IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO

UNITED STATES OF AMERICA
and STATE OF COLORADO

Plaintiffs,

v.

ASARCO, INCORPORATED,

Defendant.

CIVIL ACTION NO. 04-RB-2070(CAS)

CONSENT DECREE

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I. BACKGROUND

A. The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed a complaint in this matter against ASARCO Incorporated ("Settling Defendant") pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606, 9607.

B. The United States in its complaint seeks, inter alia: (1) reimbursement of costs incurred by EPA and the Department of Justice for response actions at the Vasquez Boulevard/ I-70 Superfund Site ("VBI70") in Denver, Colorado, together with accrued interest; and (2) performance of response work by the Settling Defendant at the Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 (as amended) ("NCP").

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of Colorado (the "State") on February 12, 2003, of negotiations with potentially responsible parties regarding the implementation of the remedial design and remedial action for the Site, and EPA has provided the State with an opportunity to participate in such negotiations and be a party to this Consent Decree.

D. The State of Colorado (the "State") has filed jointly with the U.S. a complaint against the Settling Defendant in this Court alleging that the Settling Defendant is liable to the State under Section 107 of CERCLA, 42 U.S.C. § 9607.

E. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the Federal and State natural resource trustees, Robert F. Stewart, Regional Environmental Officer, United States Department of Interior; Dan Miller, Natural Resources & Environment, CERCLA Litigation Section, Office of the Attorney General, CO; Doug Benevento, Executive Director, Dept. of the Public Health & Environment, CO on April 26, 2004 of negotiations with potentially responsible parties regarding the release of hazardous substances that may have resulted in injury to the natural resources under Federal trusteeship and encouraged the trustee(s) to participate in the negotiation of this Consent Decree.

F. The Settling Defendant does not admit any liability to the Plaintiffs arising out of the transactions or occurrences alleged in the complaint, nor does it acknowledge that the release or threatened release of hazardous substance(s) at or from the Site constitutes an imminent or substantial endangerment to the public health or welfare or the environment.

G. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on July 22, 1999, 64 Fed. Reg. 39878.

H. In response to a release or a substantial threat of a release of a hazardous substance(s) at or from the Site, EPA commenced on October 25, 2001, a Remedial Investigation and Feasibility Study ("RI/FS") for the Site pursuant to 40 C.F.R. § 300.430.

I. EPA completed a Remedial Investigation/Feasibility Study ("RI/FS") Report on September 25, 2003.

J. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for remedial action in the "Denver Post" on May 19, 2002, in the "El Semanario" on May 23, 2003, in the "La Voz," on June 12, 2002 in a local newspapers of general circulation. An amended FS and proposed plan was published on May 24th, 2003 in the "Denver Rocky Mountain News, in the "El Semanario" on May 23, 2003 and in the "La Voz" on May 20, 2003. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Regional Administrator based the selection of the response action.

K. The decision by EPA on the remedial action to be implemented at the Site is embodied in a final Record of Decision ("ROD"), executed on September 25, 2003, on which the State has given its concurrence. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA.

L. EPA has entered into a Voluntary Consent To Access Property with Asarco, as well as two extensions thereto, under which EPA has been bringing soils removed from VB/I70 OU#1 residential properties and placing them as a cap on selected areas within the Globe Plant. The terms of that agreement and the extensions thereto are superseded by this Consent Decree.

M. Based on the information presently available to EPA and the State, EPA and the State believe that the Work will be properly and promptly conducted by the Settling Defendant if conducted in accordance with the requirements of this Consent Decree and its appendices.

N. Solely for the purposes of Section 113(j) of CERCLA, the Remedial Action selected by the ROD and the Work to be performed by the Settling Defendant shall constitute a response action taken or ordered by the President.

O. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this Consent Decree will expedite the cleanup of the Site and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

P. On February 2, 2003, the United States, Asarco, Inc., and Southern Peru Holdings Corporation entered into a consent decree resolving issues regarding the rights and obligations of the parties under the Federal Debt Collection Procedures Act and the Federal Priorities Act. United States v. Asarco, Inc. and Southern Peru Holdings Corporation, (D. Arizona), Civil Action No. CV 02-2079-PHX-RCB (herein the "2003 Decree"). The 2003 Decree, among other things, formalized a budgeting process for the payment of some environmental response costs, while deferring others because of the significant environmental liabilities of Asarco. The deferral on collection of environmental response costs remains in effect until February 1, 2006.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has

personal jurisdiction over the Settling Defendant. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendant waives all objections and defenses that it may have to jurisdiction of the Court or to venue in this District. Settling Defendant shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and the State and upon Settling Defendant and its successors and assigns. Any change in ownership or corporate status of the Settling Defendant including, but not limited to, any transfer of assets or real or personal property, shall in no way alter Settling Defendant's responsibilities under this Consent Decree.

3. Settling Defendant shall provide a copy of this Consent Decree to each contractor hired to perform the Work (as defined below) required by this Consent Decree and to each person representing any Settling Defendant with respect to the Site or the Work and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Defendant or its contractors shall provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the Work required by this Consent Decree. Settling Defendant shall nonetheless be responsible for ensuring that its contractors and subcontractors perform the Work contemplated herein in accordance with this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with the Settling Defendant within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, *et seq.*

"CDPHE" shall mean the Colorado Department of Public Health and Environment and any successor departments or agencies of the State.

"Consent Decree" shall mean this Decree and all appendices attached hereto (listed in Section XXIX). In the event of conflict between this Decree and any appendix, this Decree shall control.

"Day" shall mean a calendar day unless expressly stated to be a working day. "Working day" shall mean a day other than a Saturday, Sunday, or Federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or Federal holiday, the period shall run until the close of business of the next working day.

"Effective Date" shall be the effective date of this Consent Decree as provided in Paragraph 100.

"EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

"Environmental Covenant" shall mean the covenant which controls future activities that may affect the soils removed from the Site and placed on the Globe Plant. The Environmental Covenant is attached as Appendix A.

"Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports and other items pursuant to this Consent Decree, verifying the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Sections VII, IX (including, but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure or implement institutional controls including, but not limited to, the amount of just compensation), XV, and Paragraph 82 of Section XXI or the State incurs for the cost of attorney time and any monies paid to secure access and/or to secure or implement institutional controls including, but not limited to, the amount of just compensation.

"Interest," shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"Operation and Maintenance" or "O & M" shall mean all activities required to maintain the effectiveness of the Remedial Action as required under the Operation and Maintenance Plan approved or developed by the State pursuant to this Consent Decree.

"Paragraph" shall mean a portion of this Consent Decree identified by an arabic numeral or an upper case letter.

"Parties" shall mean the United States , the State of Colorado, and the Settling Defendant.

"Past Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States paid at or in connection with the Site through the date of lodging of this Consent Decree, plus Interest on all such costs which has accrued pursuant to 42 U.S.C. § 9607(a) through such date.

"Plaintiffs" shall mean the United States and the State of Colorado.

"RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901 *et seq.* (also known as the Resource Conservation and Recovery Act).

"Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to the Site signed on September 25, 2003 and all attachments thereto. The ROD is attached as Appendix B.

"Remedial Action" shall mean those activities, except for Operation and Maintenance, to be undertaken by the Settling Defendant to implement the ROD at 100 residential properties within the Site, in accordance with the Remedial Action Work Plan and any other plans approved by EPA pursuant to this Consent Decree.

"Remedial Design" shall mean those activities that have been undertaken by the Settling Defendant to develop the final plans and specifications for disposal of contaminated soils at the Globe Plant.

"Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

"Settling Defendant" shall mean Asarco, Incorporated.

"Site" shall mean the Vasquez Boulevard/ I70 Superfund Site, Operable Unit #1 which generally includes the residential soils contaminated with heavy metals, including, but not limited to, arsenic and lead, in and around the area identified in the proposed NPL listing package, which was published in the Federal Register on January 19,1999, and all other areas where such contamination has come to be located.

"State" shall mean the State of Colorado.

"Supervising Contractor" shall mean the principal contractor retained by the Settling Defendant to supervise and direct the implementation of the Work under this Consent Decree.

"United States" shall mean the United States of America.

"Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33), 42 U.S.C. § 9601(33); and (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities Settling Defendant is required to perform under this Consent Decree, except those required by Section XXV (Retention of Records).

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment at the Site by the design and implementation of future response actions at the Site by the Settling Defendant, to reimburse response costs incurred in the future by the Plaintiffs, and to resolve the claims of Plaintiffs against Settling Defendant as provided in this Consent Decree.

6. Commitments by Settling Defendant. Settling Defendant shall finance and perform the Work in accordance with this Consent Decree, the ROD, and all work plans and other plans, standards, specifications, and schedules set forth herein or developed by Settling Defendant and approved by EPA, or the State (concerning Work under Paragraph 12) pursuant to this Consent Decree. Settling Defendant shall also reimburse the United States and the State for their respective Future Response Costs as provided in this Consent Decree.

7. Compliance With Applicable Law. All activities undertaken by Settling Defendant pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Defendant must

also comply with all applicable or relevant and appropriate requirements of all federal and State environmental laws as set forth in the ROD. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be considered to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal or state permit or approval, Settling Defendant shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. The Settling Defendant may seek relief under the provisions of Section XVIII (Force Majeure) of this Consent Decree for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit required for the Work.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

VI. PERFORMANCE OF THE WORK BY SETTLING DEFENDANT

9. Selection of Supervising Contractor.

a. All aspects of the Work to be performed by Settling Defendant pursuant to Sections VI (Performance of the Work by Settling Defendant), VII (Remedy Review), VIII (Quality Assurance, Sampling and Data Analysis), and XV (Emergency Response) of this Consent Decree shall be under the direction and supervision of the Supervising Contractor, the selection of which shall be subject to disapproval by EPA after a reasonable opportunity for review and comment by the State. By January 31, 2005, Settling Defendant shall notify EPA and the State in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor. With respect to any contractor proposed to be Supervising Contractor, Settling Defendant shall demonstrate that the proposed contractor has a quality system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995) or comparable guidelines, by submitting a copy of the proposed contractor's Quality Management Plan (QMP). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA will issue a notice of disapproval or an authorization to proceed. If at any time thereafter, Settling Defendant proposes to change a Supervising Contractor, Settling Defendant shall give such notice to EPA and the State and must obtain an authorization to proceed from EPA, after a reasonable opportunity for review and comment by the State, before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling Defendant in writing. Settling Defendant shall submit to EPA and the State a list of contractors, including the qualifications of each contractor, that would be acceptable to them within 30 days of receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization

to proceed with respect to any of the other contractors. Settling Defendant may select any contractor from that list that is not disapproved and shall notify EPA and the State of the name of the contractor selected within 21 days of EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents the Settling Defendant from meeting one or more deadlines in a plan approved by the EPA pursuant to this Consent Decree, Settling Defendant may seek relief under the provisions of Section XVIII (Force Majeure) hereof.

10. Remedial Design. Settling Defendant has developed remedial design plans for the placement of contaminated Site soils at the Globe Plant. These plans, entitled "Remedial Design Workplan for Soil Sampling & Remediation Program, Operable Unit 1, VB/I-70 Site, Denver, CO" as amended July 2004, have been approved by EPA and the State and are incorporated by reference into this Consent Decree as part of the Work. The remedial design plans are attached as Appendix C.

