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Third Five-Year Review

Asarco Globe Site
Denver, Colorado
CERCLIS ID: COD007063530

September 2009

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For
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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirements
ASARCO	American Smelting and Refining Company renamed Asarco Incorporated in 1975
CD	Consent Decree
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation Liability Act
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
DIP	Design Investigation Plan
DIR	Design Investigation Report
DW	Drinking Water
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FGD	Farmers and Gardeners Ditch
FNP	Former Neutralization Pond
FSP	Former Sedimentation Pond
GIS	Geographic Information System
HASP	Health and Safety Plan
HSS	Hospital Shared Services
IC	Institutional Control
IDD	Industrial Drainage Ditch
LFP	Localized Floodplain Plume
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOC	Notice of Completion
NPL	Superfund National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Units
PPM	Parts per million
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOW	Statement of Work
SSC	State Superfund Contract
TSP	Total Suspended Particles
TBC	to Be Considered
TCLP	Toxic Characteristics Leaching Procedure
VB/I-70	Vasquez Boulevard and I-70 Superfund Site
WWTP	Waste Water Treatment Plant

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Executive Summary

The Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division, in cooperation with the United States Environmental Protection Agency Region 8 (EPA) has conducted a third five-year review of the remedial actions performed at the Asarco Globe Plant Site located in Denver and Adams Counties, Colorado. The review was conducted from March through June 2009. Overall, the results of this third five-year review indicate that all immediate threats at the site have been addressed and the remedy is expected to be protective of human health and the environment after all components are completed as proposed. Long term protectiveness of the remedial actions was to be verified through annual monitoring. However, due to Asarco's bankruptcy, funding has been minimal and groundwater monitoring has been sparse. December 2008 was the only full round of annual groundwater monitoring since the last five-year review in 2004. Current data indicate that the remedy is functioning as anticipated and will achieve performance objectives once all components have been implemented. The only portion of the remedy that impacts current protectiveness is the continued sampling and remediation of commercial and industrial properties remaining in the Community Soils and Vegetable Gardens Operable Unit (OU). It is expected that after the bankruptcy proceedings, Asarco will have a site trust in place to enable continual monitoring of the site groundwater, finalize the sampling and remediation of the commercial and industrial properties, and complete the remediation of the Former Neutralization Pond Operable Unit, as dictated in the Consent Decree between the State of Colorado and Asarco. As a result of the Asarco bankruptcy in 2006, the Globe Plant Site was shut down and operations ceased.

The remedy for the Former Neutralization Pond (OU1) has not been implemented but is expected to be protective of human health and the environment upon completion, and is going to be implemented as soon as the Asarco Bankruptcy Trust is set up. In the interim, exposure pathways that would result in unacceptable risks are being controlled by maintaining a clean soil cover graded for proper drainage. Until the remedy is implemented, contaminated groundwater continues to be added to the system requiring extraction from the Terrace Drain and treatment in the Waste Water Treatment Plant.

The remedy for Groundwater and Surface Water (OU2) is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through continued extraction and treatment as well as natural attenuation, which is expected to require several decades to achieve. Exposure pathways that could result in unacceptable risk to people drinking contaminated groundwater are expected to be controlled when the remedy is complete. A process is being formulated with the Engineers office to notify the Colorado Department of Public Health and Environment before permits are issued for wells. The area to the east of the Globe Plant Site to the Platte River has been identified as having contaminated groundwater.

Long-term protectiveness of the OU2 remedial action is in the process of being verified by monitoring of groundwater to fully evaluate the natural attenuation and potential migration of the floodplain plume towards the South Platte River. Current data indicate that levels of arsenic and cadmium exceed the Maximum Contaminant Levels (MCLs). Current monitoring data indicate that the components of the remedy that are in place are functioning as expected, to achieve

groundwater cleanup goals. Once full implementation of the remedy is complete, natural attenuation should occur.

The remedial action for Community Soils and Vegetable Gardens (OU3) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Completion is dependent upon getting the additional funds from the Asarco Bankruptcy Trust.

OU4 (Asarco Globe Plant Site) includes five components. The remedial actions at the Former Sedimentation Pond, Point Source and Fugitive Air Emissions, and the Spill and Runoff Control Pond are expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled by berms, fencing, and an environmental covenant. However, because the remedial action for surface soils and buildings has not yet been completed, the site is not protective of human health and the environment. Additional placement of community soils on the Plant will ensure protectiveness. Threats at the site have been addressed through stabilization and capping of contaminated soils and sediments, and the implementation of the Environmental Covenant. The buildings are protective in the short term. Structures have been power washed clean, and access is restricted. If the buildings are to be demolished, a materials management plan and demolition plan will have to be submitted for the State's approval.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Asarco, Inc. (Globe Plant)		
EPA ID (from WasteLAN): COD 007063530		
Region: 8	State: CO	City/County: Denver/Denver & Adams
SITE STATUS		
NPL Status: □ Final, □ Deleted, ■Other (specify) proposed		
Remediation Status (choose all that apply): ■ Under Construction, □ Operating, □Complete		
Multiple OUs? ■ Yes, □ No	Construction Complete date:	
Has site been put into reuse: No Please refer to text description for each OU in Section 3.		
REVIEW STATUS		
Reviewing Agency: □ EPA, ■ State, □ Tribe, □ Other		
Author Name: Fonda Apostolopoulos		
Author Title: Remedial Project Manager	Author Affiliation: CDPHE	
Review period: March 2009 to June 2009 (upon last interview)		
Date(s) of site inspection: 3/18/2009 through 4/22/2009		
Type of Review: ■ Statutory, □ Policy (□ Post-SARA, □ Pre-SARA, □ NPL-Removal Only) □ Non-NPL Remedial Action Site, □ NPL State Tribe Lead		
Review number: □ 1 (first), □ 2 (second), ■ 3 (third), □ Other (specify)		
Triggering action: □ Actual RA Onsite Construction at OU#, □ Actual RA Start at OU#, □ Construction Completion, ■ Previous Five-Year Review, □ Other (specify)		
Triggering action date (from WasteLAN): 09/29/2004		
Due Date (five years after triggering action date): 09/29/09		

Five-Year Review Summary Form, cont.

Issues:

1) The Former Neutralization Pond (FNP) Operable Unit is not complete.
2) Groundwater monitoring is sporadic and not routine as required.
3) Funding must be continued for operation of the Waste Water Treatment Plant (WWTP).
4) Sampling and remediation has not been finalized for the commercial/industrial properties.
5) Vegetative cover needs to be completed and maintained.

Recommendations and Follow-up Actions:

1) Implement the remedy for the FNP as soon as funding becomes available.
2) Resume monitoring floodplain groundwater as well as interceptor trench.
3) Continue operation of the Terrace Drain and WWTP and report on the progress of natural attenuation of down gradient groundwater.
4) Sampling and remediation of commercial industrial properties projected to start up again (dependent upon funding).
5) Continue establishment and maintenance of vegetative cover.

Operable Unit 1: A Record of Decision was written February 1993. All immediate risks have been addressed. The remedy for OU1 has not yet been started, and thus a protectiveness statement can not be made at this time.

Protectiveness Statement OU2: The remedy for OU2 (groundwater and surface water) is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through continued extraction and treatment as well as natural attenuation, which is expected to require several decades to achieve. Exposure pathways that could result in unacceptable risk are being controlled by the State Engineers office. The area to the east of the Globe Plant Site to the Platte River has been identified as having contaminated groundwater. As a result, the State Engineers office will not allow permits to use the groundwater for drinking or irrigating purposes.

Long-term protectiveness of the OU2 remedial action will be verified by monitoring of groundwater to fully evaluate the natural attenuation and potential migration of the floodplain plume towards the South Platte River. Current data indicate that levels of arsenic and cadmium exceed the MCLs.

Protectiveness Statement OU3: The remedial action for OU3 (Community Soils and Vegetable Gardens) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are

being controlled. Completion is dependent upon getting the additional funds from the Asarco Trust.

Protectiveness Statement OU4: The remedial actions at the Former Sedimentation Pond, Point Source and Fugitive Air Emissions, and the Spill and Runoff Control Pond are expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, because the remedial action for Surface Soils and Buildings has not yet been completed, the site is not protective of human health and the environment. Additional placement of community soils on the Globe Plant Site will ensure protectiveness. Threats at the site have been addressed through stabilization and capping of contaminated soils and sediments, and the implementation of institutional controls. The remedy for buildings is protective in the short term because exposure pathways that could result in unacceptable risk are being controlled. The remedy for OU4 is protective in the short-term; however, in order for it to be protective in the long-term, the remedy from the ROD must be implemented.

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1.0 INTRODUCTION

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

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA Section 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 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."

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

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

This five-year review is a statutory review of the Asarco Globe Plant Site required under CERCLA and the NCP. The purpose of the review is to determine whether remedial response actions are protective of human health and the environment and to recommend ways to attain or maintain that protection. In accordance with the Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, (The Guidance) this five-year review does not reconsider decisions made during the remedy selection process but evaluates the implementation and performance of the selected remedies. The State of Colorado Department of Public Health and Environment (CDPHE) conducted this review.

This five-year review report summarizes the status of actions taken pursuant to the Final Consent Decree, Order, Judgment, and Reference to Special Master for the Asarco Globe Plant Site located in Denver and Adams Counties, Colorado, that was approved by the United States District Court in Denver Colorado on July 15, 1993 pursuant to State of Colorado vs. Asarco Incorporated, Civil Action No. 83-C-2383. Appendix I of the Consent Decree consists of a

Statement of Work (SOW) for Remedial Design and Remedial Action. The Superfund Record of Decision (ROD), for all OUs, was issued on February 18, 1993.

This is the third five-year review completed for the Asarco Globe Plant Site. In keeping with the requirements of CERCLA 121 (c) and the NCP, the subsequent five-year review triggers from the signature date of the previous five-year review. The first Asarco Globe Plant Site five-year review was completed in February 1999.

The Asarco Globe Plant Site has been divided into four Operable Units (OUs):

1. The Former Neutralization Pond (OU1)
2. Groundwater and Surface Water (OU2)
    - Terrace Groundwater
    - Floodplain Groundwater
    - Industrial Drainage Ditch (IDD) and 51st Avenue Retention Ponds
    - Northside Sewage Treatment Plant Pond (NSTP)
    - Localized Floodplain Plume (LFP)
3. Community Soils and Vegetable Gardens (OU3)
4. Asarco Globe Plant Site (OU4)
    - Buildings
    - Point Source and Fugitive Air Emissions
    - Surface Soils
    - Former Sedimentation Pond (FSP)
    - Spill and Runoff Control Pond

The CDPHE Community Involvement Program is committed to promoting communication between citizens and CDPHE. The Community Involvement Plan (CIP) Update, June 2009, (Appendix A) describes the community involvement and public participation program developed for the Asarco Globe Superfund Site in Denver, Colorado. This CIP updates the previous CIP, dated January 1995.

2.0 SITE CHRONOLOGY

EVENT	DATE
Asarco Globe Plant Site, originally know as Holden Smelter, originally produced gold and silver	1886
The American Smelting and Refining Company (ASARCO) bought the Globe Plant Site and converted it to a lead smelting plant.	1901
Globe Plant Site started to produce arsenic trioxide.	1919-1926
Cadmium production commenced using various processes.	1926-1993
Production of indium.	1944
Globe Plant Site produced variety of high specialty metals, lead litharge, test lead, thallium, antimony, indium, copper, and tellurium.	1950-1998
CDPHE's Water Quality collected samples of water and sediment from the Industrial Drainage Ditch, and detected elevated levels of cadmium, arsenic, lead, and zinc.	1974

CDPHE found the Globe Plant Site to be out of compliance with the Colorado Solid Waste Disposal Sites and Facilities Act.	1980, 1981
The EPA listed the Asarco Globe Plant Site on the open dump inventory under the Resource Conservation Recovery Act (RCRA), and three wells were installed.	1981
CDPHE sued Asarco for damages of natural resources under CERCLA.	12/1983
Record of Decision	2/1993
Site was proposed for the Superfund National Priorities List (NPL)	5/1993
Federal Consent Decree was signed between State of Colorado and Asarco.	7/1993
Remediation of community soils started.	4/1994
First Five-Year Review	1999
EPA establishes a National Trust ($100 million) for Asarco sites to deal with remaining environmental remediation.	2003
Begin to sample and remediate commercial/industrial properties	9/2004
Second Five-Year Review	9/2004
Final Medical Monitoring Report Issued	11/2004
Asarco files for bankruptcy	12/2004
Environmental Covenant filed	1/2005
Bankruptcy proceedings continue as of	9/2009

3.0 SITE BACKGROUND

The Asarco Globe Plant Site is located at 495 East 51st Avenue, Denver, Colorado. The Plant is situated on approximately 78 contiguous acres along the west edge of the South Platte River floodplain, 2.7 miles upstream of the river's confluence with Clear Creek. Most of the Asarco Globe Plant is located on a terrace that rises about 30 to 60 feet above the floodplain. The Globe Plant Site includes 53 current and former manufacturing and support buildings used for production, offices, and waste water treatment.

Surrounding the Asarco Globe Plant Site boundary area are residential, commercial, and industrial properties which were historically impacted by smelter related contaminants. The actual site boundary was to be defined by a clean city block determination (within 660 feet). Because Asarco did not find a clean block, the EPA and CDPHE established the VB-I70 Superfund Site to continue the investigation. Therefore, the aerial extent can only be inferred to extend east to the Platte River, west to I-25, south to the Burlington Northern Rail Road tracks (at approximately 43rd Avenue) and north to 60th Avenue in Adams County. Since 1998, the Vasquez Boulevard and I-70 Superfund Site (VB/I-70) has bounded the site to the east and west. A Site Index Map is presented in Figure 1.

There are going to be two trusts set up for Asarco which will affect the Asarco Globe Superfund Site. One is the National Trust, which was set up for all of the Asarco plant sites in the nation. This trust deals with the remaining remediation required by Asarco to complete at each site. Every year each state requests monies to complete Asarco projects in their state, and the trust distributes monies they deem appropriate. Once this money is gone, the trust will be dissolved.

All recent versions of the bankruptcy proceedings include a Bankruptcy Trust for each Asarco owned site. Each trust is expected to be given a predetermined amount of money to complete

remediation for the site. In the case of the Asarco Globe Superfund Trust, the government seeks to have enough money in the trust to complete remediation of the FNP, remaining community soils, and the Globe Plant Site soils.

History of Contamination

The Asarco Globe Plant Site has been the site of various metal and refining operations since 1886. In that year, the Globe Plant Site, originally known as the Holden Smelter, began producing gold and silver. In 1901, the American Smelting and Refining Company (renamed Asarco Incorporated in 1975) bought the site, which was then known as the Globe Smelter, and converted the Globe Plant Site to lead smelting. Lead smelting continued until about 1919, when the Globe Plant Site was converted to produce arsenic trioxide. Arsenic trioxide was principally produced from 1919 until 1926. Cadmium production commenced around 1926, using various processes, until 1993. Production of indium began in 1944, and during the 1950's, the Globe Plant Site produced a variety of specialty metals including litharge (lead oxide), test lead, bismuth oxide, occasionally thallium, indium, and some small quantities of high purity metals such as antimony, copper, and tellurium. Processing of all metals ceased in November of 2006, when the Globe Plant Site shut down operations.

In 1974, CDPHE's Water Quality Control Division collected water and sediment samples from the Industrial Drainage Ditch (IDD) located directly west of the Globe Plant Site and detected elevated concentrations of cadmium, arsenic, lead, zinc, and other metals. In 1980 and 1981, CDPHE found the Globe Plant Site to be out of compliance with the Colorado Solid Waste Disposal Sites and Facilities Act. Subsequent to the investigations and inspections conducted by CDPHE, the EPA listed the Asarco Globe Plant Site on the open dump inventory for 1981 under the Resource Conservation and Recovery Act (RCRA) Section 4000 criteria. Three groundwater monitoring wells were installed at the Globe Plant Site during this time.

In December 1983, CDPHE sued Asarco for damages to natural resources under CERCLA in State of Colorado v. Asarco, Inc., Civ. No. 83-C-2383, (D. Colo.). After a long legal battle, a Federal Consent Decree between the State of Colorado and Asarco, Inc. was signed on July 15, 1993.

The site was proposed for the Superfund National Priorities List (NPL) on May 10, 1993. The Superfund site was divided into four operable units: the Former Neutralization Pond, Groundwater and Surface Water, Community Soils and Vegetable Gardens, and the Globe Plant Site.

The Settlement between the United States and Asarco

Due to falling copper prices through the 1990's, Asarco was experiencing financial difficulties and an inability to meet its obligations under a number of environmental settlement agreements throughout the country. As of January 2003, this non-compliance left Asarco exposed to claims for stipulated and statutory penalties in excess of $100 million. In July 2002, Asarco informed the United States of its intention to sell its controlling interest in Southern Peru Copper to its parent company, America's Mining Inc. The United States Department of Justice contended that

the original sale price proposed by Asarco was unreasonably low and would have jeopardized Asarco's ability to continue funding environmental remediation. Accordingly, the United States filed suit in U.S. District Court in Arizona and, in January 2003, reached a settlement with Asarco that significantly increased the amount of money Asarco would receive in exchange for its stock.

