

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EPA. 2001. *Baseline Human Health Risk Assessment, Vasquez Boulevard and 1-70 Superfund Site, Denver, CO.* August.

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Figure 1 Vasquez Boulevard/ I-70 Site Location Map