11. Remedial Action.

a. During calendar year 2005, Settling Defendant shall implement the EPA-approved Remedial Action Work Plan (which has been attached as Appendix D and incorporated by reference into this Consent Decree) at one hundred (100) residential properties within the Site. After consultation with Settling Defendant and the State, EPA will identify 110 residential properties for cleanup by December 15, 2004, thus ensuring the availability of identified cleanup locations despite potential access refusals. The residential properties to be remediated by the Settling Defendant will, to the maximum extent feasible, be geographically grouped together.

b. If any of the one hundred (100) properties can not be remediated in 2005 because the funds budgeted pursuant to Paragraph 33 of the 2003 Decree are insufficient, Settling Defendant shall complete the remainder of the cleanups in calendar year 2006 subject to an analysis of ability to pay. EPA will review financial information requested by EPA and submitted by Settling Defendant in the fourth quarter 2005 to determine, in its sole discretion, whether Settling Defendant has an inability or a limited ability to perform Work in 2006 or to pay response costs in 2006 that have been incurred at the Site, taking into consideration the ability of Settling Defendant to pay such response costs and still maintain its basic business operations, including its overall financial condition and demonstrable constraints on its ability to raise revenues.

c. Soils that Settling Defendant removes from the Site pursuant to this Consent Decree shall be placed on the Globe Plant in accordance with the Remedial Action Work Plan and maintained in perpetuity pursuant to the Operation and Maintenance Plan developed under this Consent Decree.

12. Operation and Maintenance

Within 60 days after the lodging of this Consent Decree, Settling Defendant shall submit to EPA and the State for review a draft Operation and Maintenance Plan for the contaminated Site soils that have been and are to be placed at the Globe Plant. The State shall be the lead for approval, with a reasonable opportunity for review and comment by EPA, of the Operation and Maintenance Plan pursuant to the consent decree in State of Colorado v. Asarco Incorporated, (D. Colorado) Civ. No. 83-C-2383. Asarco shall make changes to the draft Operation and

Maintenance Plan that are requested by the State within 30 days of receipt of the State's comments and shall continue to do so until the Plan is approved.

13. Modification of Work Plans.

a. If EPA determines, after a reasonable opportunity for review and comment by the State, that modification to the work specified in work plans developed pursuant to, or incorporated by reference into, this Consent Decree is necessary to carry out and maintain the effectiveness of the remedy set forth in the ROD, EPA may require that such modification be incorporated in such work plans, provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the remedy selected in the ROD.

b. For the purposes of this Paragraph 13 and Paragraph 42 only, the "scope of the remedy selected in the ROD" is the removal of contaminated Site soils from OU1 and permanent placement and maintenance of those soils on the Globe Plant.

c. If Settling Defendant objects to any modification determined by EPA or the State to be necessary pursuant to this Paragraph, it may seek dispute resolution pursuant to Section XIX (Dispute Resolution) and Paragraph 59 (record review). The work plans shall be modified in accordance with final resolution of the dispute.

d. Settling Defendant shall implement any work required by any modifications incorporated in work plans developed pursuant to this Consent Decree in accordance with this Paragraph.

e. Nothing in this Paragraph shall be construed to limit EPA's or the State's authority to require performance of further response actions as otherwise provided in this Consent Decree.

14. a. Settling Defendant shall, prior to any off-Site shipment of Waste Material from the Site to an out-of-state waste management facility, provide written notification to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator of such shipment of Waste Material. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards.

(1) The Settling Defendant shall include in the written notification the following information, where available: (1) the name and location of the facility to which the Waste Material is to be shipped; (2) the type and quantity of the Waste Material to be shipped; (3) the expected schedule for the shipment of the Waste Material; and (4) the method of transportation. The Settling Defendant shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

(2) The identity of the receiving facility and state will be determined by the Settling Defendant following the award of the contract for Remedial Action construction. The Settling Defendant shall provide the information required by Paragraph 16.a as soon as practicable after the award of the contract and before the Waste Material is actually shipped.

b. Before shipping any hazardous substances or pollutants or contaminants from the Site to an off-site location, Settling Defendant shall obtain EPA's certification that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3) and 40 C.F.R. 300.440. Settling Defendant shall only send hazardous substances or pollutants, or contaminants from the Site to an off-site facility that complies with the requirements of the statutory provision and regulations cited in the preceding sentence.

VII. REMEDY REVIEW

15. Periodic Review. Settling Defendant shall conduct any studies and investigations as requested by EPA, in order to permit EPA to conduct reviews of whether the Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c) of CERCLA and any applicable regulations. Settling Defendant's obligations under this Paragraph shall not extend beyond the residential properties to be remediated by Settling Defendant pursuant to this Consent Decree.

16. EPA Selection of Further Response Actions. If EPA determines, at any time, that the Remedial Action is not protective of human health or the environment, EPA may select further response actions for the Site in accordance with the requirements of CERCLA and the NCP.

17. Opportunity To Comment. Settling Defendant and, if required by Sections 113(k)(2) or 117 of CERCLA, the public, will be provided with an opportunity to comment on any further response actions proposed by EPA as a result of the review conducted pursuant to Section 121(c) of CERCLA and to submit written comments for the record during the comment period.

VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

18. Settling Defendant shall use quality assurance, quality control, and chain of custody procedures for all [compliance and monitoring] samples in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R5)" (EPA/240/B-01/003, March 2001) "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/600/R-98/018, February 1998), and subsequent amendments to such guidelines upon notification by EPA to Settling Defendant of such amendment. Amended guidelines shall apply only to procedures conducted after such notification. Any sampling or monitoring conducted by Settling Defendant pursuant to this Consent Decree shall be performed in accordance with EPA's QAPP for the Site, which is attached as Appendix E. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Decree. Settling Defendant shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Defendant in implementing this Consent Decree. In addition, Settling Defendant shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Settling Defendant shall ensure that the laboratories it utilizes for the analysis of samples taken pursuant to this Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods which are documented in the "Contract Lab Program Statement of Work for Inorganic Analysis" and the "Contract Lab Program Statement of Work for Organic Analysis," dated February 1988, and any amendments

made thereto during the course of the implementation of this Decree; however, upon approval by EPA, after opportunity for review and comment by the State, the Settling Defendant may use other analytical methods which are as stringent as or more stringent than the CLP- approved methods. Settling Defendant shall ensure that all laboratories it uses for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA-equivalent QA/QC program. Settling Defendant shall only use laboratories that have a documented Quality System which complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)," (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program (NELAP) as meeting the Quality System requirements. Settling Defendant shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Decree will be conducted in accordance with the procedures set forth in the QAPP approved by EPA.

19. Upon request, the Settling Defendant shall allow split or duplicate samples to be taken by EPA and the State or their authorized representatives. Settling Defendant shall notify EPA and the State not less than ten days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State shall allow the Settling Defendant to take split or duplicate samples of any samples they take as part of the Plaintiffs' oversight of the Settling Defendant's implementation of the Work.

20. Settling Defendant shall submit to EPA and the State two copies of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Settling Defendant with respect to the Site and/or the implementation of this Consent Decree unless EPA, with reasonable opportunity for comment by the State, agrees otherwise.

21. Notwithstanding any provision of this Consent Decree, the United States and the State hereby retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA and any other applicable statutes or regulations.

IX. ACCESS AND INSTITUTIONAL CONTROLS

22. If the Site, or any other property where access and/or land use restrictions are needed to implement this Consent Decree, is owned or controlled by the Settling Defendant, Settling Defendant shall:

a. commencing on the date of lodging of this Consent Decree, provide the United States, the State, and their representatives, including EPA and its contractors, with access at all reasonable times to the Site, or such other property, for the purpose of conducting any activity related to this Consent Decree including, but not limited to, the following activities:

(1) Monitoring the Work;

(2) Verifying any data or information submitted to the United States or the State;

(3) Conducting investigations relating to contamination at or near the Site;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional response actions at or near the Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved Quality Assurance Project Plans;

(7) Implementing the Work pursuant to the conditions set forth in Paragraph 82 of this Consent Decree;

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendant or its agents, consistent with Section XXIV (Access to Information);

(9) Assessing Settling Defendant's compliance with this Consent Decree; and

(10) Determining whether the Site or other property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted, by or pursuant to this Consent Decree;

b. commencing on the date of lodging of this Consent Decree, refrain from using the Globe Plant in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of the remedial measures to be performed pursuant to this Consent Decree; and

c. within 45 days of entry of this Consent Decree, execute and record in the Clerk and Recorder's Office of Denver County, State of Colorado , the Environmental Covenant, as required by C.R.S. § 25-15-317 to 327, running with the land, which is attached as Appendix A. Within 30 days of the recording of the Environmental Covenant, Settling Defendant shall provide EPA and the State with a final title insurance policy, or other final evidence of title acceptable to EPA and the State, and a certified copy of the original recorded covenant showing the clerk's recording stamps.

23. Commencing on the date of lodging of this Consent Decree, Settling Defendant provides EPA and the State access to the Globe Plant for placement of soils removed from residential properties at the Site in accordance with EPA's work plan, as well as for mobilization and oversight activities at the Site, including office-trailer placement and materials storage. Access for this purpose only shall terminate after December 31, 2006, unless an extension is mutually agreed to by the parties to this Consent Decree.

24. If the Site, or any other property where access is needed to implement this Consent Decree, is owned or controlled by persons other than any of the Settling Defendant, Settling Defendant shall use best efforts to secure from such persons an agreement to provide access thereto for Settling Defendant, as well as for the United States on behalf of EPA, and the State, as well as its representatives (including contractors), for the purpose of conducting any

activity related to this Consent Decree including, but not limited to, those activities listed in Paragraph 22.a of this Consent Decree.

25. For purposes of Paragraph 24 of this Consent Decree, "best efforts" includes the payment of reasonable sums of money in consideration of access and access easements. If any access agreements required by Paragraph 24 of this Consent Decree are not obtained within 45 days of EPA's identification of the 110 properties, or if the Environmental Covenant cannot be executed and implemented in accordance with the terms of Paragraph 22.c, Settling Defendant shall promptly notify the United States in writing, and shall include in that notification a summary of the steps that Settling Defendant has taken to attempt to comply with Paragraph 22.c or 24 of this Consent Decree. The United States may, as it deems appropriate, assist Settling Defendant in obtaining access or land use restrictions, either in the form of contractual agreements or in the form of easements running with the land, or in obtaining the release or subordination of a prior lien or encumbrance. Settling Defendant shall reimburse the United States in accordance with the procedures in Section XVI (Reimbursement of Response Costs), for all costs incurred, direct or indirect, by the United States in obtaining such access, land/water use restrictions, and/or the release/subordination of prior liens or encumbrances including, but not limited to, the cost of attorney time and the amount of monetary consideration paid or just compensation.

26. If EPA or the State (with respect to the Globe Plant) determines that land use restrictions in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement the remedy selected in the ROD, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Settling Defendant shall cooperate with EPA's and the State's efforts to secure such governmental controls.

27. Notwithstanding any provision of this Consent Decree, the United States and the State retain all of their access authorities and rights, as well as all of their rights to require land use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA and any other applicable statute or regulations.

X. REPORTING REQUIREMENTS

28. In addition to any other requirement of this Consent Decree, Settling Defendant shall submit to EPA and the State two copies of written monthly progress reports that describe: (a) any safety issues during the relevant period and any resolution of issues which arose previously; (b) any QA/QC issues during the relevant period and any resolution of issues which arose previously; (c) the status of the project schedule on a per property basis, including start date, percentage completed, finish date,date of completion of post-construction maintenance and date of mailing of landowner's completion letter; (d) any conditions or events which may delay the project and a description of efforts made to mitigate those delays or anticipated delays; (e) any current project activities; and (f) any upcoming project activities. The monthly progress reports shall be submitted within 15 days following the end of the month addressed in the report.

29. The Settling Defendant shall notify EPA and the State of any change in the schedule described in the monthly progress report for the performance of any activity, including, but not limited to, data collection and implementation of work plans, no later than seven days prior to the performance of the activity.