In addition, the 2003 Asarco Globe settlement established an environmental trust that now funds environmental cleanup at Asarco sites throughout the country. The money in the trust, however, does not satisfy all of Asarco's response cost obligations. Accordingly, EPA prioritizes sites throughout the country, thereby determining which cleanup efforts will be funded, and the amount they will receive. A shortage of funding from the trust is the reason for a lack of progress at some of the OUs, such as the remediation of commercial and industrial properties and the Former Neutralization Pond. Current bankruptcy proceedings are still ongoing. Final cleanup is dependent on the resolution of the bankruptcy proceedings.

3.1 OU1: Former Neutralization Pond

Location and History

The FNP is located in the north central portion of the Asarco Globe Plant Site (see Figure 2). This operable unit was originally used for disposal of production related waste water streams generated at the Globe Plant Site. In May 1986, use of the pond was discontinued. Since most of the water drained or evaporated, what remained existed as pore water within the precipitate materials. These precipitates, primarily gypsum, contain various metals, including cadmium and arsenic. Samples of the precipitates failed both the Toxic Characteristics Leaching Procedure (TCLP) and Extraction Procedure (EP) toxicity tests for cadmium and arsenic. An interim remedial action was implemented in 1986. At that time, the pond was regraded and capped with six inches of clay soil and revegetated.

Since then, the FNP has been used for disposal of site-related sediments and sludge from the on-site Waste Water Treatment Plant. In 2003, soils excavated from the Former Sedimentation Pond were added to the FNP. The total surface area covered was approximately 3.4 acres. The placement area was then covered with approximately 4,000 cubic yards of clean material, regraded to provide adequate drainage, and was revegetated during the 2004 season. This was performed as an interim measure until the ROD can be fully implemented.

3.2 OU2: Groundwater and Surface Water

3.2.1 Terrace Groundwater

The Terrace Drain, part of the Groundwater Surface Water OU (Figure 3), is on the eastern side of the Globe Plant Site and is approximately 1,945 feet in length. It is installed near the eastern edge of the terrace portion of the Globe Plant Site. The northern

660 feet of the drain system are installed parallel to and approximately 70 feet west of Washington Street. The northern terminus of the Terrace Drain is approximately 180 feet south of the Globe Plant Site's northern boundary at 55th Avenue. The southern end of the Terrace Drain is near the Asarco's former main office building in the south central portion of the Globe Plant Site. For approximately 1,000 feet of its length, the alignment of the Terrace Drain is roughly parallel to and directly up gradient of the Farmers and Gardeners Ditch (FGD), which is an irrigation conveyance system (Figure 3) that runs from southwest to northeast through the Globe Plant Site. Within the Globe Plant Site, the FGD is enclosed within a 36-inch diameter pipeline.

Shallow groundwater on the terrace contained concentrations of cadmium, arsenic, and zinc in excess of the Federal Primary and Secondary Drinking Water Standards. Sources of the elevated metals concentrations include the FNP, fill material and deposits in the former neutralization pond, spent electrolyte solutions near the FNP, and possible wet operations from the surrounding buildings.

3.2.2 Floodplain Groundwater

Shallow groundwater flows southeastward from the terrace and enters the floodplain aquifer of the South Platte River. Upon entering the floodplain, the direction of groundwater flow bends sharply to the northeast and flows approximately 8,000 feet before entering the South Platte River.

In 1993, floodplain deposits within and beyond the Globe Plant Site's eastern boundary exceeded the Federal Primary and Secondary Drinking Water Standards for concentrations of cadmium, zinc, and arsenic. Beyond the localized floodplain plume, zinc concentrations were below the performance objective of 5.0 mg/l. Concentrations of cadmium and arsenic in the floodplain aquifer were one to two orders of magnitude lower than in the terrace groundwater, but remained above performance objectives of 0.005 mg/L and 0.05 mg/L, respectively.

3.2.3 Industrial Drainage Ditch (IDD) and 51st Avenue Retention Ponds

The IDD is an open ditch drainage way, which generally parallels the western boundary of the Asarco Globe Plant Site. It originates as an open ditch collecting runoff in an industrial area west of Interstate 25 and flows under the highway in a buried concrete pipe. It then flows as an open ditch along the west side of the Globe Plant Site to 51st Avenue, where it discharges to the 51st Avenue Retention Ponds. Water from the Retention Ponds flows into the 51st Avenue storm sewer, then into a concrete lined channel to the former Northside Sewage Treatment Plant (NSTP) property and then into the detention pond. Overflow from the detention ponds flows by buried concrete pipe to the South Platte River.

The IDD and 51st Avenue Retention Ponds were constructed to manage storm water and are operated by the City and County of Denver within an easement from the Burlington Northern Railroad. An interceptor trench was excavated on the Globe Plant Site in 1974

to prevent runoff from the vicinity of the FNP from entering the IDD. The interceptor trench was designed to stop groundwater from leaving the site at times of the year when the IDD is gaining. Water is extracted from the interceptor trench at a rate of approximately 1,000 gallons per day and treated at the existing Waste Water Treatment Plant (WWTP). The WWTP was expanded as part of the remedy to treat the Terrace Drain groundwater. Because soil berms along the perimeter of the Globe Plant Site prevent runoff from entering the IDD, the interceptor trench is no longer necessary.

3.2.4 Northside Sewage Treatment Plant Detention Pond

The Northside Sewage Treatment Plant (NSTP) Detention Pond is along the path of surface flow from the IDD to the South Platte River. Because the IDD received groundwater from the Asarco Globe Plant Site, as well as surface water and groundwater from the large urban area surrounding and upstream of the Globe Plant Site, the sediments within the detention pond had elevated levels of metals and organics.

The Industrial Drainage Ditch originates as an open ditch collecting runoff in an industrial area west of I-25 and flows under the highway in a buried concrete pipe. It then flows as an open ditch along the west side of the Globe Plant Site to 51st Avenue where it discharges to the 51st Avenue Retention Ponds. Water from the Retention Ponds flows east to Washington Street, south to 50th Avenue and east along 50th Avenue to a concrete lined open channel on the former NSTP property. Water in the concrete lined channel flows north to the NSTP Detention Pond excavated in the floodplain deposits.

3.2.5 Localized Floodplain Plume (LFP)

Within the floodplain deposits and beyond the Globe Plant Site's eastern boundary, concentrations of cadmium, zinc, and arsenic exceeded the Federal Primary and Secondary Drinking Water Standards. This included a localized area of groundwater east of the Asarco Globe Plant Site boundary in the floodplain area near GW-64 (Figure 3) where concentrations of the metals of concern were significantly higher than the concentrations throughout the majority of the floodplain plume.

Before the installation of the Terrace Drain, shallow groundwater with elevated concentrations of arsenic, cadmium, and zinc flowed in an east-southeast direction off the terrace and into the floodplain aquifer producing the localized floodplain plume. Upon entering the floodplain, the direction of groundwater flow bends sharply to the northeast and flows approximately 8,000 feet before entering the South Platte River.

Water levels recorded during the first quarter of 2000, about one year after the Terrace Drain became operational, indicate that the groundwater upgradient of the Terrace Drain flows southeast and is captured by the drain.

3.3 OU3: Community Soils and Vegetable Gardens

Location and History

The Community Soils and Vegetable Gardens Operable Unit is described as any property within or generally adjacent to the Asarco Globe Plant Site (see Figure 4), where metals concentrations in soils exceed any of the community soils action levels shown in Table 2 later in Section 4.3. The actual extent of the remediation area was based on testing of each property. The area includes both residential and commercial/industrial properties.

When the Asarco Globe Plant Site was built in 1886, the surrounding area was considered rural. The residential area grew up as a company town housing project for smelter workers from around the world. Homes date from the late 1800s.

Today the site is within the Denver urban corridor that straddles the South Platte River Valley and has become a major transportation and industrial corridor. Now, where two major interstate highways (I-25 and I-70) intersect, the Globe Plant Site and its surrounding neighborhood are at the core of a mixture of residential, commercial, and industrial land use.

3.4 OU4: Asarco Globe Plant Site

Location and History

The Asarco Globe Plant Site, bounded by East 51st Avenue on the south, the Industrial Drainage Ditch on the west, East 56th Avenue on the north, and Washington Street on the east, encompasses approximately 78 acres. See Figure 5.

The preferred alternatives in the Record of Decision for the Globe Plant Site have been implemented:

- air pollution source controls and fugitive emissions and dust controls;
- emissions cap of 162 kilograms cadmium per year;
- excavation, covering, deep tilling, or exposure controls for plant soils above worker/trespasser action levels;
- excavation and stabilization of sediments;
- sealing of floors and sumps as necessary;
- secondary containment in plant sumps; and
- spill control of the Retention Pond.

The Environmental Covenant (2005) included the followings use restrictions for the Globe Plant Site:

- No residential purposes or to raise crops and livestock;
- No child or animal daycare facility;
- Except for remediation purposes, no use or extraction of groundwater;
- No excavation or construction on the FNP; and
- The soil cap must be maintained on the site.

3.4.1 Buildings

The buildings are located on the 78 acres at the Asarco Globe Plant Site, which is located as described in Section 3.4 above. The Asarco Globe Plant Site includes 53 manufacturing and support buildings used for production, offices, and waste water treatment.

3.4.2 Point Source and Fugitive Air Emissions

The remedy applies to operations at the Asarco Globe Plant Site, which is located as described in Section 3.4 above. The history of smelting activities at the Asarco Globe Plant Site is extensive. Lead smelting occurred between 1901 and 1919. In 1919, Globe changed its production to arsenic trioxide until 1926 when it converted to cadmium production. Large-scale cadmium production ceased in 1991, however, cadmium oxide and cadmium powder production continued until 1993, the same year the Record of Decision was signed. Production of indium began in 1944 and ended in the mid 1950's. The Asarco Globe Plant Site currently is shut down and has not produced metals since November 2006. Thus, no air emissions cap is necessary.

3.4.3 Surface Soils

All surface soils at the Asarco Globe Plant Site bounded by East 51st Avenue on the south, the Industrial Drainage Ditch on the west, East 56th Avenue on the north, and Washington Street on the east have been sampled. Cadmium, arsenic, lead, and zinc concentrations are elevated in the upper 24 inches of site soils because of historical smelter operations.

3.4.4 Sedimentation Pond

A small pond, approximately 50 feet in diameter, was located in the northeast corner of the Globe Plant Site. This pond trapped sediments in surface water runoff from the northern portion of the Globe Plant Site. The pond was taken out of service in the early 1980s by filling it with building demolition material, regrading the area to a relatively smooth surface, and covering sediments in the pond with a thin clay cap. Total metal concentrations in sediments located below the groundwater table were elevated with arsenic concentrations as high as 6,125 ppm. These saturated sediments were a source of arsenic contamination in shallow groundwater.

3.4.5 Soil and Runoff Control Pond

The remedy requires that surface runoff be managed from active areas of the Globe Plant Site that could contain elevated concentrations of metals. The Asarco Globe Plant Site is located as described in Section 3.4 above. The Asarco Globe Plant Site includes several ponds, basins, and drainage pathways that historically carried runoff and process waters off the Globe Plant Site. Thus all surface water is captured in the ponds, basins and drainage areas.

4.0 REMEDIAL ACTIONS

Environmental Covenant

Because the remedy at the Globe Plant Site will not be protective for all uses, Asarco has granted the State an environmental covenant (dated October 4, 2004; filed in City and County of Denver on November 8, 2004). The purpose of the environmental covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituent, and/or solid waste that remains on the property by controlling land resource uses. By granting the environmental covenant to the State, Asarco will ensure that the State will have enforceability over certain restrictions on the use of the property. For example, because soil remediation levels at the Globe Plant Site are not compatible with the use of the property for residential or agricultural purposes, those uses will be prohibited in perpetuity. In addition, except for remediation purposes, any use or extraction of the groundwater will also be prohibited. If conditions change at the Globe Plant Site such that some or all of these uses are appropriate, the owner of the property at the time may request that CDPHE approve a modification or termination of the covenant.

4.1 OU1: The Former Neutralization Pond

4.1.1 Remedy Selection

The goal of the FNP Remedial Action is to prevent exposure and to prevent or minimize migration of FNP materials into the environment.

In the Record of Decision, the preferred alternative for the remedial action at the FNP included in place closure with a slurry wall, a multi-layer cap, maintenance of inward groundwater flow with gravity drain; treatment of collected groundwater; periodic monitoring, and institutional controls. This work is referenced in the Consent Decree's (CD) Statement of Work (SOW), under Section 3.2. More detailed information on the CD can be obtained at CDPHE's Hazardous Materials and Waste Management Division Records Center. The FNP will be closed by:

- Covering the precipitate material with a multi-layer RCRA Subtitle C-equivalent cap to minimize infiltration into, prevent direct contact with, and prevent wind blowing of precipitate materials. The cap is to be designed and constructed in accordance with relevant RCRA Subtitle C cap guidance.
- Installing a slurry wall to limit groundwater flow into, and leachate flow from the precipitate materials, and subsequent metals migration and to further contain the materials by separating the materials from the surrounding environment.
- Installing a drainage system within the slurry wall enclosure to drain groundwater from the slurry wall enclosure, and lower groundwater to elevations below the materials and prevent the generation and migration of leachate from the materials. Groundwater drained from within the slurry wall would then be pumped and treated on site.

The institutional control used to achieve the protectiveness goals of the remedy is the Environmental Covenant. The Environmental Covenant, recorded January 2005, denotes that the FNP area is a waste disposal site and includes restrictions against excavation into the cover, construction of structures, groundwater use within the slurry wall or outside the wall until MCLs are met, and agricultural use.

4.1.2 Remedy Implementation

The remedial action for the Former Neutralization Pond Operable Unit has not been initiated, except for the ICs. Designs for the FNP remain at the 90% stage. Due to Asarco's financial situation, work on the project has been postponed indefinitely. The State has indicated to EPA that completion of this project should be a priority under the Asarco Environmental Trust, and in December 2008 CDPHE requested $16M from the Asarco Trust for the completion of the project. Funding is not yet available due to the bankruptcy proceedings.

4.2 OU2: Groundwater and Surface Water

4.2.1 Remedy Selection

In the Record of Decision, the preferred groundwater remedy is described as a Terrace Drain system, excavation, and disposal of IDD and Retention Pond sediments, periodic monitoring, institutional controls and contingency for covering detention pond sediments. The Terrace Drain, installed along the length of the Globe Plant Site terrace, is designed to intercept and collect contaminated groundwater from the terrace. This supports local extraction of arsenic-contaminated floodplain groundwater near the northeast corner of the Plant as necessary, and supports the treatment of collected contaminated groundwater at Asarco's Waste Water Treatment Plant to the performance objectives as shown in Table 1. The remaining floodplain contaminated groundwater should naturally attenuate.

In the Record of Decision, institutional controls of the groundwater to prevent use of Globe Plant Site and Floodplain groundwater as long as it remains contaminated included:

- a prohibition on installation of any water supply wells within the contaminated portion of the floodplain
- a requirement that treatment of groundwater continue as long as water remains contaminated.

Table 1: Groundwater Performance Objectives

Arsenic (As)	Cadmium (Cd)	Zinc (Zn)
0.05 mg/L	0.005 mg/L	5.0 mg/L

A map illustrating the components of the Groundwater and Surface Water Operable Unit is presented in Figure 3.

4.2.2 Remedy Implementation

Terrace Groundwater

The Terrace Groundwater Remedial Action has been completed; its purpose being to prevent or minimize the flow of groundwater containing concentrations in excess of 0.005 mg/l cadmium, 0.05 mg/l arsenic, and 5 mg/l zinc, from the terrace portion of the Globe Plant Site to the floodplain and resulting impacts to the floodplain aquifer, and to prevent or minimize impact to the IDD and FGD.

The Terrace Drain intercepts groundwater by extending from the ground surface into the underlying upper claystone material of the Denver Formation (approximately 20-35 feet below the ground surface). It conveys the intercepted groundwater through a high-permeability, gravel collection system, into a perforated drainage pipe to two sumps. From these sumps, it is pumped to the Globe Plant Site's onsite Waste Water Treatment Plant. Approximately 14,000 gallons per day are extracted and sent to the WWTP. Once treated, the intercepted groundwater is discharged into the City and County of Denver sanitary sewer system in accordance with Asarco's Conditional Waste Water Discharge Permit with the Metropolitan Waste Water Reclamation District.

Asarco submitted a Notice of Completion Report in February 2001. CDPHE's approval letter was issued May 14, 2001. The SOW requires the monitoring and evaluation of cadmium, arsenic, and zinc concentrations in the groundwater of the floodplain aquifer. Concentrations of these metals should decrease over time due in part to the installation of the Terrace Drain. At present, based on estimates of time needed for concentration reductions in floodplain groundwater, insufficient time has elapsed since the drain's installation to expect observable reductions. The monitoring wells in the floodplain plume are expected to exhibit concentration reductions during the next ten years (in 2014 and 2019, respectively). Because of Asarco's tenuous financial situation and the availability of funds from the National Trust for use at the Globe Site, Asarco has only submitted the 2008 Annual Monitoring Report, not the quarterly reports as indicated in the Consent Decree. The groundwater Annual Monitoring Report indicated that the groundwater contaminants are still elevated in the floodplain plume. The EPA/State will work with the Bankruptcy Trust and implement quarterly sampling as soon as possible.