30. Upon the occurrence of any event during performance of the Work that Settling Defendant is required to report pursuant to Section 103 of CERCLA or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), Settling Defendant shall within 24 hours of the onset of such event orally notify the State Project Coordinator and the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator or Alternate EPA Project Coordinator is available, the Emergency Response Section, Region 8, United States Environmental Protection Agency. These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

31. Within 20 days of the onset of such an event, Settling Defendant shall furnish to Plaintiffs a written report, signed by the Settling Defendant's Project Coordinator, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within 30 days of the conclusion of such an event, Settling Defendant shall submit a report setting forth all actions taken in response thereto.

32. Settling Defendant shall submit two copies of all plans, reports, and data required by approved plans and this Consent Decree to EPA in accordance with the schedules set forth in such plans. Settling Defendant shall simultaneously submit two copies of all such plans, reports and data to the State. Upon request by EPA Settling Defendant shall submit in electronic form all portions of any report or other deliverable Settling Defendant is required to submit pursuant to the provisions of this Consent Decree.

33. All reports and other documents submitted by Settling Defendant to EPA (other than the monthly progress reports referred to above) which purport to document Settling Defendant's compliance with the terms of this Consent Decree shall be signed by an authorized representative of the Settling Defendant.

XI. EPA APPROVAL OF PLANS AND OTHER SUBMISSIONS

34. After review of any plan, report or other item which is required to be submitted for approval pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by the State, shall: (a) approve, in whole or in part, the submission; (b) approve the submission upon specified conditions; (c) modify the submission to cure the deficiencies; (d) disapprove, in whole or in part, the submission, directing that the Settling Defendant modify the submission; or (e) any combination of the above. However, EPA shall not modify a submission without first providing Settling Defendant at least one notice of deficiency and an opportunity to cure within ten days, except where to do so would cause serious disruption to the Work or where previous submission(s) have been disapproved due to material defects and the deficiencies in the submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

35. In the event of approval, approval upon conditions, or modification by EPA, pursuant to Paragraph 34(a), (b), or (c), Settling Defendant shall proceed to take any action required by the plan, report, or other item, as approved or modified by EPA subject only to its right to invoke the Dispute Resolution procedures set forth in Section XIX (Dispute Resolution) with respect to the modifications or conditions made by EPA. In the event that EPA modifies the submission to cure the deficiencies pursuant to Paragraph 34(c) and the submission has a

material defect, EPA retains its right to seek stipulated penalties, as provided in Section XX (Stipulated Penalties).

36. Resubmission of Plans.

a. Upon receipt of a notice of disapproval pursuant to Paragraph 34(d), Settling Defendant shall, within ten days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other item for approval. Any stipulated penalties applicable to the submission, as provided in Section XX, shall accrue during the ten-day period or otherwise specified period but shall not be payable unless the resubmission is disapproved or modified due to a material defect as provided in Paragraphs 37 and 38.

b. Notwithstanding the receipt of a notice of disapproval pursuant to Paragraph 34(d), Settling Defendant shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission. Implementation of any non-deficient portion of a submission shall not relieve Settling Defendant of any liability for stipulated penalties under Section XX (Stipulated Penalties).

37. In the event that a resubmitted plan, report or other item, or portion thereof, is disapproved by EPA, EPA, after a reasonable opportunity for State input, may again require the Settling Defendant to correct the deficiencies, in accordance with the preceding Paragraphs. EPA also retains the right to modify or develop the plan, report or other item. Settling Defendant shall implement any such plan, report, or item as modified or developed by EPA, subject only to its right to invoke the procedures set forth in Section XIX (Dispute Resolution).

38. If upon resubmission, a plan, report, or item is disapproved or modified by EPA due to a material defect, Settling Defendant shall be deemed to have failed to submit such plan, report, or item timely and adequately unless the Settling Defendant invokes the dispute resolution procedures set forth in Section XIX (Dispute Resolution) and EPA's action is overturned pursuant to that Section. The provisions of Section XIX (Dispute Resolution) and Section XX (Stipulated Penalties) shall govern the implementation of the Work and accrual and payment of any stipulated penalties during Dispute Resolution. If EPA's disapproval or modification is upheld, stipulated penalties shall accrue for such violation from the date on which the initial submission was originally required, as provided in Section XX.

39. All plans, reports, and other items required to be submitted to EPA under this Consent Decree shall, upon approval or modification by EPA, be enforceable under this Consent Decree. In the event EPA approves or modifies a portion of a plan, report, or other item required to be submitted to EPA under this Consent Decree, the approved or modified portion shall be enforceable under this Consent Decree.

XII. PROJECT COORDINATORS

40. Within 20 days of lodging this Consent Decree, Settling Defendant, the State and EPA will notify each other, in writing, of the name, address and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least 5 working days before the changes occur, unless impracticable, but in no event later than the actual day the change is made. The Settling Defendant's Project Coordinator shall be subject to disapproval by EPA and shall have the

technical expertise sufficient to adequately oversee all aspects of the Work. The Settling Defendant's Project Coordinator shall not be an attorney for the Settling Defendant in this matter. He or she may assign other representatives, including other contractors, to serve as a Site representative for oversight of performance of daily operations during remedial activities.

41. Plaintiffs may designate other representatives, including, but not limited to, EPA and State employees, and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager (RPM) and an On-Scene Coordinator (OSC) by the National Contingency Plan, 40 C.F.R. Part 300. In addition, EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the National Contingency Plan, after consultation with the State if practicable, to halt any Work required by this Consent Decree and to take any necessary response action when he or she determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

XIV. CERTIFICATION OF COMPLETION

42. Completion of the Remedial Action.

a. Within 90 days after Settling Defendant concludes that it has fully performed the Remedial Action at 100 residential properties, Settling Defendant shall schedule and conduct a pre-certification inspection to be attended by the Settling Defendant, EPA and the State. If, after the pre-certification inspection, the Settling Defendant still believes that the Remedial Action at the 100 residential properties has been fully performed, it shall submit a written report requesting certification to EPA for approval, with a copy to the State, pursuant to Section XI (EPA Approval of Plans and Other Submissions) within 30 days of the inspection. In the report, the Settling Defendant's Project Coordinator shall state that the Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree. The written report shall include as-built drawings. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendant's Project Coordinator:

> To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after completion of the pre-certification inspection and receipt and review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that the Remedial Action or any portion thereof has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendant in writing of the activities that must be undertaken by Settling Defendant pursuant to this Consent Decree to complete the Remedial Action, provided, however, that EPA may only require Settling Defendant to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD," as that term is defined in Paragraph 13.b. EPA will

set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the Work Plan or require the Settling Defendant to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendant shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph, subject to its right to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the State, that the Remedial Action has been performed in accordance with this Consent Decree, EPA will so certify in writing to Settling Defendant. This certification shall constitute the Certification of Completion of the Remedial Action for purposes of this Consent Decree, including, but not limited to, Section XXI (Covenants Not to Sue by Plaintiffs). Certification of Completion of the Remedial Action shall not affect Settling Defendant's obligations under this Consent Decree.

43. Completion of the Work.

a. Within 90 days after Settling Defendant concludes that all phases of the Work (excluding implementation of the Operation and Maintenance Plan) have been fully performed, Settling Defendant shall submit a written report stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendant's Project Coordinator:

> To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendant in writing of the activities that must be undertaken by Settling Defendant pursuant to this Consent Decree to complete the Work, provided, however, that EPA may only require Settling Defendant to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD," as that term is defined in Paragraph 13.b. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree or require the Settling Defendant to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendant shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to its right to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent request for Certification of Completion by Settling Defendant and after a reasonable opportunity for review

and comment by the State, that the Work has been performed in accordance with this Consent Decree, EPA will so notify the Settling Defendant in writing.

XV. EMERGENCY RESPONSE

44. In the event of any action or occurrence during the performance of the Work which causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendant shall, subject to Paragraph 45, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify the EPA's Project Coordinator, or, if the Project Coordinator is unavailable, EPA's Alternate Project Coordinator, as well as notifing the State Project Coordinator. If neither of these persons is available, the Settling Defendant shall notify the EPA Emergency Response Center, Region 8. Settling Defendant shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer, as well as with the State Project Coordinator and in accordance with applicable plans or documents developed pursuant to this Consent Decree. In the event that Settling Defendant fails to take appropriate response action as required by this Section, and EPA or, as appropriate, the State takes such action instead, Settling Defendant shall reimburse EPA and the State all costs of the response action not inconsistent with the NCP pursuant to Section XVI (Payments for Response Costs).

45. Nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States, or the State, a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, subject to Section XXI (Covenants Not to Sue by Plaintiffs).

XVI. PAYMENTS FOR RESPONSE COSTS

46. Payments for Future Response Costs

Settling Defendant shall pay to EPA and the State all of their respective Future Response Costs not inconsistent with the National Contingency Plan. On a periodic basis commencing on or after January 1, 2006, the United States will send Settling Defendant a bill requiring payment that includes a Scorpios, standard Regionally-prepared cost summary, which includes direct and indirect costs incurred by EPA and its contractors, and name of DOJ-prepared cost summary which reflects costs incurred by DOJ and its contractors. The State will send its own bill on a periodic basis commencing on or after January 1, 2006. Settling Defendant shall make all payments within 30 days of Settling Defendant's receipt of each bill requiring payment, except as otherwise provided in Paragraph 47. Settling Defendant shall make all payments to EPA required by this Paragraph by a certified or cashier's check or checks made payable to "EPA Hazardous Substance Superfund," referencing the name and address of the party making the payment, EPA Site/Spill ID Number 08-9R, and DOJ Case Number 90-11-3-138/7. Settling Defendant shall send the check(s) to: Regular Mail, Mellon Bank, EPA Region 8, Attn: Superfund Accounting, Lockbox 360859, Pittsburgh, Pennsylvania 15211-6859; express Mail: EPA 360859, Mellon Client Service Center,Room 154-670, 500 Ross Street, Pittsburgh, Pennsylvania 15262-0001.; or other such address as EPA may designate in writing or by wire

transfer to: ABA-=021030004, TREAS NYC/CTR, BNF=/AC-68011008.Wire transfers must be sent to the Federal Reserve Bank in New York. At the time of payment, Settling Defendant shall send notice that the payment has been made to: Kelcey Land, Cost Recovery Program Manager, U.S. EPA Region 8, Suite 300 (8ENF-RC), 999 18th Street, Suite 300, Denver, CO 80202-2466. At the time of payment, Settling Defendant shall send notice that payment has been made to the United States, to EPA and to the Regional Financial Management Officer, in accordance with Section XXVI (Notices and Submissions). Payments to the State shall be by certified or cashier's check or checks made payable to "Treasurer, State of Colorado", referencing the name and address of the party making the payment and identifying the site as Vasquez Boulevard/ I-70, OU#1. Settling Defendant shall send the check to Mr. Joe Montoya, Program Administrator, Office of the Colorado Attorney General, Natural Resources and Environment Section, 1525 Sherman Street, 5th Floor, Denver, CO 80203. Payment of response costs to the State set forth in this Section shall be deposited into the "Hazardous Substance Response Fund." Copies of check(s) paid pursuant to this section, and any accompanying transmittal letter(s), shall be sent to the State as provided in Section XXVI (Notices and Submissions).

47. Settling Defendant may contest payment of any Future Response Costs under Paragraph 46 if it determines that the United States or the State has made an accounting error or if it alleges that a cost item that is included represents costs that are inconsistent with the NCP. Such objection shall be made in writing within 30 days of receipt of the bill and must be sent to the United States or the State (for State response costs) pursuant to Section XXVI (Notices and Submissions). Any such objection shall specifically identify the contested Future Response Costs and the basis for objection. In the event of an objection, the Settling Defendant shall within the 30 day period pay all uncontested Future Response Costs to the United States or the State (for State response costs) in the manner described in Paragraph 46. Simultaneously, the Settling Defendant shall establish an interest-bearing escrow account in a federally-insured bank duly chartered in the State of Colorado and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. The Settling Defendant shall send to the United States, as provided in Section XXVI (Notices and Submissions), and the State a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, the Settling Defendant shall initiate the Dispute Resolution procedures in Section XIX (Dispute Resolution). If the United States or the State (for State response costs) prevails in the dispute, within 5 days of the resolution of the dispute, the Settling Defendant shall pay the sums due (with accrued interest) to the United States or the State (for State response costs) in the manner described in Paragraph 46. If the Settling Defendant prevails concerning any aspect of the contested costs, the Settling Defendant shall pay that portion of the costs (plus associated accrued interest) for which it did not prevail to the United States in the manner described in Paragraph 46; Settling Defendant shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XIX (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding the Settling Defendant's obligation to reimburse the United States for its Future Response Costs.

48. In the event that the payments required by Subparagraph 46 are not made within 30 days of the Settling Defendant's receipt of the bill, Settling Defendant shall pay Interest on the unpaid balance. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of the Settling Defendant's payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of Settling Defendant's failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 79. The Settling Defendant shall make all payments required by this Paragraph in the manner described in Paragraph 46.

XVII. INDEMNIFICATION AND INSURANCE

49. Settling Defendant's Indemnification of the United States and the State.

a. The United States and the State do not assume any liability by entering into this agreement or by virtue of any designation of Settling Defendant as EPA's authorized representative under Section 104(e) of CERCLA. Settling Defendant shall indemnify, save and hold harmless the United States, the State, and their officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on its behalf or under its control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendant as EPA's authorized representative under Section 104(e) of CERCLA. Further, the Settling Defendant agrees to pay the United States and the State all costs they incur including, but not limited to, attorneys fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on its behalf or under its control, in carrying out activities pursuant to this Consent Decree. Neither the United States nor the State shall be held out as a party to any contract entered into by or on behalf of Settling Defendant in carrying out activities pursuant to this Consent Decree. Neither the Settling Defendant nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Defendant notice of any claim for which the United States or the State plans to seek indemnification pursuant to Paragraph 49, and shall consult with Settling Defendant prior to settling such claim.

50. Settling Defendant waives all claims against the United States and the State for damages or reimbursement or for set-off of any payments made or to be made to the United States or the State, arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Settling Defendant shall indemnify and hold harmless the United States and the State with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

51. No later than 15 days before commencing any on-site Work, Settling Defendant or its Supervising Contractor shall secure, and shall maintain until the first anniversary of EPA's Certification of Completion of the Remedial Action pursuant to Subparagraph 42.b of Section XIV (Certification of Completion) comprehensive general liability insurance with limits of one million dollars, combined single limit, and automobile liability insurance with limits of one million dollars, combined single limit, naming the United States and the State as additional insureds. In addition, for the duration of this Consent Decree, Settling Defendant shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Defendant in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Defendant shall provide to EPA and the State certificates of such insurance and a copy of each insurance policy. Settling Defendant shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Defendant demonstrates by evidence satisfactory to EPA and the State that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendant need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

XVIII. FORCE MAJEURE

52. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of the Settling Defendant, of any entity controlled by Settling Defendant, or of Settling Defendant's contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendant's best efforts to fulfill the obligation. The requirement that the Settling Defendant exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any potential force majeure event (1) as it is occurring and (2) following the potential force majeure event, such that the delay is minimized to the greatest extent possible. "Force Majeure" does not include financial inability to complete the Work.

53. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a force majeure event, the Settling Defendant shall notify orally EPA's Project Coordinator or, in his or her absence, EPA's Alternate Project Coordinator, and the State Project Coordinator within 24 hours of when Settling Defendant first knew that the event might cause a delay. Within three days thereafter, Settling Defendant shall provide in writing to EPA and the State an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; the Settling Defendant's rationale for attributing such delay to a force majeure event if it intends to assert such a claim; and a statement as to whether, in the opinion of the Settling Defendant, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Settling Defendant shall include with any notice all available documentation supporting its claim that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude Settling Defendant from asserting any claim of force majeure for that event for the period of time of such

failure to comply, and for any additional delay caused by such failure. Settling Defendant shall be deemed to know of any circumstance of which Settling Defendant, any entity controlled by Settling Defendant, or Settling Defendant's contractors knew or should have known.

54. If EPA, after a reasonable opportunity for review and comment by the State, agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Consent Decree that are affected by the force majeure event will be extended by EPA, after a reasonable opportunity for review and comment by the State, for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. If EPA, after a reasonable opportunity for review and comment by the State, does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, EPA will notify the Settling Defendant in writing of its decision. If EPA, after a reasonable opportunity for review and comment by the State, agrees that the delay is attributable to a force majeure event, EPA will notify the Settling Defendant in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

55. If the Settling Defendant elects to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution), it shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendant shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendant complied with the requirements of Paragraphs 52 and 53, above. If Settling Defendant carries this burden, the delay at issue shall be deemed not to be a violation by Settling Defendant of the affected obligation of this Consent Decree identified to EPA, the State and the Court.

XIX. DISPUTE RESOLUTION

56. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations of the Settling Defendant that have not been disputed in accordance with this Section. Disputes arising pursuant to the requirements of Paragraph 12 or relating to State cost recovery for Settling Defendant's activities at the Globe Plant shall be resolved in accordance with the dispute resolution requirements of the consent decree in State of Colorado v. Asarco Incorporated, (D. Colorado) Civ. No. 83-C-2383, not with the terms described herein.

57. Any dispute, other than those relating to Paragraph 12 or to State cost recovery for Settling Defendant's activities at the Globe Plant, which arises under or with respect to this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party receives the other party's written Notice of Dispute.

58. Statements of Position.

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA, in consultation with the State, shall be considered binding unless, within ten days after the conclusion of the informal negotiation period, Settling Defendant invokes the formal dispute resolution procedures of this Section by serving on EPA and the State a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis or opinion supporting that position and any supporting documentation relied upon by the Settling Defendant. The Statement of Position shall specify the Settling Defendant's position as to whether formal dispute resolution should proceed under Paragraph 59 or Paragraph 60.

b. Within twenty days after receipt of Settling Defendant's Statement of Position, EPA, in consultation with the State, will serve on Settling Defendant its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 59 or 60. Within twenty days after receipt of EPA's Statement of Position, Settling Defendant may submit a Reply.

c. If there is disagreement between EPA and the Settling Defendant as to whether dispute resolution should proceed under Paragraph 59 or 60, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA, in consultation with the State, to be applicable. However, if the Settling Defendant ultimately appeals to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 59 and 60.

59. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation: (1) the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree; and (2) the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendant regarding the validity of the ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA, in consultation with the State, may allow submission of supplemental statements of position by the parties to the dispute.

b. The Assistant Regional Administrator for Ecosystem Protection and Remediation, EPA Region 8, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 59.a. This decision shall be binding upon the Settling Defendant, subject only to the right to seek judicial review pursuant to Paragraph 59.c and d.

c. Any administrative decision made by EPA pursuant to Paragraph 59.b. shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by the Settling Defendant with the Court and served on all Parties within 10 days of receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States, in consultation with the State, may file a response to Settling Defendant's motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendant shall have the burden of demonstrating that the decision of the Assistant Regional Administrator for Ecosystem Protection and Remediation, EPA Region 8 is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 59.a.

60. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendant's Statement of Position submitted pursuant to Paragraph 58, the Assistant Regional Administrator for Ecosystem Protection and Remediation, EPA Region 8 will issue a final decision resolving the dispute. The Assistant Regional Administrator's decision shall be binding on the Settling Defendant unless, within 10 days of receipt of the decision, the Settling Defendant files with the Court and serve on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. EPA, in consultation with the State, may file a response to Settling Defendant's motion.

b. Notwithstanding Paragraph N of Section I (Background) of this Consent Decree, judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

61. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone or affect in any way any obligation of the Settling Defendant under this Consent Decree, not directly in dispute, unless EPA, in consultation with the State, or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 70. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that the Settling Defendant does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XX (Stipulated Penalties).

XX. STIPULATED PENALTIES

62. Settling Defendant shall be liable for stipulated penalties in the amounts set forth in Paragraphs 63 and 64 to the United States and the State (90%-10%) for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XVIII (Force Majeure). "Compliance" by Settling Defendant shall include completion of the activities under this Consent Decree or any work plan or other plan approved under this Consent Decree

identified below in accordance with all applicable requirements of law, this Consent Decree and any plans or other documents approved by EPA pursuant to this Consent Decree and within the specified time schedules established by and approved under this Consent Decree.

63. Stipulated Penalty Amounts - Work.

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Subparagraph 63.b:

Penalty Per Violation Per Day	Period of Noncompliance
$1,000	1st through 14th day
$5,000	15th through 30th day
$32,500	31st day and beyond

b. Compliance Milestones.

(1) Completion of Remedial Action at the selected 100 residential properties by the dates specified in Paragraph 11, Submittal of O&M Plan by the dates specified in Paragraph 12.

64. Stipulated Penalty Amounts - Reports.

a. The following stipulated penalties shall accrue per violation per day for failure to submit monthly progress reports within 15 days following the end of the month addressed in the report:

Penalty Per Violation Per Day	Period of Noncompliance
$100	1st through 14th day
$500	15th through 30th day
$1,000	31st day and beyond

65. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 82 of Section XXI (Covenants Not to Sue by Plaintiffs), Settling Defendant shall be liable for a stipulated penalty in the amount of $100,000.

66. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (1) with respect to a deficient submission under Section XI (EPA Approval of Plans and Other Submissions), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendant of any deficiency; (2) with respect to a decision by the Assistant Regional Administrator for Ecosystem Protection and Remediation, EPA Region 8, under Paragraph 59.b or 60.a of Section XIX (Dispute Resolution), during the period, if any, beginning on the 21st day after the date that Settling Defendant's reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (3) with respect to judicial review by this Court of any dispute under Section XIX (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date

that the Court issues a final decision regarding such dispute. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

67. Following EPA's determination, after consultation with the State, that Settling Defendant has failed to comply with a requirement of this Consent Decree, EPA may give Settling Defendant written notification of the same and describe the noncompliance. EPA and the State may send the Settling Defendant a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified the Settling Defendant of a violation.