Floodplain Groundwater

The goals of the Floodplain Groundwater Remedial Action are:

- To prevent domestic or irrigation use and human exposure, through the implementation of the Terrace Drain, and operation of the Waste Water Treatment Plant, groundwater concentrations of cadmium, arsenic, or zinc to levels below 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively, or background levels not

attributable to the Asarco Globe Plant Site, whichever are higher, in the floodplain by 2093.

- To prevent or minimize further degradation of the floodplain groundwater due to the discharge of groundwater exceeding performance objectives while restoration takes place.

The groundwater remedial action includes two components: 1) a comprehensive groundwater use survey, 2) and a quarterly monitoring program for the floodplain aquifer that includes annual evaluation of concentrations of cadmium, arsenic, and zinc. This will ensure that monitored natural attenuation is effective. The quarterly and annual reports stopped in 2004, due to the bankruptcy, and resumed in December 2008.

In December 1995, Asarco completed the water use survey, which identified 23 wells of which six remained in service (three for irrigation, two for industrial use, and one for fire control). The remaining 17 were classified as officially closed. The State Engineer's records indicate that except for monitoring wells, no new applications for well permits were filed as of December 2002. A system is in the process of being set up for the State Engineers office to notify CDPHE before groundwater well permits are issued.

While concentrations of cadmium, arsenic, and zinc in the floodplain down gradient of the Asarco Globe Plant Site have shown a gradual decrease with time, annual monitoring has not been performed regularly since 2004. Installation of the Terrace Drain has shown a positive influence in this outcome. Routine quarterly and annual floodplain monitoring has not been performed in accordance with Section 7.5 of the SOW (CDPHE Records Center) due to lack of funds as a result of the Asarco bankruptcy.

It is recommended that as soon as funding is available, groundwater monitoring operations should recommence.

Industrial Drainage Ditch (IDD) and 51st Avenue Retention Ponds

The original goal of the IDD and Retention Ponds Remedial Action is to prevent or minimize metals migration from the Globe Plant Site to the IDD and Retention Ponds water and sediments through the installation of an interceptor trench. The proposed Remedial Objectives, referenced in the SOW, under paragraph 4.3.2 were as follows:

- Ditch sediments with metals concentrations exceeding community soils action levels (>70 parts per million (ppm) for As, >73ppm for Cd, and >500 ppm for Pb), will be removed from the IDD and Retention Ponds.
- The IDD and Retention Ponds will be restored to their previous retention and flow capacities (or greater) through grading and establishment of vegetation as necessary to control erosion.
- The interceptor trench will be excavated of sediments down to unweathered claystone and then backfilled. A gravel pipe drain will be installed in the backfill in the event that pumping from the interceptor trench drain is necessary to prevent groundwater from entering the IDD.

Community soils action levels are used to determine the need for removal of IDD ditch sediments. The action level of 500 ppm lead is above the currently recommended default action level of 400 ppm lead in soil. Because IDD and Retention Ponds will be graded and re-vegetated, having sediments left in place at concentrations of up to 500 ppm versus 400 ppm is not likely to have a significant impact on surface water or groundwater concentrations. On-going monitoring, dependent on National Trust funding, will confirm this.

Sediments were removed from the IDD and Retention Ponds and their previous capacities were restored in the fall of 1997. The interceptor trench had its sediments removed and subsequently backfilled with a gravel and pipe drain system in the fall of 1996. The groundwater objectives will be monitored in the future, and a further determination of any contingencies is subject to the completion of the FNP cap and slurry wall installation.

The Notice of Completion Report for the IDD, 51st Avenue Retention Ponds and the interceptor trench was conditionally accepted by CDPHE in a letter dated December 11, 1998. The following performance monitoring activities were initiated in January 1999, but some were halted in 2004 due to the bankruptcy:

- Quarterly monitoring of total and dissolved metals concentrations in surface water (stopped in 2004, resumed in 2007);
- Annual monitoring of total metals concentrations in sediment (stopped in 2004 and resumed in 2006);
- Quarterly monitoring of water levels and collection of groundwater samples in monitor wells adjacent to the IDD (stopped in 2004 and resumed in 2007); and
- Quarterly monitoring of dissolved metals concentrations in groundwater down gradient from the IDD (stopped in 2004 and resumed in 2007).

Surface Water Conditions
Four surface water samples were collected in 2007 and analyzed for total and dissolved arsenic, cadmium, and zinc. Total and dissolved arsenic and zinc concentrations did not exceed the respective 0.05 and 5.0 mg/L performance criteria at any of the four monitoring locations. However, cadmium concentrations in excess of 0.005 mg/L were observed at one location for three of the four sampling events. In addition, total cadmium concentrations in excess of 0.005 mg/L were observed at one location during all four events and at two other locations during the second and fourth quarter events. Again in 2008, Asarco reported that in the fourth quarter of 2008, Cadmium exceeded action levels for the sampling event. Further data is needed to determine if the remedy is working.

Sediment Conditions
In 2006 and 2007, several sediment samples from the upper portion of the IDD were reported to contain arsenic and cadmium in excess of the performance criteria (community soils action levels). Also, in 2008 Asarco reported cadmium concentrations above 73 ppm in two areas of the upper portion of the IDD. This indicates that there may

be an area from the Globe Plant Site contributing to elevated sediment contamination. Further data is needed to determine if the remedy is working.

Groundwater conditions
Since the third quarter of 2001, there have been several exceedances of the performance criteria in the rolling averages for dissolved arsenic, cadmium, and zinc (0.05, 0.005, and 5.0 mg/L respectively). Further data is needed to determine if the remedy is working. Due to the Asarco bankruptcy, this has not been funded to further evaluate the cause of these trends.

Northside Sewage Treatment Plant Detention Pond

The remedial objective of the NSTP Detention Pond Remedial Action is to prevent or minimize direct contact with NSTP Detention Pond Sediments that have metals contamination above community soils action levels.
(refer to Table 2 section 4.3*)*.

Sediments in the detention pond are continually covered with water in excess of 10 feet, are not exposed, and do not pose a risk to human health. Therefore, no action was required. If, however, the detention pond sediments with metals above the community soils action levels become exposed for two months and continued exposure appears likely, Asarco will cover the area with 12 inches of clean soil, or excavate and dispose of the exposed sediments. If excavated, soils will be tested for hazardous waste characteristics and managed appropriately. No exposed sediments were observed during any monthly inspections conducted by Asarco.

Localized Floodplain Plume (LFP)

The goal of the Localized Floodplain Plume Remedial Action is to prevent domestic irrigation use and human exposure to concentrations of cadmium, arsenic, or zinc in excess of 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L, respectively. The concentrations reported in the 2008 Performance Evaluation Report (December 2008) and the current levels appear to be typical of elevated historic conditions.

In accordance with Section 4.5.2 of the SOW, located in the CD, and the Localized Floodplain Plume Design Investigation Plan, a Design Investigation was conducted for the LFP following implementation of the Terrace Drain remedy. A Design Investigation Report (DIR) was submitted to CDPHE for that work on April 5, 2002. The DIR concluded that the Terrace Drain has been effective in reducing metal concentrations in groundwater of the LFP, and that metal concentrations in groundwater should continue to decrease over time. The DIR also concluded that separate remedial action to address groundwater metal concentrations in LFP does not appear to be necessary due to stable conditions. The Colorado State Engineer's office has noted that the groundwater is contaminated to the east and north-east of the Asarco Globe Plant Site, and will notify the State concerning applications requesting the use of the shallow aquifer.

4.3 OU3: Community Soils and Vegetable Gardens

4.3.1 Remedy Selection

In the Record of Decision the preferred remedy for the Community Soils and Vegetable Gardens Operable Unit was to excavate to a depth of 12 inches and replaced with certified soil.

The goal of the Community Soils and Vegetable Gardens Remedial Action is to prevent or minimize exposure to soils and vegetables grown in soils with concentrations of metals exceeding the health-based action levels. The primary action levels are as follows: arsenic is 70 ppm, cadmium is 73 ppm, and lead is 500 ppm. Properties that exceed action levels were identified through a property-by-property sampling and testing program. The risk based primary action levels are summarized in Table 2.

Table 2: Soils Metals Action Levels Community Soils

Metal	Residential (ppm)	Commercial/Industrial (ppm)
Arsenic (As)	>70	>70
Cadmium (Cd)	>73	>73
Lead (Pb)	>500	>1460
Zinc (Zn)	>500	>500

A medical monitoring program was included as a part of the remedy for community soils for residents and people employed in the area. The program was designed to provide an assessment of individual health status and adverse health effects that may have occurred because of historical exposure to cadmium, arsenic, and lead related to the Asarco Globe Plant Site, or that may have occurred due to site remediation. It was provided for residents who currently live near or have previously lived near the Globe Plant Site.

4.3.2 Remedy Implementation

Remediation of contaminated soils is by one of three methods; referenced in the SOW, paragraph 5.2.1: 1) Removal of a 12 inches of soil and replace with 12 inches of clean soil; 2) cap with 12 inches of clean soil; or, 3) deep tilling. In general, the order in which remediation took place was: 1) schools and parks; 2) required residential areas; and 3) commercial areas. The remedy included implementation of public information and education as well as a medical monitoring program.

As of the fall of 2002, all residential properties (approximately 700) in the area immediately surrounding the Asarco Globe Plant Site and those not incorporated into the Vasquez Boulevard and I-70 Superfund Site that exceed the State action levels as defined

in Table 2 above, have been remediated. Also, all the school and parks in the site have been remediated.

A number of commercial and industrial properties have not been sampled, and a number have been sampled but not remediated. All of the schools and parks were remediated during the residential portion of the cleanup. Because of Asarco's financial situation, a National Trust fund has been established to assure Asarco's ability to address environmental liability. CDPHE has requested funding for that project from the Asarco Trust. To date $500,000 has been allocated for the fiscal year (FY) 2009.

In 2002, the State and Asarco filed a "Notice of Joint Modification of Statement of Work and Medical Monitoring Program" with the United States District Court for the District of Colorado. At that time, the commercial/industrial action level for lead was changed from 500 ppm to 1,460 ppm, which is consistent with the Hazardous Materials and Waste Management Division's Proposed Soil Remediation Objective Policy. It was hoped that by reducing the number of commercial/industrial properties that require remediation for lead, Asarco could redirect available funds to the residential cleanup while still providing a protective cleanup for those commercial/industrial properties that are significantly impacted.

The medical monitoring program evaluated "recent" exposure to lead, arsenic, and cadmium, which is both before and during soil remediation activities. The test used to detect metals only represents recent exposure over the last 48 -72 hours. An updated cancer cluster survey was performed to evaluate long-term carcinogenic effects from exposure to both arsenic and cadmium. In addition to health education, the program offered individual follow-up by a program physician. Medical monitoring was offered throughout the duration of community soil remediation. Since the program began in 1994, over 1,500 individuals have participated in the program. CDPHE has not seen community–wide evidence of health effects due to exposure to heavy metals originating from the Asarco Globe Plant Site. A final medical monitoring report was prepared and issued in 2004. The report indicated that there were no ill health effects due to the exposure of heavy metals originating from the Asarco Globe Plant Site.

4.4 OU4: Asarco Globe Plant Site

The Asarco Globe Plant Site, bounded by East 51st Avenue on the south, the Industrial Drainage Ditch on the west, East 56th Avenue on the north, and Washington Street on the east, encompasses approximately 78 acres. See Figure 5.

4.4.1 Remedy Selection

In the Record of Decision, the preferred alternative for the Globe Plant Site included:

- air pollution source controls and fugitive emissions and dust controls;
- emissions cap of 162 kilograms cadmium per year;
- excavation, covering, deep tilling, or exposure controls for Globe Plant Site soils above worker/trespasser action levels;

- excavation and stabilization of sediments;
- sealing of floors and sumps as necessary;
- secondary containment in Globe Plant Site sumps; and,
- spill control of Retention Pond.

The Environmental Covenant included the following use restrictions for the Globe Plant Site:

- No residential purposes or to raise crops and livestock;
- No child or animal daycare facility;
- Except for remediation purposes, no use or extraction of groundwater;
- No excavation or construction on the FNP; and,
- The soil cap must be maintained on the site.

Buildings

The goals of the remedial action for the Asarco Globe Plant Site buildings are to:

- prevent or minimize leaching of metals from buildings and sumps that result in concentrations of cadmium, arsenic or zinc that exceed 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively; and
- prevent or minimize leaching of metals from sources below buildings that result in concentrations of cadmium, arsenic or zinc that exceed 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively.

4.4.2 Remedy Implementation

Because large-scale operations were discontinued at approximately the same time as the signing of the decision documents, the risk of release from any of the buildings was minimized. The Asarco Globe Plant Site buildings and associated drive, parking areas and concrete pads covers about one-fourth of the Globe Plant Site surface area and serve as a stable interim status, reducing the possibility of exposure to workers and trespassers. Therefore, leaching of metals would not be occurring.

Point Source and Fugitive Air Emissions

The goals of the Point Source and Fugitive Air Emissions Remedial Action were to minimize point source and fugitive emissions of cadmium and arsenic from the Asarco Globe Plant Site and to reduce human health risk due to cadmium and arsenic emissions from the Globe Plant Site to health protective levels. Since the Globe Plant Site has shut down, these are no longer an issue.

The remedy consisted of controls for an industrial-scale cadmium refining process, which after the Record of Decision was issued in 1993, was discontinued due to no air emissions from the Globe Plant Site.

Ambient air monitoring was conducted at four existing monitoring high-volume stations near the Plant boundaries on at least a once every six days, twenty-four hour period frequency. The High volume filters were analyzed for Total Suspended Particles (TSP), cadmium, arsenic, and lead during each test period. In addition, at least one of the TSP stations was modified to include a co-located air particle monitor. The meteorological station on the Globe Plant Site was discontinued at the time the Globe Plant Site ceased air emissions in 1994.

Surface Soils

The goals of the Asarco Globe Plant Site surface soils are to:

- prevent or minimize community residents exposures to windblown soils from the Globe Plant Site that exceed community soils action levels by use of vegetation or by covering with asphalt, buildings or other barriers;
- prevent or minimize migration of cadmium, arsenic, lead, or zinc from Globe Plant Site shallow soils with concentrations that exceed community soils action levels to surface water and groundwater;
- prevent or minimize exposure to trespassers or workers to soils with metals concentrations exceeding health-based action levels for cadmium, arsenic or lead above 9,125 ppm, 426 ppm, and 3,000 ppm, respectively; and,
- maintain a continuous fence around the Globe Plant Site property so that it is only accessible to Globe Plant Site workers and authorized visitors.

Surface soils at the Asarco Globe Plant that exceed the worker/trespasser action levels (cadmium, arsenic or lead above 9,125 ppm, 426 ppm, and 3,000 ppm respectively) will be remediated by capping or deep tilling to prevent exposure of workers or trespassers to these concentrations. Capping consists of 12 inches of borrow soils (including excavated community soils with metals concentrations below the worker/trespasser action levels) or two inches of asphalt or other durable cover (hardscaping) placed over these soils. Deep tilling will be allowed where tilling will mix the soils such that the overall concentration is brought below the worker/trespasser action level for each metal. For all capped areas that are not paved or covered with gravel, a vegetative cover will be established that has sufficient diversity to ensure long-term viability and sufficient density to prevent erosion that may impair the integrity of the soil cap.

Surface soils that exceed the community soil action levels in the upper six inches but are less than the worker/trespasser action levels, are remediated by providing a vegetative cover that is sufficient to endure long term viability and prevent erosion or, by placing a minimum of 12 inches of borrow soils meeting specifications approved by CDPHE (including excavated community soils with metals concentrations below the worker/trespasser action levels) over the soils, or by placing a two inch asphalt cover. All slopes with soils that exceed community soils action levels will be stable and erosion resistant. The top one foot will remain uncompacted for establishment of vegetation.

Where soils are placed on the Asarco Globe Plant Site, the resulting topography will blend with the natural landscape, be of stable configuration, create positive stable drainages, and have vegetative covers sufficient to ensure long-term viability and prevent erosion.

To the extent possible, excavated community soils placed on the Globe Plant Site must not be characteristically hazardous based on the upper 90% confidence limits for the correlations between the Toxicity Characteristic Leaching Procedure (TCLP) results and the total metal concentrations and meet the technical requirements of a Solid Waste Certificate of Designation (no degradation of groundwater, surface water, or air quality).

After areas exceeding worker/trespasser action levels and the lead slag pile are covered, excavated community soils will continue to be placed on areas with higher concentrations of metals to areas of lower concentrations. Soils with metals concentrations greater than the worker/trespasser action levels or which are Resource Conservation Recovery Act (RCRA) characteristic, will be managed in a manner meeting all applicable off-site regulations or applicable or relevant and appropriate requirements if managed on-site.