68. All penalties accruing under this Section shall be due and payable to the United States and the State within 30 days of the Settling Defendant's receipt from EPA of a demand for payment of the penalties, unless Settling Defendant invokes the Dispute Resolution procedures under Section XIX (Dispute Resolution). All payments to the United States under this Section shall be paid by certified or cashier's check(s) made payable to "EPA Hazardous Substances Superfund," shall be mailed to Regular Mail: Mellon Bank, EPA Region 8 , Attn: Superfund Accounting, Lockbock 360859, Pittsburgh, Pennsylvania 15251-6859; Express Mail: EPA 360859, Mellon Client Service center, Room 154-670, 500 Ross Street, Pittsburgh, Pennsylvania 15262-0001; or other such address as EPA may designate in writing or wire transfer to: ABA=021030004, TREAS NYC/CTR/, BNF=/AC-68011008; Wire transfers must be sent to the Federal Reserve Bank in New york. At the time of payment, Settling Defendants shall send notice that the payment has been made to: Dawn Tesorero, EPA Enforcement Specialist, U.S. EPA Region 8, Suite 300 (8ENF-RC), 999 18th Street, Denver, CO 80202-2466, shall indicate that the payment is for stipulated penalties, and shall reference the EPA Region and Site/Spill ID, the DOJ Case Number 90-11-3-138/7, and the name and address of the party making payment. Copies of check(s) paid pursuant to this Section, and any accompanying transmittal letter(s), shall be sent to the United States as provided in Section XXVI (Notices and Submissions). All payments to the State under this Section shall be by certified or cashier's check or checks made payable to "Treasurer, State of Colorado", referencing the name and address of the party making the payment and identifying the site as Vasquez Boulevard/ I-70, OU#1. Settling Defendant shall send the check to Mr. Joe Montoya, Program Administrator, Office of the Colorado Attorney General, Natural Resources and Environment Section, 1525 Sherman Street, 5th Floor, Denver, CO 80203. Payment of response costs to the State set forth in this section shall be deposited into the "Hazardous Substance Response Fund." Copies of check(s) paid pursuant to this section, and any accompanying transmittal letter(s), shall be sent to the State as provided in Section XXVI (Notices and Submissions).

69. The payment of penalties shall not alter in any way Settling Defendant's obligation to complete the performance of the Work required under this Consent Decree.

70. Penalties shall continue to accrue as provided in Paragraph 66 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owing shall be paid to EPA and the State within 15 days of the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendant shall pay all accrued penalties determined by the Court to be

owed to EPA and the State within 60 days of receipt of the Court's decision or order, except as provided in Subparagraph c below;

c. If the District Court's decision is appealed by any Party, Settling Defendant shall pay all accrued penalties determined by the District Court to be owing to the United States or the State into an interest-bearing escrow account within 60 days of receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days of receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA and the State or to Settling Defendant to the extent that it prevails.

71. If Settling Defendant fails to pay stipulated penalties when due, the United States or the State may institute proceedings to collect the penalties as well as interest. Settling Defendant shall pay Interest on the unpaid balance, which shall begin to accrue on the date of demand made pursuant to Paragraph 68.

72. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States or the State to seek any other remedies or sanctions available by virtue of Settling Defendant's violation of this Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA, provided, however, that the United States shall not seek civil penalties pursuant to Section 122(l) of CERCLA for any violation for which a stipulated penalty is provided herein, except in the case of a willful violation of the Consent Decree.

73. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXI. COVENANTS NOT TO SUE BY PLAINTIFFS

74. United States' Covenant Not to Sue. In consideration of the actions that will be performed and the payments that will be made by the Settling Defendant under the terms of the Consent Decree, and except as specifically provided in Paragraphs 75, 76, and 78 of this Section, the United States covenants not to sue or to take administrative action against Settling Defendant pursuant to Sections 106 and 107(a) of CERCLA relating to the Site. With respect to future liability, these covenants not to sue shall take effect upon Certification of Completion of Remedial Action by EPA pursuant to Paragraph 42.b of Section XIV (Certification of Completion). These covenants not to sue are conditioned upon the satisfactory performance by Settling Defendant of its obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendant and do not extend to any other person.

75. United States' Pre-certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendant

a. to perform further response actions relating to the Site, or

b. to reimburse the United States for additional costs of response if, prior to Certification of Completion of the Remedial Action:

(1) conditions at the Site, previously unknown to EPA, are discovered, or

(2) information, previously unknown to EPA, is received, in whole or in part,

and EPA determines that these previously unknown conditions or information together with any other relevant information indicates that the Remedial Action is not protective of human health or the environment.

76. United States' Post-certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendant

a. to perform further response actions relating to the Site, or

b. to reimburse the United States for additional costs of response if, subsequent to Certification of Completion of the Remedial Action:

(1) conditions at the Site, previously unknown to EPA, are discovered, or

(2) information, previously unknown to EPA, is received, in whole or in part,

and EPA determines that these previously unknown conditions or this information together with other relevant information indicate that the Remedial Action is not protective of human health or the environment.

77. For purposes of Paragraph 75, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date the ROD was signed and set forth in the Record of Decision for the Site and the administrative record supporting the Record of Decision. For purposes of Paragraph 76, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date of Certification of Completion of the Remedial Action and set forth in the Record of Decision, the administrative record supporting the Record of Decision, the post-ROD administrative record, or in any information received by EPA pursuant to the requirements of this Consent Decree prior to Certification of Completion of the Remedial Action.

78. United States' General Reservations of Rights. The United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendant with respect to all matters not expressly included within United States' covenant not to sue. Notwithstanding any other provision of this Consent Decree, the United States reserves all rights against Settling Defendant with respect to:

a. claims based on a failure by Settling Defendant to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site, except for the placement of soils on the Globe Plant pursuant to this Consent Decree;

c. liability based upon the Settling Defendant's ownership or operation of the Site, or upon the Settling Defendant's transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the ROD, the Work, or otherwise ordered by EPA, after signature of this Consent Decree by the Settling Defendant;

d. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

e. criminal liability;

f. liability for violations of federal or state law which occur during or after implementation of the Remedial Action;

g. liability for additional operable units at the Site; and

h. liability for additional response actions for soils placed at the Globe Plant if such become necessary because of a potential or actual imminent and substantial endangerment resulting from inadequate or inappropriate operation and maintenance.

79. State's Covenant Not To Sue. In consideration of the actions that will be performed and the payments that will be made by the Settling Defendant under the terms of the Consent Decree, and except as specifically provided in Paragraphs 80 and 81 of this Section, the State covenants not to sue or to take administrative action against Settling Defendant pursuant to Section 107(a) of CERCLA relating to the Site. With respect to future liability, these covenants not to sue shall take effect upon Certification of Completion of Remedial Action by EPA pursuant to Paragraph 42.b of Section XIV (Certification of Completion). These covenants not to sue are conditioned upon the satisfactory performance by Settling Defendant of its obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendant and do not extend to any other person.

80. State's Reservations of Rights. Notwithstanding any other provision of this Consent Decree, the State reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, seeking to compel Settling Defendant

a. to perform further response actions relating to the Site, or

b. to reimburse the State for additional costs of response if:

(1) conditions at the Site, previously unknown to State, are discovered, or

(2) information, previously unknown to the State, is received, in whole or in part,

and the State determines that these previously unknown conditions or this information together with other relevant information indicate that the Remedial Action is not protective of human health or the environment. The information and the conditions known to the State shall include only that information and those conditions known to the State as of the date the ROD was signed for the Site.

81. State's General Reservations of Rights. The State reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendant with respect to all matters not expressly included within the State's covenant not to sue. Notwithstanding any other provision of this Consent Decree, the State reserves all rights against Settling Defendant with respect to:

a. claims based on a failure by Settling Defendant to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site, except for the placement of soils on the Globe Plant pursuant to this Consent Decree;

c. liability based upon the Settling Defendant's ownership or operation of the Site, or upon the Settling Defendant's transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the ROD, the Work, or otherwise ordered by EPA, after signature of this Consent Decree by the Settling Defendant;

d. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

e. criminal liability;

f. liability for violations of federal or state law which occur during or after implementation of the Remedial Action;

g. liability for additional operable units at the Site; and

h. liability for additional response actions for soils placed at the Globe Plant if such become necessary because of a potential or actual imminent and substantial endangerment resulting from inadequate or inappropriate operation and maintenance.

82. Work Takeover In the event EPA determines that Settling Defendant has ceased implementation of any portion of the Work, is seriously or repeatedly deficient or late in its performance of the Work, or are implementing the Work in a manner which may cause an endangerment to human health or the environment, EPA may assume the performance of all or any portions of the Work as EPA determines necessary. Settling Defendant may invoke the procedures set forth in Section XIX (Dispute Resolution), Paragraph 59, to dispute EPA's determination that takeover of the Work is warranted under this Paragraph. Costs incurred by the United States in performing the Work pursuant to this Paragraph shall be considered Future Response Costs that Settling Defendant shall pay pursuant to Section XVI (Payment for Response Costs).

83. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all their authority and reserve all rights to take any and all response actions authorized by law.

XXII. COVENANTS BY SETTLING DEFENDANT

84. Covenant Not to Sue. Subject to the reservations in Paragraph 85, Settling Defendant hereby covenants not to sue and agree not to assert any claims or causes of action against the United States or the State with respect to the Site, the Work, past response actions at the Site, past and future placement of contaminated soils from the Site at the Globe Plant and Past and Future Response Costs as defined herein or this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112, 113 or any other provision of law;

b. any claims against the United States, including any department, agency or instrumentality of the United States under CERCLA Sections 107 or 113 related to the Site, or

c. any claims arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the State Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law.

Except as provided in Paragraph 87 (Waiver of Claims Against De Micromis Parties), and Paragraph 92 (waiver of Claim-Splitting Defenses), these covenants not to sue shall not apply in the event that the United States or the State brings a cause of action or issues an order pursuant to the reservations set forth in Paragraphs 75, 76, 78 (b) - (d) or 78 (g), but only to the extent that Settling Defendant's claims arise from the same response action, response costs, or damages that the United States or the State is seeking pursuant to the applicable reservation.

85. The Settling Defendant reserves, and this Consent Decree is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, any such claim shall not include a claim for any damages caused, in whole or in part, by the act or omission of any person, including any contractor, who is not a federal employee as that term is defined in 28 U.S.C. § 2671; nor shall any such claim include a claim based on EPA's selection of response actions, or the oversight or approval of the Settling Defendant's plans or activities. The foregoing applies only to claims which are brought pursuant to any statute other than CERCLA and for which the waiver of sovereign immunity is found in a statute other than CERCLA.

86. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

87. Settling Defendant agrees not to assert any claims and to waive all claims or causes of action that it may have for all matters relating to the Site, including for contribution, against any person where the person's liability to Settling Defendant with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or

treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if:

a. the materials contributed by such person to the Site containing hazardous substances did not exceed the greater of (i) 0.002% of the total volume of waste at the Site, or (ii) 110 gallons of liquid materials or 200 pounds of solid materials.

b. This waiver shall not apply to any claim or cause of action against any person meeting the above criteria if EPA has determined that the materials contributed to the Site by such person contributed or could contribute significantly to the costs of response at the Site. This waiver also shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant may have against any person if such person asserts a claim or cause of action relating to the Site against such Settling Defendant.

XXIII. EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION

88. Except as provided in Paragraph 87 (Waiver of Claims Against De Micromis Parties) nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. The preceding sentence shall not be construed to waive or nullify any rights that any person not a signatory to this decree may have under applicable law. Except as provided in Paragraph 87 (Waiver of Claims Against De Micromis Parties), each of the Parties expressly reserves any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

89. The Parties agree, and by entering this Consent Decree this Court finds, that the Settling Defendant are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by CERCLA Section 113(f)(2), 42 U.S.C. § 9613(f)(2) for matters addressed in this Consent Decree. For purposes of this Consent Decree, "matters addressed" shall include liability for the Site, the Work and Past and Future Response Costs.

90. The Settling Defendant agrees that with respect to any suit or claim for contribution brought by it for matters related to this Consent Decree it will notify the United States and the State in writing no later than 60 days prior to the initiation of such suit or claim.

91. The Settling Defendant also agrees that with respect to any suit or claim for contribution brought against it for matters related to this Consent Decree it will notify in writing the United States and the State within 10 days of service of the complaint on Settling Defendant. In addition, Settling Defendant shall notify the United States and the State within 10 days of service or receipt of any Motion for Summary Judgment and within 10 days of receipt of any order from a court setting a case for trial.

92. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendant shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant

case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXI (Covenants Not to Sue by Plaintiffs).

XXIV. ACCESS TO INFORMATION

93. Settling Defendant shall provide to EPA and the State, upon request, copies of all documents and information within its possession or control or that of its contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Settling Defendant shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

94. Business Confidential and Privileged Documents.

a. Settling Defendant may assert business confidentiality claims covering part or all of the documents or information submitted to Plaintiffs under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA and the State, or if EPA has notified Settling Defendant that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such documents or information without further notice to Settling Defendant.

b. The Settling Defendant may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendant asserts such a privilege in lieu of providing documents, it shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the contents of the document, record, or information: and (6) the privilege asserted by Settling Defendant. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

95. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXV. RETENTION OF RECORDS

96. Until 10 years after the Settling Defendant's receipt of EPA's notification pursuant to Paragraph 43.b of Section XIV (Certification of Completion of the Work), each Settling Defendant shall preserve and retain all non-identical copies of records and documents (including records or documents in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to its liability under CERCLA with respect to the

Site, provided, however, that the Settling Defendant, for property which it owns within the Site, Site must retain, in addition, all documents and records that relate to the liability of any other person under CERCLA with respect to the Site. Each Settling Defendant must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any documents or records (including documents or records in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work, provided, however, that each Settling Defendant (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned documents required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

97. At the conclusion of this document retention period, Settling Defendant shall notify the United States and the State at least 90 days prior to the destruction of any such records or documents, and, upon request by the United States or the State, Settling Defendant shall deliver any such records or documents to EPA or the State. The Settling Defendant may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendant asserts such a privilege, it shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by Settling Defendant. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

98. Settling Defendant hereby certifies that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA requests for information pursuant to Section 104(e) and 122(e) of CERCLA, 42 U.S.C. 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. 6927.

XXVI. NOTICES AND SUBMISSIONS

99. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State, and the Settling Defendant, respectively.

As to the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DJ # 90-11-3-138/7

and

As to EPA:

Victor Ketellapper - EPR-SR
EPA Project Coordinator
United States Environmental Protection Agency
Region 8
999 18th St., Suite 300
Denver, CO 80202

As to the Regional Financial Management Office:

Cheryl Presley, TMS-F
U.S. EPA
999 18th St., Suite 300
Denver, CO 80202

As to the State:

Barbara O'Grady
State Project Coordinator
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive, South
Denver, CO 80246

As to the Settling Defendant:

Robert Litle
Asarco, Incorporated
495 E. 51st Ave.
Denver, CO 80216

XXVII. EFFECTIVE DATE

100. The effective date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court, except as otherwise provided herein.

XXVIII. RETENTION OF JURISDICTION

101. This Court retains jurisdiction over both the subject matter of this Consent Decree and the Settling Defendant for the duration of the performance of the terms and provisions of this

Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XIX (Dispute Resolution) hereof.

XXIX. APPENDICES

102. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is the Environmental Covenant.

"Appendix B" is the ROD.

"Appendix C" is the remedial design plans.

"Appendix D" is the Remedial Action Work Plan.

"Appendix E" is the QAPP.

XXX. COMMUNITY RELATIONS

103. Settling Defendant shall propose to EPA and the State its participation in the community relations plan to be developed by EPA. EPA will determine the appropriate role for the Settling Defendant under the Plan. Settling Defendant shall also cooperate with EPA and the State in providing information regarding the Work to the public. As requested by EPA or the State, Settling Defendant shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA or the State to explain activities at or relating to the Site.

XXXI. MODIFICATION

104. Schedules specified in this Consent Decree for completion of the Work may be modified by agreement of EPA, after consultation with the State, and the Settling Defendant. All such modifications shall be made in writing.

105. Nothing in this Decree shall be deemed to alter the Court's power to enforce, supervise or approve modifications to this Consent Decree.

XXXII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

106. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendant consents to the entry of this Consent Decree without further notice.

107. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXXIII. SIGNATORIES/SERVICE

108. Each undersigned representative of Settling Defendant to this Consent Decree and the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

109. Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified the Settling Defendant in writing that it no longer supports entry of the Consent Decree.

110. Settling Defendant shall identify, on the attached signature page, the name, address and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendant hereby agrees to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. The parties agree that Settling Defendant need not file an answer to the complaint in this action unless or until the court expressly declines to enter this Consent Decree.

XXXIV. FINAL JUDGMENT

126. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the parties with respect to the settlement embodied in the Consent Decree. The parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Consent Decree.

127. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States and the Settling Defendant. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS __ DAY OF _____, 2004.

_____

United States District Judge

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States and the State of Colorado v. ASARCO Incorporated, relating to OU#1 of the Vasquez Boulevard/ I-70 Superfund Site.

FOR THE UNITED STATES OF AMERICA

10/1/04
Date

Kelly A. Johnson
Principal Deputy Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

10/1/04
Date

John C. Cruden
Deputy Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

10/1/04
Date

Robert R. Homiak
Environmental Enforcement Section
Environment and Natural Resources Division
999 18th St., Suite 945
Denver, CO 80202

10/1/04
Date

Stephen D. Taylor
Assistant United States Attorney
District of Colorado
U.S. Department of Justice
1225 17th St., Suite 700
Denver, CO 80202

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States and the State of Colorado v. ASARCO Incorporated, relating to OU#1 of the Vasquez Boulevard/ I-70 Superfund Site.

8/12/2004
Date

Carol Rushin, Assistant Regional Administrator
Office of Enforcement,Compliance
and Environmental Justice, Region 8
U.S. Environmental Protection Agency
999 18th St, Suite 300
Denver, CO 80202

8/12/2004
Date

Matthew Cohn
Legal Enforcement Program
U.S. Environmental Protection Agency
Region 8
999 18th St, Suite 300
Denver, CO 80202

FOR THE STATE OF COLORADO

Date

Alan J. Gilbert
Solicitor General
Colorado Attorney General's Office
1525 Sherman Street
Denver, CO 80203

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States and the State of Colorado v. ASARCO Incorporated, relating to OU#1 of the Vasquez Boulevard/ I-70 Superfund Site.

Date

Carol Rushin, Assistant Regional Administrator
Office of Enforcement,Compliance
and Environmental Justice, Region 8
U.S. Environmental Protection Agency
999 18th St, Suite 300
Denver, CO 80202

Date

Matthew Cohn
Legal Enforcement Program
U.S. Environmental Protection Agency
Region 8
999 18th St, Suite 300
Denver, CO 80202

September 13, 2004
Date

FOR THE STATE OF COLORADO

Alan J. Gilbert
Solicitor General
Colorado Attorney General's Office
1525 Sherman Street
Denver, CO 80203

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States and the State of Colorado v. ASARCO Incorporated, relating to OU#1 of the Vasquez Boulevard/ I-70 Superfund Site.

FOR ASARCO Incorporated

8-9-04
Date

D. E McAllister
Douglas E. McAllister
Vice President, General Counsel and Secretary
Asarco, Incorporated
2575 E. Camelback Road, Suite 500
Phoenix, AZ 85016

8-10-04
Date

T. L. Aldrich
Thomas L. Aldrich
Vice President, Environmental Affairs
Asarco, Incorporated
2575 E. Camelback Road, Suite 500
Phoenix, AZ 85016

Agent Authorized to Accept Service on Behalf of Above-signed Party:

The Corporation Company
1675 Broadway
Denver, CO 80201

This property is subject to an Environmental Covenant held by the Colorado Department of Public Health and Environment pursuant to section 25-15-321, C.R.S.

ENVIRONMENTAL COVENANT

ASARCO Incorporated ("Asarco") grants an Environmental Covenant ("Covenant") this 4th day of October, 2004 to the Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and the Environment ("the Department") pursuant to § 25-15-321 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq*. The Department's address is 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

WHEREAS, Asarco is the owner of certain property commonly referred to as The Globe Plant, located at 495 E. 51st Ave., Denver, Colorado 80216, more particularly described in Attachment A, attached hereto and incorporated herein by reference as though fully set forth (hereinafter referred to as "the Property"); and WHEREAS, pursuant to the Consent Decree lodged in the United States District Court for the District of Colorado on October 6, 2004 pursuant to United States of America and State of Colorado v. Asarco, Inc. Civil Action No. _____, the Property is the subject of enforcement and remedial action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9601, et seq. ("CERCLA"); and

WHEREAS, the purpose of this Covenant is to ensure protection of human health and the environment by restricting uses that are not compatible with soil remediation levels at the Globe Plant; and

WHEREAS, Asarco desires to subject the Property to certain covenants and restrictions as provided in Article 15 of Title 25, Colorado Revised Statutes, which covenants and restrictions shall burden the Property and bind Asarco, its heirs, successors, assigns, and any grantees of the Property, their heirs, successors, assigns and grantees, and any users of the Property, for the benefit of the Department.

NOW, THEREFORE, Asarco hereby grants this Environmental Covenant to the Department, and declares that the Property as described in Attachment A shall hereinafter be bound by, held, sold, and conveyed subject to the following requirements set forth in paragraph 1 below, which shall run with the Property in perpetuity and be binding on Asarco and all parties having any right, title or interest in the Property, or any part thereof, their heirs, successors and assigns, and any persons using the land. As used in this Environmental Covenant, the term "Owner" means the record owner of the Property and, if any, any other person or entity otherwise legally authorized to make decisions regarding the transfer of the Property or placement of encumbrances on the Property, other than by the exercise of eminent domain, and any heirs, successors and assigns thereof.

1. Environmental Protection Covenant - Use Restrictions:

a. The use of the property for residential purposes or to raise crops or livestock is prohibited;

b. The use of the property for child or animal day care facilities, including child or animal day camps and educational facilities, is prohibited;

c. Except for remediation purposes, any use or extraction of any groundwater, including the unconfined, alluvial aquifer, is prohibited;

d. Any excavation into the cover of the Former Neutralization Pond or construction of structures on the Former Neutralization Pond is prohibited;

e. Any excavation, grading, construction, drilling, digging, or any other activity that may damage the integrity of the soil cap at the Plant Site Operable Unit ("Cap") is prohibited without the submission and approval by the Department of a plan for the management and disposition of disturbed and contaminated materials. Any damage to the integrity of the Cap will be followed by repair of the Cap so that the repaired Cap consists of at least 12 inches of borrow soils meeting specifications approved by the Department and a vegetative cover or two inches of asphalt or other durable cover;

f. Except as permitted in paragraph e, any activity that will impair the effectiveness of the remedy is prohibited, including any activity that will interfere with groundwater extraction and remediation.

2. Purpose of this covenant: The purpose of this Covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituents, and/or solid waste that remains on the Property.

3. Modifications: This Covenant runs with the land and is perpetual, unless modified or terminated pursuant to this paragraph. Owner or its successors and assigns may request that the Department approve a modification or termination of the Covenant. The request shall contain information showing that the proposed modification or termination shall, if implemented, ensure protection of human health and the environment. The Department shall review any submitted information, and may request additional information. If the Department determines that the proposal to modify or terminate the Covenant will ensure protection of human health and the environment, it shall approve the proposal. No modification or termination of this Covenant shall be effective unless the Department has approved such modification or termination in writing. Information to support a request for modification or termination may include one or more of the following:

a) a proposal to perform additional remedial work;
b) new information regarding the risks posed by the residual contamination;
c) information demonstrating that residual contamination has diminished;
d) information demonstrating that the proposed modification would not adversely impact the remedy and is protective of human health and the environment; and other appropriate supporting information.