After the completion of the residential portion of the Community Soils and Garden's Operable Unit, which included the placement of those soils on the Globe Plant Site, community soils covered approximately 30% of the Asarco Globe Plant Site. In 2002, because areas needing cover remained, EPA began placing soils removed from residential properties at Operable Unit 1 (OU1) of the Vasquez Boulevard and I-70 (VB/I-70) Superfund Site on the Globe Plant Site to continue covering areas not yet covered with Globeville community soils. Placement of the VB/I-70 soils is consistent with the remedy design agreed to by the State and Asarco in the Statement of Work of the Consent Decree for the Asarco Globe Plant Site and as stated in Section 1.3.1 of the Globe Plant Soils Preliminary Design Report (February 22, 1994). Soil placement (See Figure 6) will likely continue until the remaining commercial/industrial properties in the Asarco Globe Plant Site have been remediated. Reduction of contaminant levels in the surface soils will facilitate future development of the property.

This remedial action is an ongoing effort until all the community soils placement areas have been completed. The remaining commercial/industrial contaminated soils will be brought on the Globe Plant Site and deposited in the placement areas. This effort is projected to be completed by December 2011. The community soils placement activities are conducted to improve the drainage on the Globe Plant Site. Currently a berm runs the length of Washington Street on the west side and prevents any runoff from reaching the City and County of Denver right-of-way. In addition, upgrades have been performed with funds from the Natural Resource Damage Suit. This includes planting of several hundred trees and shrubs that will provide protective cover, erosion control, as well as serve as a visual barrier to the Asarco Globe Plant Site.

Sedimentation Pond

Remedial Objectives for the Sedimentation Pond are to prevent or minimize leaching of arsenic, cadmium, lead, and zinc into shallow groundwater and to prevent or minimize exposure of worker/trespassers to contaminated surface soils.

In late 2003, materials contained within the sedimentation pond were excavated, placed on the Former Neutralization Pond, and covered with approximately 4,000 cubic yards of clean fill material. Remediation is complete for this area.

Spill and Runoff Control Pond

The goal of the Spill and Runoff Control Pond Remedial Action is to prevent or minimize any surface runoff from active areas of the Asarco Globe Plant Site that may contain elevated metals from entering other areas or from leaving the Globe Plant Site.

Because large-scale operations were discontinued at approximately the same time as the signing of the decision documents, the risk of spills was minimized due to no more ongoing releases from the operation.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

Little has changed since the last five-year review. Due to the bankruptcy proceedings, only the minimum has been done to the site. In 2006 the Globe Plant Site was shut down and the operations were discontinued. The Waste Water Treatment Plant has been maintained and operating, and 2008 was the last time a full round of groundwater monitoring was performed since 2004. Over the last two years there has been some soil sampling and remediation of the remaining commercial industrial properties. Last count showed that there were approximately 112 sectors (6.4 acres) that still need to be remediated.

Very little has been done in completing the closure of the FNP. CDPHE will be working closely with the National and Bankruptcy Trust to proceed with the final remedy.

Since the filing of the environmental covenant, the only work on the site has been some placement of community soils, which is consistent with the covenant. Final grading and placement of community soils should be completed in late 2010.

Issues and recommendations from the 2004 Five-Year Review:

- Completion of OU for the Former Neutralization Pond—continued in 2009 five-year review
- Continue groundwater monitoring—continued in 2009 five-year review
- Continue operation of the Waste Water Treatment Plant—continued in 2009 five-year review
- Completion of the Final Medical Monitoring Report—completed November 2004
- Sampling and remediation of commercial/industrial properties—continued in the 2009 five-year review
- Enforcement of institutional controls—completed environmental covenant January 2005

- Continue placement of VB/I-70 community soils on Globe Plant Site—completedVB/I-70 soils September 2006
- Establishment and maintenance of vegetative cover—continued in the 2009 five-year review

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Component

The third five-year review for the Asarco Globe Superfund Site was led by Fonda Apostolopoulos, of the Colorado Department of Public Health and Environment. The following team members assisted in the review:

- Danny Lutz – CDPHE Public Information Officer
- John Goodrick – EPA representative
- Randy Flynn – Asarco Property Manager
- Patricia Courtney – EPA Community Involvement Coordinator

The five-year review consisted of the following activities: a review of relevant documents; community involvement plan, data review, and site inspections.

6.2 Community Involvement

A notice was put in the Denver Post YourHub section for the Globeville area May 14, 2009 announcing the five-year review and soliciting public comment. Community interviews were held with area residents.

6.3 Data Review

Due to the bankruptcy and the lack of Asarco funds, only one formal report was issued in 2008. This consisted of groundwater monitoring in the LFP and the industrial drainage ditch. The results were indicative of previous years, and until all operable units are complete, a determination of the remedy can not be established.

As part of the five-year review, state and federal Applicable or Relevant and Appropriate Requirements (ARARs) were reviewed. The purpose of this review was to determine if any newly promulgated or modified requirements of federal and state environmental laws would affect the protectiveness of the remedies implemented at the site. The ARAR review did not find any changes to the regulations that would affect action or location specific standards. However, changes to chemical specific standards have been made that impact the groundwater remedy. The MCL for arsenic has been changed from 50 ug/l to 10 ug/l, and the numeric criterion for aquatic wildlife (i.e., ambient water quality criterion) has changed from 190 ug/l to 150 ug/l.

Groundwater at the Asarco Globe Superfund Site is not currently being used as a source of drinking water and future institutional controls will restrict groundwater use. Therefore, the remedy will remain protective despite the change to the MCL.

6.4 Site Inspection

The State Project Manager performed a site visit on March 18 and 26. The purpose of the site visit was to assess the protectiveness of the remedy. The Environmental Covenant that is in place includes restricted access and prohibitions on use or disturbance of the area. No activities were observed that would have violated the covenant. The cover and surrounding area were undisturbed.

Asarco's Environmental Services Manager stated that the Terrace Drain was in good condition and operating effectively. He reported that no significant issues had been identified regarding the area and that Asarco has met the monitoring requirements successfully in the past five years. All monitoring wells were reported in good condition. The monitoring program has recommenced, as required under the Consent Decree.

At the time of the site visit, it was observed that all residential properties in the area identified as Community Soils and Vegetable Gardens Operable Unit have not changed. No new residential properties have been built at the site since the last five-year review.

The Asarco Globe Plant Site was observed to be in very good condition. No debris or hazards were observed. The asphalt and concrete are in good condition. The buildings are in good repair. To restrict access to the property, the Globe Plant Site is fenced. The condition of the fence is monitored by the Asarco Globe Site plant manager and reported annually to CDPHE.

All culverts and drainage ways are designed and maintained such that surface water remains on the Asarco Globe Plant Site and either evaporates or filters into groundwater where it is subject to monitoring under the Groundwater and Surface Water Operable Unit.

The sedimentation pond has been re-graded to achieve stable configuration and create positive stable drainage. A vegetative cover will be established to ensure long-term viability and prevent erosion.

6.5 Community Interviews

State and EPA representatives conducted interviews with an elected official, the elected official's staff-person, a community leader, and local businessman. Community involvement staff identified interviewees by speaking with project staff.

The businessman has worked in the area for over 20 years, but has never lived in Globeville. The community leader has lived in Globeville for over 20 years. The elected

official has spent much of her life in the Globeville area, representing the neighborhood for the past six years.

In terms of the site's perception, the businessman said that "there's not the community concern [over health effects] that there once was." The community leader also said that there was "hysteria" during the site's cancer study, but then "everything [about the cleanup] seemed to be going smoothly."

The business owner did not find concern about Asarco's funding for the clean-up, saying that cost-recovery "will be a government decision." However, the elected official and her aide both asked about Asarco's ability to pay for the cleanup. They expressed concern about Asarco's bankruptcy, pointing out that it has environmental liabilities at sites across the United States.

6.6 Remediation

All interviewees were unsure of the progress of the cleanup and asked whether the commercial and residential yards remediation actions were complete. The Globe Plant Site remediation seems to be in the back of the community's mind, the business owner said, since there haven't been trucks coming on and off the site over the past few years. Further, he said that the Washington Street and Interstate 25 widening proposals garner more community attention.

The elected official asked if air monitoring occurred at the site, now that Asarco Globe Plant operations have ceased. State project manager Fonda Apostolopoulos answered that after three years of monitoring without any "hits" above air quality standards, monitoring stopped.

Perceptions of the residential yards cleanup have not changed since the last Community Involvement Plan Update (2004 Update), which said that "the community soils cleanup proceeded effectively, that it beautified their neighborhoods, and that the stigma of the contamination was lifted." All interviewees said that the neighborhood stigma has disappeared. However, the business owner said that while the soils are now clean, not all residents are keeping their yards in (what he views as) proper condition.

6.7 Future of the Site

The community leader, elected official aide showed significant interest in the future use of the Globe Plant Site property. They were all curious about funding for the remaining site cleanup and redevelopment – where it will come from and what it will lead to. They agreed that they do not want to see the property turn into industrial use, but instead become more commercial. The business owner offered another alternative for site reuse, a golf course, as the Globe Plant Site footprint fits the required acreage.

Both the community leader and aide had questions about off-site, non-residential properties in the neighborhood – how certain is the state health department that they are clean? For the community leader, it's a concern about a potential area for green space; the elected official's aide has a formerly commercial, city-owned property in mind for redevelopment.

Aside from the Globe Plant Site's reuse, the community leader had questions about Asarco's "demonstration house." She mentioned that during the residential cleanup phase, Asarco had built a house that held information about the cleanup. The community leader said Asarco had promised to donate the house to the community after the residential cleanup. The residential cleanup is complete, but she doesn't know what became of the house.

These priorities differ from the 2004 Update, which found that interviewees thought "redevelopment of the site must be carried out with the community's health as the top priority." In 2009, interviewees seem confident that the state will ensure protection of human health and environment; their main concerns are with zoning and end-use of the remediated Globe Plant Site.

6.8 Stakeholder Communication

All interviewees said that there hasn't been much current public information regarding the site; some requested stronger communication from the agencies. The community leader mentioned that she receives information through newspapers, church fliers or word-of-mouth, but nothing recently from Asarco, EPA or the state of Colorado. She recommended that, in scaling up communications efforts, the state of Colorado could place advertisements in the *North Denver Tribune* and distribute fliers to local churches.

The elected official's aid agreed that there has been minimal information; she recommended placing advertisements and articles in the *YourHub* section of the *Denver Post*, as well as announcing information on Councilwoman Judy Montero's blog. According to the elected official, Montero's blog receives quite a bit of viewer traffic. Journalists say they check the blog for article ideas. The official said that her constituency (which overlaps with the Asarco Globe Plant Superfund Site's stakeholders) is becoming increasingly techno-savvy. They communicate via Twitter, text-messaging and the social networking sites on the internet.

In sharing information about the Globe Site, it was recommended that agencies put out more notices and newsletters, and update stakeholder contact information.

7.0 ASSESSMENT

(OU1) Former Neutralization Pond

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

No, the remedy has not been initiated. In the Record of Decision (ROD) issued February 18, 1993, the preferred alternative is described as "in-place closure with a slurry wall, multi-layer cap, maintenance of inward groundwater flow with gravity drain; treatment of collected groundwater; periodic monitoring and institutional controls." The review of documents, ARARs, and risk assumptions indicate that the completion of the remedy as planned or some variation there of, would still result in a remedy that is protective of human health and the environment. Because the remedy is not yet in place, it is not yet functioning as intended.

Question B: Are the assumptions made at the time of the remedy selection still valid?

Yes, the assumptions made at the time of remedy selection remain valid. Capping of the materials will prevent direct human contact with the materials and wind blowing of particles. The cap will also provide long-term protection against surface water contacting materials. The composite cap will also prevent and/or minimize infiltration of precipitation into the contents and minimize leachate production and subsequent migration into groundwater. Further, the slurry wall and groundwater drain will prevent migration of contaminants into the surrounding groundwater. Once this is in place, it will minimize the maintenance requirement on the Terrace Drain extraction system as well. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy as described in the ROD.

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

No, it is possible that in the ten years since the initial description of the remedy that new technologies may be developed that would improve or enhance the remedy and improve its performance. When it comes time to implement the remedy, any such technologies or changes to the original conceptual design should be considered. Further, redevelopment opportunities may have some bearing on the ultimate remedy design and implementation. In any event, no information has been identified that would call into question the protectiveness of the remedy as described once implemented.

(OU2) Groundwater and Surface Water

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

Yes, in the Record of Decision, the groundwater remedy is described as a Terrace Drain system; excavation and disposal of IDD and Retention Pond sediments; periodic monitoring, institutional controls, and contingency for covering Detention Pond

sediments; a Terrace Drain, installed along the length of the Asarco Globe Plant Site Terrace to intercept and collect contaminated groundwater from the terrace; local extraction of arsenic-contaminated floodplain groundwater near the northeast corner of the Globe Plant Site as necessary; and treatment of collected contaminated groundwater at Asarco's Waste Water Treatment Plant; natural attenuation; and institutional controls.

All the components of the remedy have been installed and appear to be operating as intended. However, cadmium and zinc levels in surface water and arsenic, cadmium and zinc in groundwater exceed performance criteria at the IDD and 51st Avenue Retention Ponds and may indicate an ongoing source of contaminants and a continued exposure pathway. It is not conclusive at this time. Several years of continued monitoring will be necessary to evaluate whether the remedy is operating effectively. Additional monitoring information should be evaluated at the time of the next five-year review.

Question B: Are the assumptions made at the time of the remedy selection still valid?

Yes, the assumptions made at the time of the remedy selection remain valid. No changes in risk assessment methodologies have been noted.

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

No, the performance objective for the allowable concentration of arsenic in groundwater is 50 ug/L, which is above the currently promulgated MCL of 10 ug/L. Therefore, this performance objective would not currently be considered protective for a drinking water source.

<u>(OU3) Community Soils and Vegetable Gardens</u>

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

Yes, the remedy for residential soils and gardens has been partially implemented and is functioning as intended by the decision documents for those portions implemented. The remedy has not yet been implemented at many commercial/industrial properties and is therefore not functioning as intended.

Question B: Are the assumptions made at the time of the remedy selection still valid?

Yes, for residential properties, the assumptions made at the time of the decision documents are still valid. The Hazardous Materials and Waste Management Division of CDPHE developed a commercial/industrial action level for lead in 1999. The remedy originally used 500 ppm lead as a protective number for both residential and commercial/industrial properties. As a result of the new policy, 1,460 ppm was agreed to between Asarco and the State of Colorado in a "Notice of Joint Modification of Statement of Work and Medical Monitoring Program" in 2002. That change will affect the remedy for commercial industrial properties by reducing the number of properties requiring cleanup.

Changes in Risk Assessment Methodologies:

Yes, exposure assumptions and general risk assessment methodologies used to determine health protective remedial actions for the Globe Site community soils are generally unchanged, as are toxicity values for arsenic and cadmium. However, lead screening values for lead in residential soil and methodologies for assessing adult lead exposure (i.e., lead on commercial or industrial properties) have been revised, as discussed below.

Per EPA OSWER Directive 9200.4-27P (August 1998) and Directive 9355.4-12 (July 1994), the screening level for lead in soil for residential land use areas has been revised downward to 400 ppm, in the absence of site-specific study. Therefore, the residential soil cleanup level for lead in community soils (500 ppm) exceeds current risk assessment guidance. However, under the Escamilla Class Action law suit and the C de Bacca Class Action law suit, all residential properties within the site boundaries were remediated regardless of contaminated soil present.

Further, in 2002, EPA signed a ROD for the VB/I-70 Residential Soils Operable Unit where the action levels for arsenic and lead were 70 ppm and 400 ppm respectively. The proposed arsenic cleanup level based on the risk assessment was 240 ppm but was adjusted at the request of the community's desire to be consistent across neighboring sites. The lead cleanup level was altered from the risk-based number of 540 ppm due to State and community input on the proposed remedy.

The cleanup level at the Globe Site for lead in soil at commercial/industrial properties (1,460 ppm) is based on the general methodology provided in Attachment 3 of CDPHE's draft Soil Remediation Objectives (SRO) guidance document (December 1997, and updated in March 2005). More recent risk assessment guidance is currently available for assessing risks to adults exposed to lead in soil (OSWER #9285.7-54 Recommendations of the Technical Review Workshop for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil. EPA-540-R-03-001. January 2003). The risk assessment methodology recommends incorporation of updated information on background levels of blood lead levels in adults (based on CDC's current NHANES data) and improved estimates of variation in adult blood lead levels. The current guidance identifies a range of remediation values for protection of adults exposed to lead in soil from 710 ppm to 1712 ppm, based on site-specific considerations.

Finally, the risk assessment methodology used to calculate exposure dose and risk from ingestion of garden vegetables is outdated compared to currently available data on consumption levels and amount of inorganic arsenic (toxic species) versus organic arsenic (non-toxic form) present in a typical diet. However, again since all residential properties were either remediated under the state program or the class action law suits, this is no longer an issue.

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

No additional information has been identified that would call into question the protectiveness of the remedy.

(OU4) Globe Plant Site

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

No, not all components of the remedy have been implemented. While a large portion of the Asarco Globe Plant Site has been covered with hardscaping or community soils, some areas still need cover (see Figure 5). The Point Source and Fugitive Air Emissions portion of the Globe Plant Site Remedial Action is functioning as intended by the decision documents. The Former Sedimentation Pond remedy has been successfully implemented. The Spill and Runoff Control Pond remedy has been implemented. The threat of release to the community has been controlled.

Question B: Are the assumptions made at the time of the remedy selection still valid?

No. The assumption that the Asarco Globe Plant Site would operate as it was in 1993 at the time of the ROD is no longer valid. Due to the bankruptcy, the entire Globe Plant Site had been shut down in November 2006.

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

No additional information has been identified that would call into question the protectiveness of the remedy.

8.0 ISSUES

Summary of Issues	Affects Protectiveness (N/Y)	
	Current	Future
Completion of the FNP OU	N	Y
Continued Groundwater Monitoring	N	Y
Continued operation of the Waste Water Treatment Plant	Y	Y
Sampling and remediation of Commercial/Industrial properties	Y	Y
Establishment and maintenance of a vegetative cover	N	Y

9.0 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue: Recommendation and Follow-up Action	Party Responsible	Milestone Date	Affects Protectiveness (Y/N)	
			Current	Future
Completion of the FNP OU: Make funding available to implement the remedy as soon as possible.	Asarco	ASAP	N	Y
Resume Groundwater monitoring: Make funding available to continue monitoring floodplain groundwater as well as to monitor the Industrial Drainage Ditch.	Asarco	Until MCLs are met	N	N
Continued operation of the Waste Water Treatment Plant: Fund operational cost of WWTP including disposal of sludge into the FNP or off-site as necessary	Asarco	Until MCLs are met	N	Y

Sampling and remediation of Commercial/Industrial properties: Sampling of properties not yet sampled must commence and remediation of those properties that exceed commercial industrial levels must be completed.	Asarco	By the end of 2009	N	Y
Establishment and maintenance of a vegetative cover: The same Consent Decree will assure establishment of a vegetative cover to control erosion and windblown soils from leaving the property.	Asarco	2010	N	Y

(OU1) Former Neutralization Pond

Remedy design should be completed and implementation started as soon as all materials that are anticipated to be entombed in the FNP have been added and funding is available.

(OU2) Groundwater and Surface Water

Quarterly monitoring should resume. The Waste Water Treatment Plant should remain operational to assure treatment of water extracted from the interceptor trench. Floodplain groundwater should be monitored yearly to assess the effectiveness of the remedy. A decrease in arsenic and cadmium levels should be observed after the passage of sufficient time as addressed in the Floodplain Monitoring Plan. Groundwater monitoring in the Localized Floodplain wells GW-105, GW-28, GW-58, and GW-59 should be assessed to observe changes in metals concentrations over time.

Funding for the Waste Water Treatment Plant is subject to the requirements of the Asarco National Trust. In 2006, CDPHE requested $250,000 annually over the next three years (FY07-09) to assure continuous operation of the treatment system. The funding was allocated as requested for FY06. Funding for FY 2010-2012 is being requested but due to the Asarco settlement in the courts, it will be some time before the budgets are known.

(OU3) Community Soils and Vegetable Gardens

Sampling and remediation of qualifying commercial/industrial properties should commence as soon as possible.

(OU4) Globe Plant Site

Continue placement of community soils in accordance with the requirements of the SOW. Establish and maintain a vegetative cover on the soils to address dust issues and erosion concerns expressed by members of the community and to comply with the Globe Plant Site Soils Preliminary Design Report (February 1994). Establish and maintain a vegetative cover on the area. Should the property be redeveloped, issues will arise that will require coordination with CDPHE to assure that any future use is consistent with the remedy. Care must be taken to

prevent or minimize exposure to contaminated soils during demolition and excavation activities. All future processes at the Asarco Globe Plant Site must comply with applicable state and federal ambient air quality standards.

10.0 PROTECTIVENESS STATEMENTS

(OU1) Former Neutralization Pond

A Record of Decision was written February 1993. All immediate risks have been addressed. The remedy for OU1 has not yet been started, and thus a protectiveness statement can not be made at this time.

(OU2) Groundwater and Surface Water

The remedy for OU2 (groundwater and surface water) is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through continued extraction and treatment as well as natural attenuation, which is expected to require several decades to achieve. Exposure pathways that could result in unacceptable risk are being controlled by the State Engineers office. The area to the east of the Globe Plant Site to the Platte River has been identified as having contaminated groundwater. As a result, the State Engineers office will not approve groundwater permits for drinking or irrigating purposes.

Long-term protectiveness of the OU2 remedial action will be verified by monitoring of groundwater to fully evaluate the natural attenuation and potential migration of the floodplain plume towards the South Platte River. Current data indicate that levels of arsenic and cadmium exceed the MCLs.

(OU3) Community Soils and Vegetable Gardens

The remedial action for OU3 (Community Soils and Vegetable Gardens) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Completion is dependent upon getting the additional funds from the Asarco Trust.

(OU4) Asarco Globe Plant Site

The remedial actions at the Former Sedimentation Pond, Point Source and Fugitive Air Emissions, and the Spill and Runoff Control Pond are expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, because the remedial action for Surface Soils and Buildings has not yet been completed, the site is not protective of human health and the environment. Additional placement of community soils on the Globe Plant Site will ensure protectiveness. Threats at the site have been addressed through stabilization and capping of contaminated soils and sediments, and the implementation of institutional controls. The remedy for buildings is protective in the short term because exposure pathways that could result in unacceptable risk are being controlled. The remedy for OU4 is protective in the short-term;

however, in order for it to be protective in the long-term, the remedy from the ROD must be implemented.

11.0 NEXT REVIEW

The Asarco Globe Superfund Site is a statutory site that requires ongoing five-year reviews. The next five-year review will be conducted within 5 years of the completion of this five-year review report. The completion date is the date of the signature shown on the signature cover page attached to the front of this report.

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REFERENCES

General

U.S. Environmental Protection Agency. 1991. OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews.

U. S. Environmental Protection Agency. 1994a. OSWER Directive 93 5 5.7-02A, Supplemental Five-Year Review Guidance.

U. S. Environmental Protection Agency. October 4, 1995. Asarco Globe Superfund Site Five-Year Review.

U. S. Environmental Protection Agency. 2001. OSWER Directive 9355.7-03B-P. Comprehensive Five-Year Review Guidance.

Site Wide Reports

Remedial Investigation Report Asarco Inc. and State of Colorado Joint Study, Globe Plant Site, Denver, Colorado Volume 1-3, September 1988.

Civil Action No. 83-C-2383. State of Colorado vs. Asarco Incorporated. 1993. Final Consent Decree, Order, Judgment, and Reference to Special Master.

Five-Year Review (Type Ia) Asarco Globe Cleanup Site (Denver, Colorado).
Colorado Department of Public Health and Environment. February 1999.

Record of Decision Asarco Globe Plant Site Denver, Colorado. CDPHE. February 1993.

Former Neutralization Pond Operable Unit

Groundwater and Surface Water Operable Unit

Notice of Completion for Terrace Groundwater Remedial Action, Globe Plant Site. Asarco, Inc. Hydrometrics, Inc., 2001.

Localized Floodplain Plume - Remedial Design Plan - Correspondence/Notices - 1994 through 1999.

Localized Floodplain Plume Design Investigation Report, Asarco, Inc., Globe Plant Site, April 2000.

Floodplain Monitoring Plan Groundwater and Surface Water Operable Unit, Asarco Inc., Globe Plant Site, Denver, Colorado October 1993.

Notice of Completion Report, Industrial Drainage Ditch, Globe Plant Site, Denver, Colorado, Hydrometrics, Inc., November 1998.

Notice of Completion Report, 51st Avenue Retention Ponds, Globe Plant Site, Denver, Colorado, Hydrometrics, Inc., November 1998.

Notice of Completion Report, Interceptor Trench Drain Conversion, Globe Plant Site, Denver Colorado, Hydrometrics, Inc., November 1998.

2008 Annual Monitoring Report Globe Plant Site Denver, Colorado, December 2003.

Community Soils and Vegetable Gardens Operable Unit

4th Quarter
1999 Design Investigation Report, Prefinal Design Report, Community Soils and Vegetable Gardens, Globe Plant, Denver, Colorado, March 2001.

Northside Sewage Treatment Plant Portions of Phases II and III, December 1999, Asarco Inc Denver, Colorado Asarco Globe - Remedial Design Plan - - Correspondence/Notices - Notice of Completion Letters - Portions of Phase II and III Northside Sewage Treatment Plant

Globe Plant Site Operable Unit

Fourth Quarter 2002 Ambient Air Monitoring Asarco Globe Date Transmittal May 2004.

Draft Supplemental Preliminary Design Report for the Former Sedimentation Pond, Prepared for Asarco Incorporated, Denver, Colorado, EnviroGroup Limited, July 2003.

Work Plan, Former Sedimentation Pond Project, Globe Site, Denver, Colorado, Shaw Environmental, Inc., November 2003.

Remedial Action Report (Notice of Completion), Former Sedimentation Pond, Globe Site, Denver, Colorado, Shaw Environmental, Inc., January 2004.

Preliminary Design Report Globe Plant Surface Soils, Denver, Colorado, Asarco, February 1994.

Figures

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0 1,050 2,100 4,200 6,300 8,400
Feet
N
Asarco Globe
Superfund Site
55th Ave
Asarco Globe
Plant Site
I-25
51st Ave
Washington St
South Platte River
I-70
FIGURE 1
ASARCO GLOBE
SUPERFUND SITE
5 Year Review
September 2009
Fonos Apostolopoulos

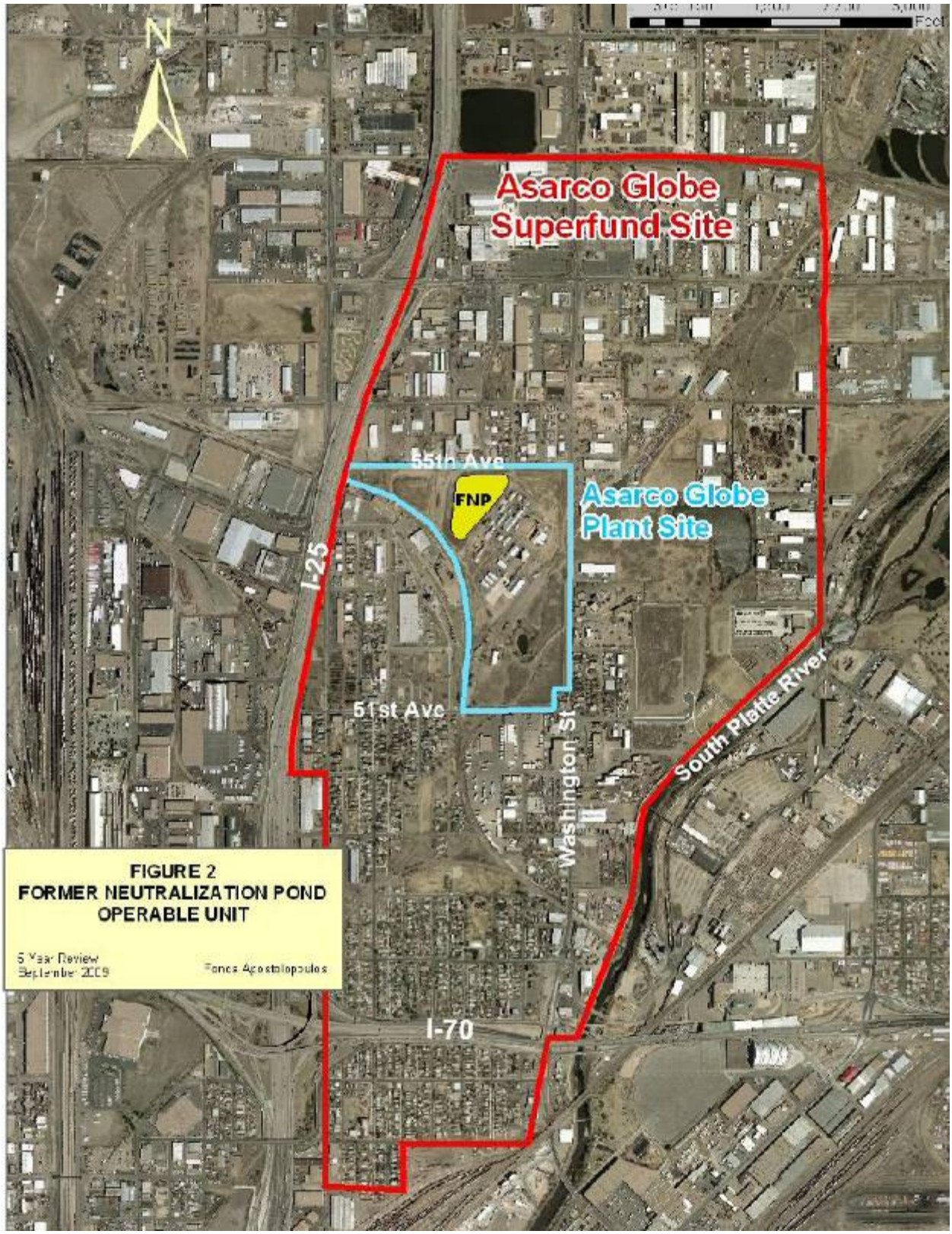

FIGURE 2
FORMER NEUTRALIZATION POND OPERABLE UNIT

5 Year Review
September 2009

Fonce Agostolopoulos

0 375 750 1,500 2,250 3,000
Feet
FIGURE 3
GROUNDWATER AND SURFACE WATER
OPERABLE UNIT
5 Year Review
September 2009
Fonda Apostoloculos
GW50
Washington St
Interceptor Trench
Terrace Drain
Floodplain Plume
GW25
Northside Sewage
Treatment Plant
Pond
55th Ave
Industrial Drainage Ditch
GW-64
GW-84
GW-86R
GW-94
GW105
Localized
Floodplain Plume
I-25
Asarco Globe
Plant Site
South Platte River
51st Ave

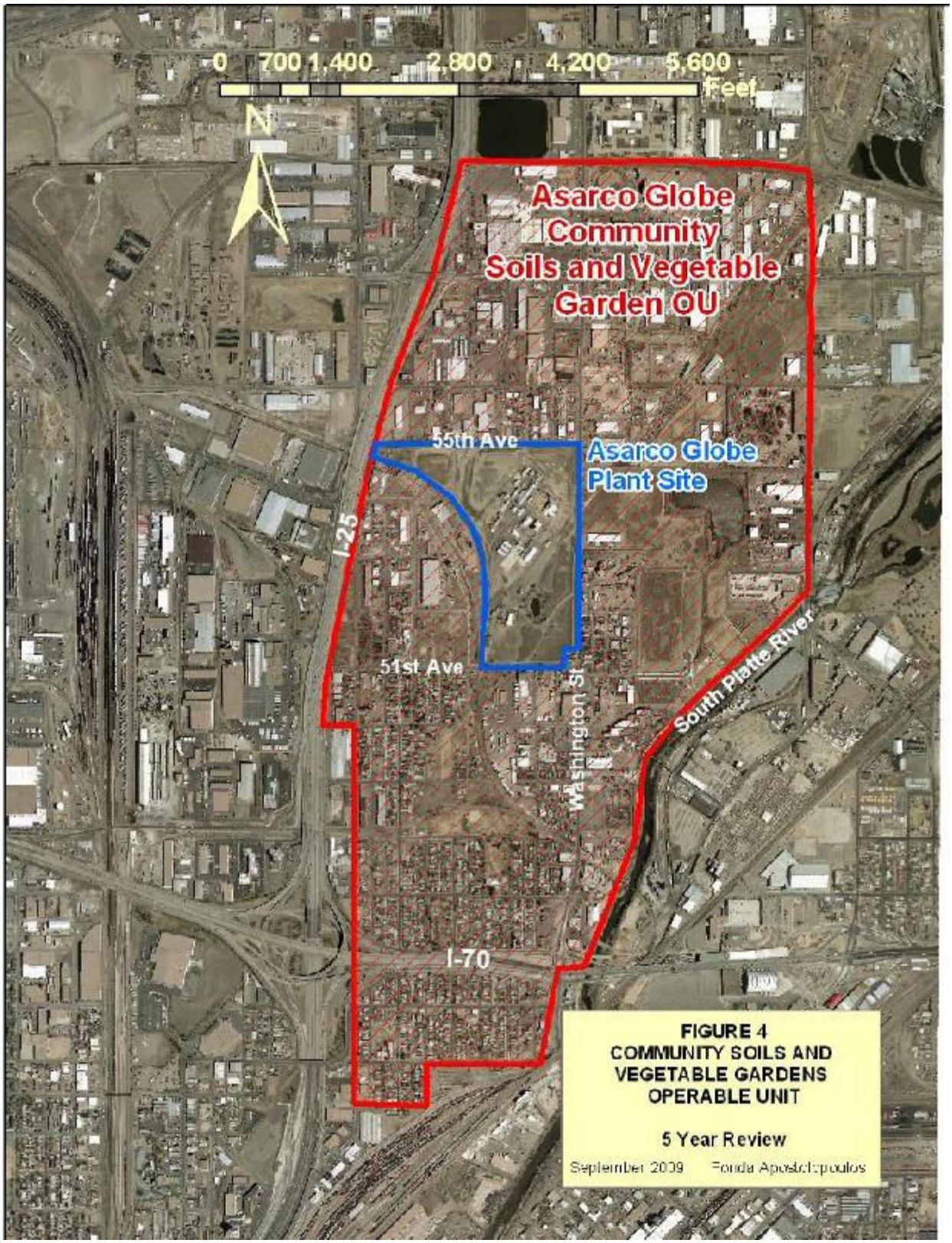

FIGURE 4
COMMUNITY SOILS AND VEGETABLE GARDENS OPERABLE UNIT

5 Year Review

September 2009 Fonda Apostolopoulos

FIGURE 5
PLANT SITE

5 Year Review

September 2009
Fonda Apostolocouloc

FIGURE 6
ASARCO GLOBE
SOIL PLACEMENT AREAS
5 Year Review

September 2009 Fonda Aposto ccou os

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Appendix B

Monitoring Data

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LAB AND DATABASE FLAG SUMMARY - PARAGON ANALYTICS, INC.