4. Conveyances: Owner shall notify the Department at least fifteen (15) days in advance of any proposed grant, transfer or conveyance of any interest in any or all of the Property. Owner agrees to incorporate either in full or by reference the restrictions of this Covenant in any leases, licenses, or other instruments granting a right to use the Property. No owner of the Property shall have any responsibility or liability under this Covenant for obligations required, arising, or occurring from the actions of others after that owner's conveyance or transfer of all of its interests in the Property. Nothing in this paragraph shall alter or impair Asarco's liability under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601, et. seq., the Resource Conservation and Recovery Act, 42 U.S.C. § 6901, et. seq., the Colorado Hazardous Waste Act, § 25-15-101, et. seq., or any judicial or administrative order issued pursuant to any of the foregoing.

5. Notification for proposed construction and land use: Owner shall notify the Department simultaneously when submitting any application to a local government for a building permit or change in land use.

6. Inspections: The Department shall have the right of entry to the Property at reasonable times with prior notice for the purpose of determining compliance with the terms of this Covenant. Nothing in this Covenant shall impair any other authority the Department may otherwise have to enter and inspect the Property.

7. No Liability: The Department does not acquire any liability under State law by virtue of accepting this Covenant.

8. Enforcement: The Department may enforce the terms of this Covenant pursuant to §25-15-322. C.R.S. Asarco and any Owner may file suit in district court to enjoin actual or threatened violations of this Covenant.

9. Owner's Compliance Certification: Owner shall submit an annual Report to the Department, on the anniversary of the date this Covenant was signed by Asarco, detailing Owner's compliance, and any lack of compliance, with the terms of this Covenant during the period of its ownership.

10. Notices: Any document or communication required under this Covenant shall be sent or directed to:

Hazardous Waste Corrective Action Unit Leader
Hazardous Materials and Waste Management Leader
Colorado Department of Public Health and the Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Asarco has caused this instrument to be executed this 4th day of October, 2004.

By: Thomas L. Aldrich

Title: Vice President - Environmental Affairs

By: Gary A. Miller

Title: Vice President - Commercial

STATE OF ARIZONA)
) ss:
COUNTY OF MARICOPA)

The foregoing instrument was acknowledged before me this 4th day of October, 2004 by Thomas L. Aldrich and Gary A. Miller on behalf of Asarco.

Michelle Pechan
Notary Public

14582 W. Hillside St.
Address
Goodyear, AZ 85338

My commission expires: 06-13-2007

MICHELLE PECHAN
Notary Public - Arizona
Maricopa County
My Comm. Expires Jun 13, 2007

Accepted by the Colorado Department of Public Health and Environment this 4th day of October, 2004.

By: Gary W. Baughman

Title: Director, HMWMD

STATE OF COLORADO)
) ss:
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 4 day of OCTOBER, 2004 by GARY BAUGHMAN on behalf of the Colorado Department of Public Health and Environment.

Claudia M. Ferris
Notary Public

4300 CHERRY CREEK DR SO
Address
DENVER, CO 80246

My commission expires: October 21, 2007

ATTACHMENT A

LEGAL DESCRIPTION AS SURVEYED:

A PARCEL OF LAND LOCATED IN THE EAST ONE HALF OF SECTION 15, TOWNSHIP 3 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTIES OF ADAMS AND DENVER, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION 15, AND CONSIDERING THE EAST LINE OF SAID NORTHEAST QUARTER TO BEAR N. 00°16'06" E.;
THENCE S. 89°56'46" W. ALONG THE SOUTH LINE OF SAID NORTHEAST QUARTER OF SAID SECTION 15, A DISTANCE OF 60.00 FEET TO THE POINT OF BEGINNING;
THENCE S. 00°15'30" W. PARALLEL WITH AND 60 FEET FROM THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 15, A DISTANCE OF 465.87 FEET;
THENCE N 89°57'05" W. PARALLEL WITH AND 200 FEET FROM THE SOUTH LINE OF THE NORTH ONE HALF OF SAID NORTHEAST QUARTER OF THE SOUTHEAST QUARTER, A DISTANCE OF 125.00 FEET;
THENCE S 00°15'30" W. PARALLEL WITH AND 185 FEET FROM THE EAST LINE OF SAID NORTHEAST QUARTER OF THE SOUTHEAST QUARTER, A DISTANCE OF 170.00 FEET;
THENCE N. 89°57'05" W. PARALLEL WITH AND 30 FEET FROM THE SOUTH LINE OF THE NORTH ONE HALF OF SAID NORTHEAST QUARTER OF THE SOUTHEAST QUARTER, A DISTANCE OF 950.09 FEET TO THE EASTERLY LINE OF THE FORMER COLORADO & SOUTHERN RAILROAD RIGHT-OF-WAY;
THENCE N. 04°26'02" E. ALONG SAID EASTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 635.89 FEET TO THE SOUTH LINE OF SAID NORTHEAST QUARTER OF SECTION 15;
THENCE S. 89°56'46" W. ALONG SAID SOUTH LINE OF SAID NORTHEAST QUARTER, A DISTANCE OF 17.92 FEET TO THE SOUTHEAST CORNER OF TRACT "C", AS SHOWN UPON THE PLAT OF COLORADO & SOUTHERN GLOBEVILLE INDUSTRIAL SUBDIVISION, RECORDED IN FILE 14, MAP 409, ADAMS COUNTY RECORDS;
THENCE ALONG THE EASTERLY BOUNDARY OF SAID COLORADO & SOUTHERN GLOBEVILLE INDUSTRIAL SUBDIVISION THE FOLLOWING NINE (9) COURSES:
1. N 04°40'30" E., A DISTANCE OF 175.87 FEET;
2. N. 85°19'30" W., A DISTANCE OF 23.00 FEET;
3. ALONG THE ARC OF A CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 16°12'31" AND A RADIUS OF 1413.97 FEET, AN ARC DISTANCE OF 400.00 FEET, (CHORD BEARS N. 03°25'42" W., A DISTANCE OF 398.67 FEET);
4. S. 85°45'30" E., A DISTANCE OF 23.88 FEET;
5. ALONG THE ARC OF A CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 21°14'40" AND A RADIUS OF 1436.97 FEET, AN ARC DISTANCE OF 532.80 FEET, (CHORD BEARS N. 21°53'50" W., A DISTANCE OF 529.76 FEET) TO THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID NORTHEAST QUARTER;
6. N. 00°16'33" E. ALONG SAID WEST LINE OF THE SOUTHEAST QUARTER OF SAID NORTHEAST QUARTER, A DISTANCE OF 30.96 FEET;
7. ALONG THE ARC OF A CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 14°58'05" AND A RADIUS OF 1459.21 FEET, AN ARC DISTANCE OF 381.21 FEET, (CHORD BEARS N. 41°02'39" W., A DISTANCE OF 380.13 FEET);
8. ALONG THE ARC OF A CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 19°37'48" AND A RADIUS OF 1656.68 FEET, AN ARC DISTANCE OF 567.59 FEET, (CHORD BEARS N. 58°20'36" W., A DISTANCE OF 564.82 FEET);
9. N. 68°09'10" W., A DISTANCE OF 422.07 FEET TO THE SOUTHEAST CORNER OF PARCEL NO. 303, AS DESCRIBED IN DEED RECORDED IN BOOK 4798 AT PAGE 503, ADAMS COUNTY RECORDS;
THENCE N. 16°07'40" E., A DISTANCE OF 111.11 FEET TO THE NORTHEAST CORNER OF SAID PARCEL NO. 303;
THENCE N. 89°23'59" E. PARALLEL WITH AND 30 FEET FROM THE NORTH LINE OF THE SOUTH ONE HALF OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER, A DISTANCE OF 1095.48 FEET TO THE EAST LINE OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER;
THENCE N 89°23'51" E. PARALLEL WITH AND 30 FEET FROM THE NORTH LINE OF THE SOUTH ONE HALF OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER, A DISTANCE OF 1257.92 FEET;
THENCE S. 00°16'06" W. PARALLEL WITH AND 60 FEET FROM THE EAST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 15, A DISTANCE OF 1966.28 FEET, MORE OR LESS, TO THE POINT OF BEGINNING. CONTAINS 3,377,703 SQUARE FEET, OR 77.5414 ACRES, MORE OR LESS.

COPY

RECORD OF DECISION

Vasquez Boulevard/Interstate 70 Superfund Site

Operable Unit 1 Residential Soils

Environmental Protection Agency
Region 8

September 25, 2003

RECORD OF DECISION
FOR
VASQUEZ BOULEVARD/I 70 SUPERFUND SITE
OPERABLE UNIT 1, RESIDENTIAL SOILS

CITY AND COUNTY OF DENVER, COLORADO

DECLARATION

Site Name and Location

The Vasquez Boulevard and I-70 (VB/I-70) Superfund Site (Site) is comprised of approximately 4.5 square miles, located in the north-central section of the City and County of Denver, Colorado. This document represents the Record of Decision (ROD) for the Operable Unit No. 1 (Residential Soils) remedial action. Operable Unit No. 1 (OU1) encompasses four neighborhoods in north-central Denver that are largely residential: Swansea, Elyria, Clayton, and Cole. OU1 also includes the southwest portion of the Globeville neighborhood and the northern portion of the Curtis Park Neighborhood.

Statement of Basis and Purpose

This decision document presents the Selected Remedy for OU1 of the VB/I-70 Site. The remedy selected in this ROD was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The decision is based on the Administrative Record file for OU1 of the Site. The U. S. Environmental Protection Agency's (U.S. EPA) CERCLIS identification number for the Site is CO0002259588.

This document is issued by the U.S. EPA Region 8 (EPA), the lead agency, and the Colorado Department of Public Health and Environment (CDPHE). Both U.S. EPA and CDPHE concur on the Selected Remedy presented herein. The remedial action selected in this Record of Decision is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances at the Site.

Assessment of Site

The VB/I-70 Site was placed on the National Priorities List (NPL) in 1999 due to arsenic and lead contamination of soil. For the purposes of investigations and remedy development, the Site was divided into three OUs. This Record of Decision is for OU1, Off-Facility (Residential) Soils of the VB/I-70 Site. There are approximately 4,000 residential properties, 10 schools, and 7 parks within OU1. Most residences are single-family dwellings. There are some multi-family homes and apartment buildings. EPA determined that the VB/I-70 Site is an Environmental Justice (EJ) Site because the residents are predominantly low income and minority. It is also disproportionately affected by environmental impacts from many sources including industry, other Superfund sites, and major transportation corridors.

Operable Units 2 and 3 address On-Facility soil and groundwater at the Omaha & Grant Smelter and Argo Smelter sites, respectively. The structures associated with both of these smelters have been demolished and the sites have been redeveloped with commercial businesses.

Because residential properties within the VB/I-70 Site contained concentrations of arsenic or lead at levels that could present unacceptable health risks to residents with short-term exposures, in September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action. The Action Memorandum required that soil be removed and replaced at any property where the average arsenic soil levels were greater than 450 ppm and/or lead soil levels were greater than 2000 ppm. These removal "action levels" were chosen to protect young children from adverse health effects related to short term (sub-chronic) exposure. To be conservative in meeting the action levels, a 5-point composite sample was collected from the front yard and a second 5-point composite sample was collected from the back yard of each property. Any property with one or more composite samples exceeding the action levels for either arsenic or lead was identified for soil removal.

EPA proposed the VB/I-70 Site for inclusion on the NPL in January 1999. EPA added the VB/I-70 Site to the NPL on July 22, 1999 (64 Fed. Reg. 39881, July 22, 1999).

The overall Remedial Action Objective (RAO) for OU1 of the Site is to protect human health. The following OU1 specific RAOs were developed for arsenic and lead in soil:

RAOs for Arsenic in Soil

1. For all residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in an excess lifetime cancer risk associated with ingestion of soil which exceeds 1×10^{-4}, using reasonable maximum exposure assumptions.