4TH Quarter 2008

Dissolved Groundwater Metals (All Units are ppb)

Location		As	Cd	Zn
Performance objective		10	5	5000
Flood Plain Plume Data				
GW-105		<10	**190**	320
GW-28		<10	**110**	280
GW-58		<10	**1,500**	2,000
GW-59		<10	**46**	100
GW-149		<10	**1,600**	590
IDD Data				
GW-25		<10	**65**	**16,000**
GW-21		<10	**140**	1,100
GW-42		<10	**580**	**5,500**

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Appendix C

Community Involvement Plan

Colorado Department of Public Health and Environment

COMMUNITY INVOLVEMENT PLAN

ASARCO GLOBE SITE

Revised June 2009

Section 1.0
Introduction

The Colorado Department of Public Health and Environment (CDPHE) Community Involvement Program is committed to promoting community participation and communication between citizens, CDPHE and other agencies and stakeholders. This Community Involvement Plan Update describes the community involvement and public participation program developed for the Asarco Globe site in Denver, Colorado. The Community Involvement Plan Update was developed in coordination with the US Environmental Protection Agency (EPA) Region 8, and revises the August 2004 Update.

This Community Involvement Plan (CIP) was developed in accordance with guidance found in the Superfund Community Involvement Toolkit, September 2002. The Toolkit outlines community involvement requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and as stipulated in the regulations that interpret the Superfund legislation – the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This CIP Update is being released concurrently with a five-year review of the Asarco Globe site. The five-year review determines whether remedial response actions are protective of human health and the environment and recommends ways to attain or maintain that protection. The five-year review is also required under CERCLA and the NCP. The five-year review does not reconsider decisions made during the remedy selection process; it solely evaluates the implementation and performance of the selected remedies.

1.1 Purpose

The Asarco Globe CIP Update aims to:

- Ensure two-way communication between the community and CDPHE. This requires developing and maintaining open communication between CDPHE, EPA, the City of Denver, Asarco Inc, community leaders, environmental/public interest groups and any other interested or affected groups. To do so, the CIP should:
    - Assess who all of the stakeholder groups are;
    - Understand the mechanisms for communication between stakeholders; and

  - Figure out **how** and **when** agencies should tap into those mechanisms

- Summarize community involvement program activities that have occurred through progressive phases of remediation. Determine which actions have been most effective and which have not.

- Develop or update public involvement and communication methods that address community concerns.

- Identify and monitor community concerns.

Section 2.0
Site Description

2.1 Physical Description

The Asarco Globe Plant Site is located at 495 East 51st Avenue, Denver, Colorado, in the Globeville neighborhood. The northern portion of the Globe Plant Site property is located in Adams County and its southern portion in the City and County of Denver. The property is bounded by 55th Avenues to the north, Washington Street to the east, 51st Avenue to the south, and the Industrial Drainage Ditch (formerly known as the Rocky Mountain Waste Ditch) to the west. The site is located along the west edge of the South Platte River floodplain, about 2.7 miles upstream of the Platte River's confluence with Clear Creek.

The majority of the Asarco Globe Plant Site sits on a terrace that rises about 30 to 60 feet above the floodplain. Only the southwest portion of the Globe Plant Site is located in the floodplain. The Asarco Globe Superfund Site includes the Globe Plant Site property and adjacent properties believed to be contaminated by releases originating at the Globe Plant Site. Historically, Asarco owned a 50-acre tract of land east of their current property, called the "Asarco Annex," which became a milling waste disposal site. The property currently under Asarco's ownership consists of approximately 78 acres and 53 buildings. Metals contamination in Globeville cannot wholly be attributed to the Asarco Globe Plant Site due to existence of other historical smelters in the area.

2.2 General Site History

Edward R. Holden built the Globe Plant Site with the backing of bankers Kountze and Sheedy. It was one of several smelters built in the northern suburbs of Denver between 1875 and 1890. The Argo Smelter and the Omaha and Grant Smelter were two others that operated in the area. Railroads brought ore from Montana and northern Mexico to the smelters.

The Globe Plant Site began operations in 1886, and around 1889 ownership changed to Benjamin Guggenheim, who renamed the company Globe Smelting and Refining. The American Smelting and Refining Company bought the Globe Plant Site in 1901 and renamed itself Asarco, Inc in 1975.

During early operations at the Globe Plant Site, the primary production process was conventional smelting carried out in blast furnaces, producing gold, silver, lead and copper. Lead smelting operations discontinued in 1919 and arsenic roasting and refining furnaces were put into operation in 1921. Arsenic production continued until 1926, at which time Globe Plant Site operations were re-geared for cadmium production.

The Globe Plant Site was one of the largest of the nation's few producers of cadmium, which is used in the manufacture of rechargeable nickel-cadmium batteries, paint and electroplating. Cadmium production continued at varying rates until 1993.

The primary waste product from the Globe Plant Site has been an acidic pool containing dissolved metals. This liquid waste has been placed in an unlined sludge pond known as the Former Neutralization Pond. The sludge pond area was constructed northwest of the Globe Plant Site's buildings around 1949. As the pond filled, the solids have been dredged to the sides to raise the containment berm. Runoff and seepage from the pond and berm were collected in a small unlined ditch adjacent to the waste piles, discharging into the Industrial Drainage Ditch (IDD).

In 1974, Asarco constructed an unlined interceptor trench between the waste pile and the IDD. A pump system recirculated liquids from the trench back to the sludge pond. However, this was only partly successful. While the contaminants were kept from entering the IDD by lowering the water table, the recirculated water picked up more contamination that could be carried by groundwater.

2.3 Cleanup and Regulatory History

In 1974, CDPHE (then called the Colorado Department of Health) collected water and sediment samples from the Industrial Drainage Ditch (IDD). The sampling detected elevated concentrations of cadmium, lead and other metals. In 1980 and 1981, CDPHE found the site out of compliance with the Colorado Solid Waste Disposal Sites and Facilities Act. Subsequent to investigations by CDPHE, the EPA listed the Globe Plant Site on the Open Dump Inventory for 1981 under the Resource Conservation and Recovery Act (RCRA) Section 4000 criteria. A preliminary uncontrolled hazardous waste site ranking, as defined by the NCP, was conducted in 1982. Soils, sediments, wastes and surface water at the site and vicinity were sampled in December 1982. Three groundwater monitoring wells were installed on site during this time.

In September 1982, the EPA National Enforcement Investigations Center conducted airborne particulate sampling on the Globe Plant Site. A report completed in June 1983 provided a summary and interpretation of data collected during 1982 and 1983. The gathered data did not provide justification for proposing the site for the National Priorities List.

In December 1983, the State of Colorado sued Asarco for damages to natural resources and risk to public health in State of Colorado v. Asarco, Inc. In 1986, CDPHE issued an Administrative Compliance Order against Asarco alleging violations of hazardous waste management requirements under the Colorado Hazardous Waste Management Act. After negotiating a Compliance Order on Consent in 1987, the State and Asarco entered into a Memorandum of

Agreement to conduct joint studies to assess and clean up the site in a manner consistent with the requirements of the NCP, to undertake some interim remedial actions and to facilitate a negotiated settlement of litigation.

In the following years, a comprehensive Remedial Investigation, Public Health Evaluation and Feasibility Study were conducted as part of the joint investigation of the Globe Plant Site.

The objectives of the Remedial Investigation were to determine the extent, magnitude, sources and impacts, if any, of the contamination due to releases of hazardous substances from the site; as well as to gather necessary data to assist in preparation of the Public Health Evaluation and Feasibility Study. The Remedial Investigation included a source inventory, air monitoring sampling and investigations of groundwater, surface water, soil and vegetation at the site. The Remedial Investigation was finalized in March 1992.

The Public Health Evaluation evaluated the potential impact on human health from the site if no remedial actions were to occur and was finalized in April 1992. The Feasibility Study developed and evaluated potential cleanup alternatives. The Feasibility Study was finalized in May1992.

Upon receipt and consideration of public comment, the most viable alternatives evaluated in the Feasibility Study were selected and presented for public comment in the Proposed Plan in October 1992.

Upon receipt and consideration of public comment on the proposed remedy in the Proposed Plan, the Record of Decision (ROD) –which outlines the selected remedy for the site– was issued in February 1993. The selected remedy in the ROD included medical monitoring, residential soils cleanup and soils, surface and groundwater cleanup at the Globe Plant Site.

Selected Remedy Components in Record of Decision (ROD)

- Provide medical monitoring to area residents
- Contain and close the Former Neutralization Pond
- Install a terrace drain to cut off the release of contaminated groundwater from the Globe Plant Site
- Excavate and dispose of Industrial Drainage Ditch and Retention Pond sediments
- Cap or remove detention pond sediments
- Excavate and remove, cap control exposure to, or deep till contaminated community soils
- Excavate, cap control exposure to, or deep till Globe Plant Site soils above the worker or trespasser action levels
- Cover and vegetate the lead slag pile
- Excavate and stabilize contaminated Globe Plant Site sediments
- Seal floors and sumps as necessary during wet operations
- Install further air pollution point source and fugitive emission controls
- Use institutional controls, maintenance and monitoring to supplement the remedy

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The State of Colorado and Asarco, Inc. reached a settlement in July 1993 as stipulated in the Consent Decree. The Consent Decree Statement of Work builds upon the ROD and is the plan for implementation of remedial work at the Asarco Globe Plant Site. It also stipulates state administrative and technical oversight, reimbursement of state costs and payment of natural resource damages.

In 1991, a private attorney agreed to represent residential property owners and former Stapleton Homes' residents in a class-action suit against Asarco (Escamilla et al. v. Asarco, Inc.) for cleanup and property damages. The members of the class included residential property owners in North Globeville. The lawsuit was settled in the fall of 1993. The $24 million settlement included a cash award and soil remediation for members of the class. Additionally, residents of Stapleton Homes were given cash awards to compensate the relocation from their 1989 housing closure. Stapleton Homes was a subsidized housing complex owned by the City of Denver and managed by the city's Housing Authority.

In 1997, a second class action lawsuit was filed against Asarco (C de Baca et al. v. Asarco, Inc.). Class members included citizens in South Globeville – south of Interstate 70 – who were not included in the Escamilla lawsuit. The $12.3 million November 1999 settlement includes cash awards for 390 property owners and renters and soil remediation for 285 properties. It also includes funds to pay for engineering services to supervise the remediation, for a claims administrator and for a contingency fund against any unusual hardship suffered by class members resulting from the remediation.

2.4 Environmental Concerns

Arsenic, cadmium, zinc and lead were found in elevated concentrations over a large geographical area, with concentrations generally decreasing with distance from the Globe Plant Site. The Public Health Evaluation found the contaminants of concern in various media including air, soil, sediments, surface water, groundwater and garden vegetables.

Exposure studies looked at the ways in which people in the vicinity of the site could potentially be exposed to the contaminants of concern. Exposure pathways that were examined included inhaling of ambient air, drinking the groundwater, eating vegetables grown in the soil, inhaling blowing soil, ingesting contaminated soil, ingesting Industrial Drainage Ditch (IDD) sediments and dermal absorption of IDD water.

The health effects of these metals include carcinogenic (cancer-causing) and non-carcinogenic impacts. Health effects are associated with the type of exposure, the level of exposure, the length of exposure, the frequency of exposure and other factors. For more information on the health impacts of these metals, please see the Record of Decision, the Public Health Evaluation, or the Agency for Toxic Substances and Disease Registry's Public Health Assessment for the Asarco Globe site.

The Globe area medical monitoring results from 1994 to 2000 indicate no community-wide evidence of health effects from the Globe Plant Site. A 1995 CDPHE cancer study found that for areas near the Globe Plant Site, the number of observed cancer cases for all cancers studied was

similar overall to the number expected based on the cancer rates in the Denver Metro area. The cancer study analyzed cancers with known association with arsenic, cadmium and lead exposure, as well as the number of all types of cancer combined that are reported to the Colorado Central Cancer Registry.

2.5 Remedial Actions to Date

From 1994 through 2003, Asarco cleaned up lead, cadmium and arsenic contamination in the soils of the Globeville community. While Asarco's residential soils cleanup in Globeville is complete, Asarco's financial difficulties have left the cleanup of the Globe Plant Site and surrounding commercial areas incomplete.

The Consent Decree calls for measures to reduce and monitor toxic emissions from the Globe Plant Site, reduce future contamination of ground water, clean ditches on the Globe Plant Site grounds, close a hazardous waste pile on the Globe Plant Site, sample community soils and clean up those soils that are a health concern due to metals, provide a medical monitoring program and provide long-term monitoring of the site. The Asarco Globe Plant Site has been divided into four Operable Units.

<u>Four Operable Units at the Asarco Globe Superfund Site</u>
(Operable Units Compose the Remedy)

1) Former Neutralization Pond
2) Groundwater and Surface Water
   - Terrace Groundwater
   - Floodplain Groundwater
   - Industrial Drainage Ditch and 51st Avenue Retention Ponds
   - Northside Sewage Treatment Plant Pond
   - Localized Floodplain Plume
3) Community Soils and Vegetable Gardens
4) Globe Plant Site
   a. Buildings
   b. Point Sources and Fugitive Air Emissions
   c. Surface Soils
   d. Former Sedimentation Pond
   e. Spill and Runoff Control Pond

state

Former Neutralization Pond
The Former Neutralization Pond (FNP), located in the north central portion of the Asarco Globe Plant Site, was originally used for disposal of production-related wastewater generated at the Globe Plant Site. Since most of the water drained or evaporated, what remained existed as pore water (i.e. water filling the spaces between grains of sediment) within the precipitate minerals. These precipitates, primarily gypsum, contain various metals, including elevated levels of cadmium and arsenic. An interim remedial action – re-grading and capping the pond with six inches of clay soil and revegetating it – was implemented in 1986. Since then, the FNP has been

used for disposal of site-related sediments and sludge from the on-site wastewater treatment Globe Plant Site and sediments from the Former Sedimentation Pond. Final remediation outlined in the ROD incorporates an in-place closure with a slurry-wall, a multi-layer cap, maintenance of inward groundwater flow, treatment of collected groundwater, periodic monitoring and institutional controls.

Groundwater and Surface Water

In the Record of Decision, the preferred groundwater remedy is described as a terrace drain system, excavation and disposal of Industrial Drainage Ditch and retention pond sediments, extraction of contaminated floodplain groundwater, treatment of collected contaminated groundwater at Asarco's Wastewater Treatment Plant, periodic monitoring, institutional controls and contingency for covering detention pond sediments.

Terrace and floodplain groundwater contained concentrations of cadmium, arsenic and zinc in excess of the Federal Primary and Secondary Drinking Water Standards. The Terrace Drain intercepts shallow groundwater coming off of the terrace portion of the Globe Plant Site, flowing into the floodplain aquifer. Collected groundwater is treated at the onsite Waste Water Treatment Plant and discharged into the City and County of Denver's sanitary sewer system in accordance with Asarco's discharge permit. Floodplain groundwater, moving in a northeast direction, is monitored quarterly. A water-use survey of neighboring area wells showed that none are being used for drinking water.

The Industrial Drainage Ditch is a ditch that runs along the western boundary of the Globe Plant Site. It flows into the 51st Avenue retention ponds. Water from the retention ponds is then treated at the Waste Water Treatment Plant. Sediments with elevated levels of metals from the Industrial Drainage Ditch and retention ponds have been removed.

The Northside Sewage Treatment Plant detention pond is located along the path of surface flow from the Industrial Drainage Ditch to the South Platte River. Because the Industrial Drainage Ditch received groundwater from the Asarco Globe Plant Site, as well as surface water and groundwater from the large urban area surrounding and upstream of the Globe Plant Site, the sediments within the detention pond had elevated levels of metals and organics. Sediments in the detention pond are perennially covered with water, cutting off exposure pathways and risk to human health. Therefore, no cleanup was required. Capping will occur if the sediments in the pond do become exposed.

Community Soils and Vegetable Gardens

The Community Soils and Gardens Operable Unit cleaned any property within or generally adjacent to the Globe Plant Site where metals concentrations in soils exceeded any of the health-based action levels. Properties exceeding action levels were identified through a property-by-property sampling and testing program.

The community soils remedy called for removal and replacement of the top 12 inches of soil (18 inches in vegetable garden soils) where metals concentrations exceeded 73 parts per million (ppm) cadmium, 500 ppm lead, or 70 ppm arsenic. Residents could opt to have their property

cleaned if soils contained more than the average background for arsenic at 28 ppm. An additional action level of 500 ppm for zinc applied to garden soils.

Metal	Residential ppm requiring removal	Commercial/Industrial ppm requiring removal
Arsenic (As)	>70	>70
Cadmium (Cd)	>73	>73
Lead (Pb)	>500	>1460
Zinc (Zn)	>500	>500

Table 1: Soils Metals Action Levels

In general, the order in which remediation took place was: 1) schools and parks; 2) required residential areas; and 3) commercial areas. The remedy included implementation of public information and education as well as a medical monitoring program.

By fall 2003, all residential properties (approximately 700) in the area immediately surrounding the Asarco Globe Plant Site that exceeded the state action levels had been remediated. A number of commercial and industrial properties have not yet been sampled, while others have been sampled but not yet remediated. Because of Asarco's financial situation, a National Trust fund has been established to assure Asarco's ability to address environmental liability. The state health department has requested funding from the Asarco Trust for $1 million to cover the Waste Water Treatment Plant and future commercial property remediation.

In 2002, the state and Asarco modified the Statement of Work so that the commercial/industrial action level for lead changed from 500 ppm to 1,460 ppm. The modification is consistent with the Hazardous Materials and Waste Management Division's Proposed Soil Remediation Objective Policy. It intended to reduce the number of commercial/industrial properties that require remediation for lead, allowing Asarco to redirect available funds to the residential cleanup while still ensuring a protective cleanup for commercial/industrial properties.

Medical Monitoring

The Globeville Medical Monitoring program was established in 1994 to evaluate whether past or current residents have been exposed to metals from the Asarco Globe Plant Site. Since the program began, 1550 individuals have had their blood and/or urine tested to determine their exposure to cadmium, lead and arsenic. An updated cancer cluster survey also was performed to evaluate long-term carcinogenic effects from exposure to both arsenic and cadmium.

In addition to health education and individual interpretation of results, the program offered individual follow-up by a program physician. Medical monitoring was offered throughout the duration of community soil remediation.

Residents living or working in the area bordered by I-70, I-25, 60th Avenue and the South Platte River were the main focus of the testing program. Overall, Globeville residents in this area have average blood and urine values for lead, cadmium and arsenic, similar to average levels seen elsewhere in the United States.

CDPHE has not seen community-wide evidence of health effects due to exposure to heavy metals originating from the Asarco Globe Plant Site. The individuals tested for the most part have had cadmium, lead and arsenic levels below action levels established by the state. A test result above an action level does not mean that a person is ill, but indicates the need for further review by the program physician, who then makes a recommendation for follow-up consultation or additional medical testing.

Six percent (eight) of the children tested had a blood lead level above the program action level of 10 micrograms of lead per deciliter of blood (ug/dl). The program provided follow-up activities to all of these children, including environmental investigation of their homes. In five cases, the source of the lead exposure appeared to be lead-based paint only. In two cases, both lead-based paint and, to a lesser extent, lead-contaminated soil in their yard or play area were apparent sources of lead exposure. No source was identified for one child, who upon retesting was found to have a normal blood lead level.

Six percent (63) of the individuals tested had a blood cadmium level above the program action level of 2 micrograms of cadmium per liter of blood (ug/L). Elevated levels of cadmium in blood can indicate recent exposure to cadmium. Of these individuals, the vast majority (57 individuals) was or had been cigarette smokers. There is a proven link between elevated blood cadmium levels and cigarette smoking. Smoking appears to be the most significant current exposure to cadmium for people tested in the Globe area. Six non-smokers had elevated blood cadmium levels.

Elevated levels of cadmium in urine indicate long-term exposure to cadmium and accumulation of cadmium in the kidneys. Three percent (21 individuals) of those tested had urine cadmium levels above the program action level. Of these, nine individuals had been cigarette smokers, indicating that the rate of urine cadmium above the action level is not higher in smokers than non-smokers. Long-term residents – people who have lived longer than 30 years in the Globe Plant Site area – are approximately four times more likely to have urine cadmium test results above the action level than people who have lived fewer than 30 years in the area.

No one has had an elevated urine arsenic test since the program began. However, because arsenic passes quickly from the body through the urine, this test will only show arsenic exposure that occurred two to three days before the sample was collected.

Asarco Globe Plant Site

In the Record of Decision, the preferred alternative for the Globe Plant Site included measures to address air pollution from the site, exposed soils and sediments onsite, and Plant floors and sumps. Institutional controls include restrictions on future use of the Asarco Globe Plant property – it must stay industrial land use with similar or more restrictive exposure levels, as well as proper maintenance of vegetative cover and erosion control.

The Asarco Globe Plant Site includes 53 current and former manufacturing and support buildings used for production, offices and wastewater treatment. *Because large-scale operations at Asarco have ceased, the risk of release from any of the buildings has been minimized.* Should the property be redeveloped, issues will arise that will require coordination with CDPHE to

assure that any future use is consistent with the remedy. Care must be taken to prevent or minimize exposure to contaminated soils during demolition and excavation activities.

The goals of the air emissions remedial action were to minimize point source and fugitive emissions of cadmium and arsenic from the Asarco Globe Plant Site and to reduce human health risk. With the end of large-scale refining in 1993, point source emissions are no longer a concern. Ambient air monitoring is conducted at four existing monitoring stations near the Plant boundaries at least once every six days to measure for fugitive and dust emissions.

Clean up goals for the Asarco Globe Plant site

- Air pollution source controls and fugitive emissions and dust controls
- Emissions restriction of 162 kilograms cadmium per year
- Excavation, covering, deep tilling, or exposure controls for Globe Plant Site soils above worker/trespasser action levels
- Excavation and stabilization of sediments
- Stealing of floors and sumps as necessary
- Secondary containment in Globe Plant Site sumps
- Spill control of retention pond

Cadmium, arsenic, lead and zinc concentrations are elevated in the upper 24 inches of site soils because of historical smelter operations. The goals for the Asarco Globe Plant Site surface soils are to prevent or minimize exposure of community residents to windblown soils from the Plant through use of vegetation or by covering them; to prevent or minimize migration of metals from Globe Plant Site shallow soils to surface water and ground water; to prevent or minimize exposure to workers or trespassers to soils with elevated metals concentrations; and to maintain a continuous fence around the Globe Plant Site property.

Surface soils at the Globe Plant Site will be remediated according to the level of contamination and in such a manner that the resulting topography will blend with the natural landscape, be stable, create positive stable drainages and include vegetative covers to ensure long-term viability and prevent erosion.

Surface soils that exceed the worker/trespasser action levels (cadmium, arsenic or lead above 9125 ppm, 426 ppm and 3000 ppm respectively) will be remediated by capping or deep tilling to prevent exposure. Caps consist of 12 inches of soils or two inches of asphalt or other durable cover. Deep tilling can occur where tilling will mix the soils so that the overall concentration is brought below the worker/trespasser action level for each metal. All capped areas that aren't paved or covered with gravel require vegetative cover.

Surface soils that exceed the community soil action levels in the upper six inches but are less than the worker/trespasser action levels will be remediated by providing a vegetative cover that endures long-term viability and prevents erosion, or by placing a minimum of 12 inches of soils or a two-inch asphalt cover.

In 2002, the EPA began placing soils removed from residential properties in the Swansea, Elyria, Cole and Clayton neighborhoods on the Globe Plant Site. Residential yards in these

neighborhoods were remediated as part of the Vasquez Boulevard / I-70 Superfund Site cleanup. Residential soils from Vasquez Boulevard / I-70 have levels of arsenic and lead similar to soils in Globeville, but are absent cadmium.

Placement of the VB/I-70 soils is consistent with the remedy design agreed to by the state and Asarco in the Statement of Work of the Consent Decree for the Asarco Globe Plant Site. Reduction of contaminant levels in the surface soils should facilitate future development of the property.

The community soils placement activities at the Globe Plant Site have improved site drainage. The community soils form a berm that runs the length of Washington Street on the west side, preventing any runoff from reaching the City and County of Denver's right-of-way. In addition, several hundred trees and shrubs have been planted along the western boundary of the Globe Plant Site, providing protective cover, erosion control and a visual barrier to the Asarco Globe Plant Site.

The sedimentation pond is a small pond in the northeast corner of the Globe Plant Site that traps sediments in surface water runoff from the Globe Plant Site's northern portion. The pond was taken out of service in the early 1980s by filling it with building demolition material, re-grading the area to a relatively smooth surface and covering sediments in the pond with a thin clay cap. The pond's metal-contaminated sediments contaminated shallow ground water.

In late 2003, materials contained within the sedimentation pond were excavated, placed on the Former Neutralization Pond and covered with approximately 4000 cubic yards of clean fill material. A vegetative cover will be established to ensure long-term viability and prevent erosion.

The goal of the Spill and Runoff Control Pond Remedial Action is to prevent or minimize any surface runoff from areas of the Asarco Globe Plant Site that may contain elevated metals. Because large-scale operations were discontinued at approximately the same time as the signing of the Decision Documents, the risk of spills was minimized.

Section 3.0
Community Involvement

3.1 Community Profile

Globeville is a working-class community with a rich and diverse history. Located just 20 blocks north of downtown Denver, Globeville is surrounded by industry whose development helped build Globeville and Denver. The community takes pride in the area's rich and diverse history.

In 1886, Edward R. Holden built the Holden Smelter, north of Denver along the Platte River. While people had moved into the area before the smelter was built, the smelter helped attract workers that eventually formed the town of Globeville. In 1889, the smelter was sold and the name changed to the Globe Smelting and Refining Company. Globeville was formally incorporated in 1891.

Globeville was settled largely by Volga Germans, Poles, Slovenians, Croatians and Russians, although by the 1920s residents represented over 50 nationalities. Each group brought with them rich cultural and religious traditions. The major groups settled amongst themselves, forming smaller neighborhoods. They built churches and formed clubs and associations that helped preserve their cultures.

While they worked to preserve their own cultures, the people of Globeville also began to form a distinct identity. Conflict between the various groups was not apparent and Globeville fought its annexation into the City of Denver in 1903. Travel between Globeville was difficult and indirect, and residents stayed in their community to work, shop and live. The neighborhood was isolated from the rest of the city, with the railroads and South Platte River serving as physical barriers. In the early years, people left only in the summers to go work in Colorado's beet fields.

While Globeville had always been a working-class community, where industry and homes were often located side-by-side, several significant events began to change and fragment the community.

In the early 1950s, the 232-unit Stapleton Homes housing project was built in the "Dobrinka" Volga German section of Globeville between 51st and 52nd Avenues and Logan and Acoma Streets, adjacent to the Asarco Globe site. Four homes were torn down to make way for the project, which provided subsidized low-income housing.

The construction of Interstate Highway 25 in the 1950s and I-70 in the late 1950s and early 60s had a devastating effect. The highways cut through Globeville and resulted in the destruction of seven blocks and over 30 homes. Only Lincoln and Washington remained open to north-south traffic. As it had been over half a century before, much of Globeville was again isolated from Denver.

In 1991, the Stapleton Homes was torn down, an event that impacted the neighborhood. Many of Globeville's current residents either grew up in or had friends who lived in Stapleton Homes. Earlier, the Federal Government made a $4 million grant available to the Denver Housing Authority intended for renovation of Stapleton Homes on the condition that the city could guarantee that the facility would be used for the next 40 years. Among the many issues considered at the time, the project was in need of lead paint and asbestos abatement, concern was escalating about the proximity of the project to the I-25 corridor, and the Denver Housing Authority was moving towards a more dispersed housing policy. A number of Stapleton Homes residents had voluntarily left the project as more information became available about area heavy metals contamination. Since 100 of the 226 available units were already vacant, Denver Housing Authority decided to demolish rather than renovate the project. The general impression of the public, supported by a large segment of the media, was that this was an evacuation based on contamination from the nearby Asarco Globe site.

Today, Globeville continues to include a mix of residential and industrial activity. The area has experienced significant change in the ethnic and cultural makeup of its citizens. Over the years Latino families moved into Globeville and now compose the largest ethnic group in the area. In

1950, there were only 12 Latino households in Globeville; in 2000, 77 percent of Globeville's population was Latino. As the residents change, so do Globeville-area businesses, with many local businesses owned and operated by Latinos.

Litigation activity regarding the Asarco Globe site polarized the area. Residents south of I-70 were not included in the class-action suit (Escamilla v. Asarco, Inc (1991)). The complex sampling methodology cited in State of Colorado v. Asarco, Inc – beginning at properties closest to the Globe Plant Site and working outward – added to the perception that residents' properties south of I-70 might be contaminated but excluded from any recourse from Asarco's liability. Consequently, a degree of animosity developed toward residents north of I-70, and the litigating agents.

The people of Globeville were, for the most part, relieved at the settlement of the two major lawsuits. They felt that they were going to "have the neighborhood back." The community now appears to be working on building a sense of cohesiveness and self-esteem by involving itself in projects aimed at improving quality of life. The cohesive glue for the residents appears to remain in the area churches, neighborhood centers and neighborhood groups.

Many local community groups are active in the Globeville area, including the Globeville Civic Association, Cross Community Coalition / Colorado People's Environmental and Economic Network (COPEEN), the Elyria / Swansea / Globeville Business Association and the Globeville United Neighborhoods Group. In addition, other social service, cultural and recreational services are provided by a number of agencies and organizations. Examples include Laradon Hall, the Stapleton Recreation Center, the Globeville Recreation Center and Argo Park.

The EPA defines environmental justice (EJ) as the "fair treatment for people of all races, cultures and incomes, regarding the development of environmental laws, regulations and policies." Over the last 20 years, attention to the impact of environmental pollution on particular segments of our society, such as minority and/or low-income populations, has been steadily growing.

The EPA Region 8's Environmental Small Grant Program awarded around $20,000 to Cross Community Coalition / COPEEN, a local service organization. The funds were used to conduct research on the health effects caused by living near I-25 and I-70. Research was also conducted on how other communities combat the health effects of heavily polluting freeways.

3.2 History of Community Involvement

This is the fourth update of the Asarco Globe Community Involvement Plan (CIP) since 1986. The first plan was prepared in 1986. It was updated in March 1989, January 1995 and August 2004.

Two mailing lists of people interested in the site were developed to keep the public informed. A general mailing list was developed for larger public meetings and issues of general interest. This list includes State of Colorado elected officials, City and Council of Denver officials, area media, community organizations, as well as approximately 600 area residents. A working group mailing list of approximately 70 individuals and entities was also developed for those interested in more

frequent updates on site status. The working group includes leaders of local community organizations and governmental representatives.

Numerous public meetings have been held in the Globeville area throughout the clean-up project. A community meeting was held on the first Tuesday of every month at Laradon Hall in the Globeville neighborhood. Meetings were conducted in English with Spanish language interpretation provided. Meetings covered project updates, medical monitoring and community concerns. As remedial work was completed, there was no longer the need or interest in monthly meetings.

The January 1995 CIP lists 25 additional public meetings that took place between January 1986 and May 1993. These include informational meetings, working group meetings and meetings to discuss a Public Health Evaluation, a Feasibility Study and the Proposed Plan.

State of Colorado project staff also met with concerned citizens, city and county representatives, local community groups and EPA representatives as necessary to discuss the site.

The Colorado Department of Public Health and Environment employed a full time, bilingual community health outreach coordinator for the translation of all pertinent written information, representation at community meetings, community outreach and response to inquiries and/or comments from the public.

Fact sheets and handouts, many of them in both Spanish and English, have been relied upon heavily to inform Globeville residents. Over 30 fact sheets have been prepared and distributed to community members since the beginning of the project. Fact sheets have covered issues such as health risks of heavy metals, gardening in Globeville, the medical monitoring program and milestones of the regulatory process such as the Feasibility Study, Proposed Plan and Record of Decision.

Press releases were widely used by CDPHE to inform the community about site status. The January 1995 CIP lists 17 press releases about the Asarco Globe project between October 1985 and June 1994. Since then, numerous press releases have been issued by CDPHE regarding the Asarco Globe remediation and medical monitoring.

CDPHE organized a groundbreaking ceremony in June 1994, held at the site of the first residential property to be remediated. Community members, local business people and the media were invited. State of Colorado, EPA Region 8 and city and county representatives also attended.

The Remedial Investigation, Public Health Evaluation and Feasibility Study reports were issued in draft form and were made available to the public for comment. Extensive public comments were received on each document; these comments were considered when the documents were finalized. Public meetings were held to discuss the findings of each document. Transcripts of the public meetings are available in the Administrative Record. The final version of each document includes detailed responses to the comments received.

Public meetings addressing the Proposed Plan were held in 1992. A summary of the comments received (written or oral) and agency responses are contained in the Responsiveness Summary of the Record of Decision.

A number of information repositories containing the primary documentation for the site were available to residents throughout the community soils cleanup and medical monitoring. Repositories were provided at the Globeville Civic Association, the Commerce City Branch Library and the Globeville Area Business Association, all located close to the site. The complete Administrative Record was available at CDPHE, the Colorado Attorney General's Office, the Central Denver Public Library and the Stapleton Recreation Center in Globeville. Copies of a video demonstrating the remediation plan for Asarco Globe are available for free check out at the Stapleton Recreation Center, Community Center, the Globeville Health Clinic, Transfiguration of Christ Church, the Civic Association, and the local Safeway store.

3.3 Community Relations – Environmental Protection Agency

The EPA has been an important partner in community involvement activities in Globeville. EPA representatives attend and participate in state-sponsored public meetings and activities.

The EPA also awarded a Technical Assistance Grant (TAG) program for the Asarco Globe cleanup. The TAG application was submitted to the EPA by the Globeville Community Resource Center on June 6, 1994. The grant was awarded in July 1994.

3.4 Community Relations – Asarco, Inc.

Upon resolution of the Escamilla v. Asarco, Inc. class action suit and the Natural Resources Damages suit, Asarco began soil remediation of the properties in the Globeville area. The company also began its own community relations program and hired a community involvement consultant in an effort to help residents understand the cleanup process.

The most notable community relations contribution made by the company to date has been the purchase of a residential property within the cleanup area near the Globe Plant Site, and its clean redevelopment into an information center. A bilingual member of the community staffed the Globeville Information Center. It offered residents, property owners and interested individuals information on the cleanup process, a central location to obtain information and the opportunity to get answers to questions and provide feedback on the remediation. The property serves as a model of the type of remediation that took place at site residential and commercial properties.

Asarco also contributed to community development by enhancing its remediation activities, including work at Argo Park, the community's largest park.

In addition, Asarco has:

- Operated a summer intern program
- Provided financial assistance to the Stapleton Recreation Center
- Produced a monthly newsletter, *Update*, in both English and Spanish

- Conducted community focus group meetings –two in each English and Spanish – with residents and business leaders to generate and evaluate community relations program ideas and information needs
- Funded the Denver Audubon Society's urban environmental education project, involving parents and community members in hands-on activities for fourth grade students at Garden Place Elementary School

3.5 Community Interviews Summary

State and EPA representatives conducted interviews with an elected official, the elected official's staff-person, a community leader, and local businessman. Community involvement staff identified interviewees by speaking with project staff.

Community History and General Information
The businessman has worked in the area for over 20 years, but has never lived in Globeville. The community leader has lived in Globeville for over 20 years. The elected official has spent much of her life in the Globeville area, representing the neighborhood for the past six years.

In terms of the site's perception, the businessman said that "there's not the community concern [over health effects] that there once was." The community leader also said that there was "hysteria" during the site's cancer study, but then "everything [about the cleanup] seemed to be going smoothly."

The business owner did not find concern about Asarco's funding for the clean-up, saying that cost-recovery "will be a government decision." However, the elected official and her aide both asked about Asarco's ability to pay for the cleanup. They expressed concern about Asarco's bankruptcy, pointing out that it has environmental liabilities at sites across the United States.

Remediation
All interviewees were unsure of the progress of the cleanup and asked whether the commercial and residential yards remediation actions were complete. The Globe Plant Site remediation seems to be in the back of the community's mind, the business owner said, since there haven't been trucks coming on and off the site over the past few years. Further, he said that the Washington Street and Interstate 25 widening proposals garner more community attention.

The elected official asked if air monitoring occurred at the site, now that Globe Plant Site operations have ceased. State project manager Fonda Apostolopoulos answered that after three years of monitoring without any "hits" above air quality standards, monitoring stopped.

Perceptions of the residential yards cleanup have not changed since the last Community Involvement Plan Update (2004 Update), which said that "the community soils cleanup proceeded effectively, that it beautified their neighborhoods, and that the stigma of the contamination was lifted." All interviewees said that the neighborhood stigma has disappeared. However, the business owner said that while the soils are now clean, not all residents are keeping their yards in (what he views as) proper condition.

The Future of the Site
The community leader, elected official aide showed significant interest in the future use of the Globe Plant Site property. They were all curious about funding for the remaining site cleanup and redevelopment – where it will come from and what it will lead to. They agreed that they do not want to see the property turn into industrial use, but instead become more commercial. The business owner offered another alternative for site reuse. He said he would like to see the site turned into a golf course, as the Globe Plant Site footprint fits the required acreage.

Both the community leader and aide had questions about off-site, non-residential properties in the neighborhood – how certain is the state health department that they are clean? For the community leader, it's a concern about a potential area for green space; the elected official's aide has a formerly commercial, city-owned property in mind for redevelopment.

Aside from the Globe Plant Site's reuse, the community leader had questions about Asarco's "demonstration house." She mentioned that during the residential cleanup phase, Asarco had built a house that held information about the cleanup. The community leader said Asarco had promised to donate the house to the community after the residential cleanup. The residential cleanup is complete, but she doesn't know what became of the house.

These priorities differ from the 2004 Update, which found that interviewees thought "redevelopment of the site must be carried out with the community's health as the top priority." In 2009, interviewees seem confident that the state will ensure protection of human health and environment; their main concerns are with zoning and end-use of the remediated Globe Plant Site.

Stakeholder Communication
All interviewees said that there hasn't been much current public information regarding the site; some requested stronger communication from the agencies. The community leader mentioned that she receives information through newspapers, church fliers or word-of-mouth, but nothing recently from Asarco, EPA or the state of Colorado. She recommended that, in scaling up communications efforts, the state of Colorado could place advertisements in the *North Denver Tribune* and distribute fliers to local churches.

The elected official's aid agreed that there has been minimal information; she recommended placing advertisements and articles in the *YourHub* section of the *Denver Post*, as well as announcing information on Councilwoman Judy Montero's blog. According to the elected official, Montero's blog receives quite a bit of viewer traffic. Journalists say they check the blog for article ideas. The official said that her constituency (which overlaps with the Globe Plant Superfund Site's stakeholders) is becoming increasingly techno-savvy. They communicate via Twitter, text-messaging and the social networking sites on the internet.

In sharing information about the Globe site, it was recommended that agencies put out more notices and newsletters, and update stakeholder contact information.

3.6 Path Forward: Recommended community relations activities

Provide the community with accurate and timely information
CDPHE will disseminate timely and accurate information to the community mailing list and will update the information repositories. Since Asarco's "information" house has closed, there should be more emphasis on pointing the interested community to existing information repositories and websites. Further, CDPHE should look into the future use of the Asarco house.

CDPHE will also send news article ideas and press releases to local newspapers as appropriate. Information worth sending may include findings from the five-year review, sampling/study results, information on potential impacts to human health or environment, and information related to future land use.

Engage the community to understand and respond to its concerns
While CDPHE should continue to use tried-and-true communication pathways (newspapers, information repositories) to disseminate Globe Plant Site information, CDPHE should become aware of changes within the community. These changes include new communication through developing technologies and shifting demographics. Communication activities to consider developing are:

- Use of new technologies to transmit information (Judy Montero's blog, online media, and Twitter are the first to come to mind)
- Online social networking may also offer opportunities. For example, creating a Myspace web page for the Globeville site may help provide an avenue for educating Globeville's younger population about the site, its history, contamination and cleanup.
- Using preexisting social networks to disseminate information via word-of-mouth. For example, the churches in the Globeville are a neighborhood cohesive; a phone call to an involved member can help to quickly send information across the community.
- Integrating more Spanish translation and interpretation into outreach and public involvement. The Piton Study (Appendix A) shows that Globeville, compared to Denver, has a significant Latino community. There may be a need to engage the Spanish-speaking community when discussing site closure.

APPENDIX A - Community Profile Data
Source: The Piton Foundation, Denver

Indicator	Globeville	Denver	Data Year
Total Population	3,819	592,052	2007

Race/Ethnicity

Indicator	Globeville	Denver	Data Year
% Population Non-Latino White	16.97%	51.93%	2000
% Population African American	2.55%	10.8%	2000
% Population Latino	77.48%	31.68%	2000
% Population Native American	0.98%	0.69%	2000
% Population Asian/Pacific Islander	0.78%	2.81%	2000
% Population of 2 or More Races	1.2%	1.9%	2000
% Foreign Born	37.52%	17.42%	2000
% Adults Non-English Speaking	26.1%	9.2%	2000
% Births Non-Latino White *	18.92%	38.18%	2007
% Births African-American *	0%	10.56%	2007
% Births Latino *	77.03%	45.22%	2007
% Birth Native American *	0%	1.06%	2007
% Birth Asian/Pacific Islander *	0%	3.47%	2007
% Births to Foreign Mothers *	49.35%	38.12%	2006

Age

Indicator	Globeville	Denver	Data Year
% Population under 6	9.03%	6.81%	2000
% Population 6-11	10.51%	7.36%	2000
% Population 12-17	11.4%	6.56%	2000
% Population 18-24	13.09%	10.74%	2000
% Population 25-34	17.2%	20.5%	2000
% Population 35-44	14.13%	15.58%	2000
% Population 45-54	10.4%	12.8%	2000
% Population 55-64	5.41%	7.17%	2000
% Population over 65	7.27%	11.26%	2000

Families and Households

Indicator	Globeville	Denver	Data Year
Persons per Household	3.72	2.24	2007
% 1-Person Households	19.21%	39.31%	2000
% Families with Children	43.47%	23.24%	2000
% Families without Children	33.26%	26.63%	2000

% Non-Family Households	23.27%	50.13%	2000
% Children Living with Single Parents	21.91%	28.01%	2000
% Births to Teen Mothers (19 and under) *	12.16%	11.18%	2007
% Births to Unwed Mothers *	45.95%	33.24%	2007

Mobility

Indicator	Globeville	Denver	Data Year
% Persons Age 5+ Living in Denver Who Lived in a City Other than Denver in 1995	24.27%	33.01%	2000
% Households Living at Current Address Less than 1 Year	22.17%	28.68%	2000

Student Demographics

Indicator	Globeville	Denver	Data Year
% DPS Children Receiving Free School lunch	91.38%	69.35%	2007

Newborns

Indicator	Globeville	Denver	Data Year
Premature Birth Rate *	11.69	11.71	2006
Low Birth Weight Rate *	13.51	8.74	2007
% Births to Women Receiving Late or No Prenatal Care *	0%	5.04%	2007

Early Education

Indicator	Globeville	Denver	Data Year
% Children under 12 in Subsidized Child Care	6.97%	6.87%	2003
# Licensed Child Care Slots	176	23,886	2003

Poverty and Income

Indicator	Globeville	Denver	Data Year
Average Household Income	$37,063	$55,129	2000
% Children (under 18) on TANF	3.75%	4.57%	2002
% Children (under 18) on Medicaid	33.33%	22.49%	2002
% Persons in poverty	23.15%	14.29%	2000
% Children (under 18) in Poverty	28.8%	20.82%	2000
% Families in Poverty	19.8%	10.63%	2000
% Single Mothers with Children in Poverty	22.7%	32.58%	2000
% Non-Latino Whites in Poverty	17.39%	7.8%	2000
% African-Americans in Poverty	34.83%	19.37%	2000
% Latinos in Poverty	22.89%	22.47%	2000
% Native Americans in Poverty	57.14%	27.3%	2000
% Asian and Pacific Islanders in Poverty	0%	16.83%	2000

Labor and Employment

Indicator	Globeville	Denver	Data Year
Total jobs	6,962	486,669	2002

% Government Jobs	0.52%	5.41%	2002
% Service Jobs	14.35%	36.06%	2002
% Transportation, Communications & Public Utility Jobs	27%	9.09%	2002
% Finance, Insurance & Real Estate Jobs	0.63%	7.12%	2002
% Manufacturing jobs	12.24%	5.93%	2002
% Retail Trade Jobs	9.32%	12.52%	2002
% Construction Jobs	14.45%	4.26%	2002
% Wholesale Trade Jobs	15.15%	5.37%	2002
% Mining jobs	0%	0.85%	2002
% Other jobs	6.32%	13.39%	2002
Average Annual Wage	$32,817	$37,407	2000
Unemployed as % of Civilian Labor Force	11.95%	5.67%	2000

Adult Education

Indicator	Globeville	Denver	Data Year
% Persons age 25+ with less than 12th grade education	63.37%	21.11%	2000
% Persons age 25+ with high school only education	20.89%	20.01%	2000
% Persons age 25+ with some college but no degree	9.93%	19.52%	2000
% Persons Age 25+ with college degree (Associates or Better)	5.81%	39.37%	2000
% Births to women with less than 12th grade education *	45.95%	24.5%	2007

Homeownership

Indicator	Globeville	Denver	Data Year
# Housing Units	1,084	274,735	2007
% Housing Owner-Occupied	62.68%	52.48%	2000
% non-Latino White Homeowners	66.67%	62.62%	2000
% African-American Homeowners	75%	48.37%	2000
% Latino Homeowners	60.56%	49.11%	2000
% Native American Homeowners	71.88%	42%	2000
% Asian/Pacific Islander Homeowners	76%	44.87%	2000
Median Income for Home Purchasers	$41,420	$65,400	2003
Total Foreclosure Filings	57	4,730	2007

Housing Characteristics

Indicator	Globeville	Denver	Data Year
Average Home Sale Price	$149,494	$278,024	2003
% Housing Vacancy	6.52%	6.59%	2005
% Housing Publicly Subsidized	2.5%	6.6%	1999
% Renters paying more than 30% of income on Housing	43.41%	38.6%	2000
% of Overcrowded Housing Units	29.3%	7.71%	2000
% Housing Units Built Before 1940	48.48%	24.5%	2000

Crime

Indicator	Globeville	Denver	Data Year
% Property Crimes	55.22%	57.74%	2007
% Violent Crimes	5.72%	8.27%	2007
% Other Crimes	39.06%	33.99%	2007
Crime Rate per 1,000 Persons	288.3	68.62	2007
Burglary Crime Rate per 1,000 Households	180.12	22.48	2007
Violent crime rate per 1,000 Persons	16.5	5.68	2007

Child Abuse

Indicator	Globeville	Denver	Data Year
Confirmed Child Abuse & Neglect Rate	8.95	7.48	2004
3-Year Cumulative Confirmed Child Physical Abuse Rate	6.62	5.19	2004
3-Year Cumulative Confirmed Child Neglect Rate	18.2	11.56	2004
Out-of-Home Placement Rate	105	11.48	2004

APPENDIX B - Information Repository Locations

EPA Superfund Records Center
1595 Wynkoop St
Denver, CO 80202-1129
(303) 312-6473

Colorado Department of Public Health & Environment
Hazardous Material and Waste Management Division - Record Center
4300 Cherry Creek Drive South
Denver, CO 80246-1530
(303) 629-2331

Globeville Information Center
5060 Logan Street
Denver, CO 80216

Denver Public Library, Central Branch
Government Publications
10 W. 14th Avenue Parkway
Denver, CO 80204-2731

APPENDIX C - Agency Contact Information

Environmental Protection Agency

Superfund Project Manager
Kathie Atencio
U.S. EPA Region 8 (EPR-SR)
1595 Wynkoop St
Denver, CO 80202-1129
(303) 312-6803 or 1-800-227-8917 x 6803 (Region 8 only)
Email: atencio.kathie@epa.gov

Community Involvement Coordinator
Patricia Courtney
U.S. EPA Region 8 (8OC)
(303) 312-6631 or 1-800-227-8917 x6631 (Region 8 only)
Email: courtney.patricia@epa.gov

Colorado Department of Public Health and Environment

Superfund Project Manager
Fonda Apostolopoulos
4300 Cherry Creek Drive South
Denver, CO 80246-1530
(303) 692-3411
Email: fonda.apostolopoulos@state.co.us

Public Information Officer
Danny Lutz
4300 Cherry Creek Drive South
Denver, CO 80246-1530
(303) 692-3329
Email: daniel.lutz@state.co.us

APPENDIX D – Local Officials and Interested Organizations Contacts

Judy H. Montero
Councilwoman District 9
303.458.8960
judy.montero@denvergov.org

John Hickenlooper
Mayor of Denver
City and County Building
1437 Bannock St., Room 350
Denver, CO 80202
720-865-9090

Mary Hodge
State Senate District 25
303-866-4855
mary.hodge.senate@state.co.us

Jennifer Veiga
State Senate District 31
303-866-4861
senatorveiga@gmail.com

Joel Judd
State Representative District 5
303-866-2925
repjoeljudd@joeljudd.com

Global Civic Association
Contact Person: Ms. Paulett Hirsch
Home: 303-294 2811
Work: 303-294 0938
jhirsch@sprintmail.com

Global Civic Association
Contact Person: Mr. John M. Zapien
Home Phone: 303-296-4657
puuden@aol.com

Cross Community Coalition
Globeville Location
4400 Lincoln St, Denver, CO 80216
303-292-3508
Eric Wright, Executive Director – 303-292-3203 ext 14

APPENDIX E – Local Media Contacts

Globeville Gazette
Toni Riley
303-295-0171 or 303-298-8822
** She has been difficult to reach, unknown whether the paper still exists **

Denver Post – YourHub North Denver
Charmaine Robledo, Denver Community Journalist / Editor
303-954-2465
robledoc@yourhub.com
** *YourHub* is a Thursday-only section of the *Denver Post* that focuses on specific neighborhoods. Globeville is in the North Denver neighborhood. **

Denver Post
Stephanie Shuman, Account Executive
Denver Newspaper Agency
303-954-1074
sshuman@denvernewspaperagency.com
** Contact Stephanie to place display ads and legal notices in the *Post* and *YourHub* **

The Denver Daily News
303-433-1492
art@thedenverdailynews.com – Advertising
editor@thedenverdailynews.com – Editorial

Westword
303-296-7744 – Editorial
303-293-8007 – Advertising
** Go to www.westword.com to email editorial or advertising staff **

La Voz
303-936-8556
news@lavozcolorado.com – News
adline@lavozcolorado.com – Display Advertising
** Bilingual newspaper **