2. For all residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in a chronic or sub-chronic hazard quotient associated with ingestion of soil which exceeds 1, using reasonable maximum exposure assumptions.

3. For children with soil pica behavior who reside in the VB/I-70 Site, reduce the potential for exposures to arsenic in soil that result in acute effects.

RAO for Lead in Soil

4. Limit exposure to lead in soil such that no more than 5 percent of young children (72 months or younger) who live within the VB/I-70 Site are at risk for blood lead levels higher than 10 micrograms per deciliter (ug/dL) from such exposure. This provides 95% confidence that children exposed to lead in soil will be protected.

Description of Selected Remedy

Six alternatives were developed and evaluated to address the arsenic and lead contamination found at OU1 of the Site. Based on the Comparative Analysis of Alternatives, the remedy selected for OU1 of the VB/I-70

Site is Alternative 6. The selected remedy consists of 3 components: a community health program; soil removal; and sampling.

The Community Health Program consists of community and individual health education, a biomonitoring program to measure urinary arsenic levels and blood lead levels of children, and a response program that includes necessary follow-up environmental sampling, home investigation, and response. The program is composed of two separate, but overlapping, elements. The first element will address risks to area children from non-soil sources of lead. The second element will be designed to address children with soil pica behavior, to reduce their risks to arsenic in soil above 47 ppm, which is the preliminary action level determined in the Baseline Human Health Risk Assessment for children with soil pica behavior. Participation in one or both elements of the program will be strictly voluntary, and there will be no charge to eligible residents and property owners for any of the services offered by the Community Health Program. The Community Health Program will be implemented on an ongoing basis until the residential soil removal portion of this remedial action has been completed.

Soil removals will occur at properties that have lead or arsenic soil concentrations greater that 70 ppm arsenic or 400 ppm lead. The action level for lead is exceeded when the average lead concentration from three composite soil samples taken from the property is greater than 400 ppm. The action level for arsenic is exceeded when the highest arsenic concentration from three composite soil samples taken from the property is greater than 70 ppm. For properties where soil removal is conducted, all accessible soils will be removed to a depth of 12 inches. The excavation areas will be backfilled with clean soil, and pre-remediation yard features restored to the extent practicable, in consultation with the property owner. All excavated soils will be transported to an acceptable receiving facility, which may include the ASARCO Globe Plant. If the VB/I-70 soils are transported to the ASARCO Globe Plant, it will be used as capping and fill material in implementing the remedy at the Globe Plant Operable Unit. If the excavated soils cannot be placed on the ASARCO Globe Plant, then they will be transported to a local solid waste landfill where the soils may be used as daily cover material.

A program of on-going soil sampling will be implemented for lead and arsenic at all residential properties within the Site that have not already been adequately tested. This sampling program will continue through the completion of the soil removal portion of this remedy.

Statutory Determinations

The Selected Remedy meets the mandates of CERCLA § 121 and the National Contingency Plan. The remedy is protective of human health and the environment. It complies with all Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy for OU1 of the VB/I-70 Site does not satisfy the statutory preference for treatment as a principal element of the remedy because the large volumes of soils contaminated with low levels of lead and arsenic can not be treated cost effectively, and treatment was not acceptable to the community.

If VB/I-70 soils are disposed of at the ASARCO Globe Plant, a 5-Year Review will be required. If the soils are disposed of off-Site, this remedy will not result in hazardous substances, pollutants, or contaminants

remaining on-Site above levels that allow for unlimited use and unrestricted exposures, and a 5-Year Review will not be required.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can by found in the Administrative Record file for this Site.

- Contaminants of concern and their respective concentrations.
- Baseline risks represented by the contaminants of concern.
- How source materials constituting principal threats are addressed.
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment.
- Potential land use that will be available at the Site as a result of the Selected Remedy.
- Estimated capital, annual operating and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factors that led to selecting the remedy.

Authorizing Signatures

Max Dodson
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region 8

9/25/03
Date

Howard Roitman
Director of Environmental Programs
Colorado Department of Public Health and Environment

9-25-03
Date

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LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COCs	Contaminant of Concern
CT	Central Tendency
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
FS	Feasibility Study
GRA	General Response Action
IEUBK	Integrated Exposure, Uptake, and Biokinetic Model
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD Reference Dose	
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
USEPA	United States Environmental Protection Agency
VB/I-70	Vasquez Boulevard and I-70

RECORD OF DECISION
FOR
VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE

1.0 DECISION SUMMARY

1.1 Site Name, Location, and Brief Description

The Vasquez Boulevard and I-70 (VB/I-70) Superfund Site (Site) comprises approximately 4.5 square miles, located in the north-central section of the City and County of Denver, Colorado. The U.S. EPA CERCLIS identification number for the VB/I-70 site is CO0002259588.

The VB/I-70 Site was placed on the NPL due to metals contamination associated with historic smelter operations. The primary contaminants of concern are lead and arsenic. Subsequent investigations indicate that arsenic contamination may also be present as a result of application of lawn care products. For the purposes of investigations and remedy development, the Site was segregated into three operable units (OUs). This Record of Decision (ROD) is for Operable Unit 1 (OU1), Off-Facility (Residential) Soils of the VB/I-70 Site. Operable Units 2 and 3 address On-Facility soils and groundwater at the Omaha & Grant Smelter and Argo Smelter sites, respectively. The structures associated with both of these smelters have been demolished and the sites have been redeveloped with commercial businesses.

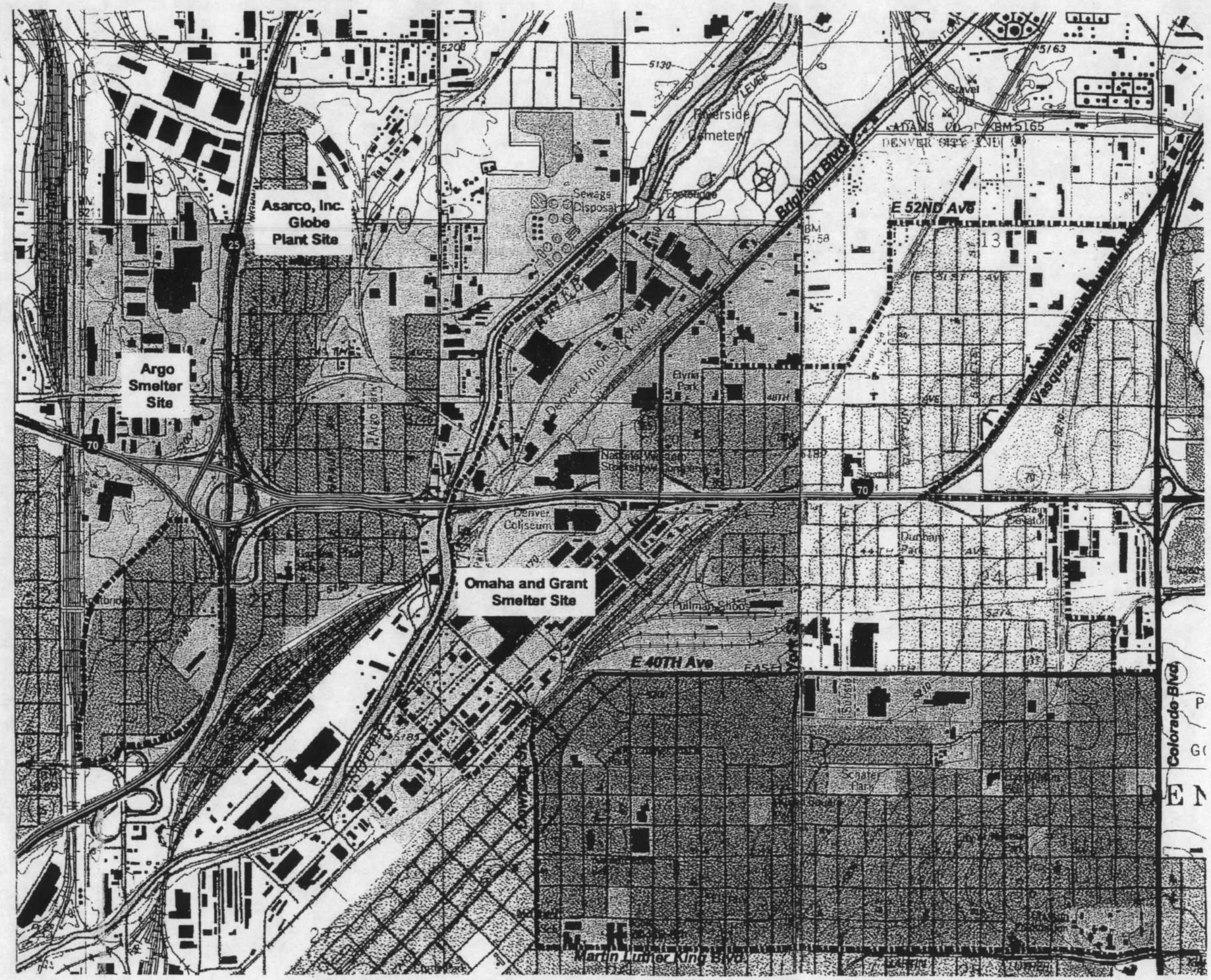
OU1 encompasses four neighborhoods in north-central Denver that are largely residential: Swansea, Elyria, Clayton, and Cole. OU1 also includes the southwest portion of the Globeville neighborhood and the northern portion of the Curtis Park Neighborhood. Figure 1 is a map of the area. There are approximately 4,000 residential properties, 10 schools, and 7 parks within OU1. Most residences are single-family dwellings. There are some multi-family homes and apartment buildings. While numerous commercial and industrial properties are also located within the Site, the levels of arsenic and lead at these properties do not appear to pose an unacceptable risk to workers in a commercial/industrial scenario based on the limited sampling that was performed.

EPA is the lead agency for this action. The Colorado Department of Public Health and Environment (CDPHE) is the support agency. It is anticipated that the clean up will be funded by EPA and CDPHE.

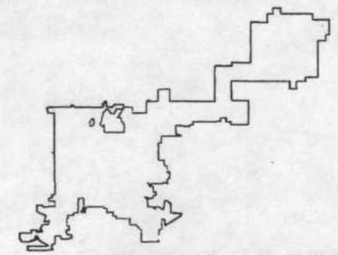
1.1.1 Environmental Justice Considerations

EPA determined that the VB/I-70 Site is an Environmental Justice (EJ) site because the residents are predominantly low income and minority. It is also disproportionately affected by environmental impacts from many sources including industry, other Superfund sites, and major transportation corridors.

According to the 2000 census, the total population living within OU1 is 17,545, including approximately 2,400 children 6 years old or younger. A higher percentage of people who identify themselves as minorities reside in VB/I-70 OU1 compared to the Denver citywide average, and average household incomes are lower in the VB/I-70 community than the average income for households in Denver citywide. Table 1 summarizes key demographic data by neighborhood.



Location of VB/I-70 Site



City and County of Denver

Washington

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Legend

- Study Area Boundary
- Stream or River

Neighborhood

- CLAYTON
- COLE
- ELYRIA
- GLOBEVILLE
- SWANSEA

Map Base:

USGS 7.5' Quadrangle
Commerce City

1,000 500 0 1,000 2,000
Feet

200 100 0 200 400 600
Meters

Vasquez Boulevard / I-70
Operable Unit 1
Remedial Investigation Report

Figure 1

Site Location

Project No: RAC 68-W7-0039 WA 004-RICO-089R
File: Q:\4994\1004\RI-FS\vbi70_site.eps

Table 1

Demographic and Economic Indicators for the Neighborhoods of VB/I-70

	Clayton	Cole	Swansea-Elyria	Globeville	Denver
Total Population	5,172	5,662	6,708	3,454	560,663
# Children under 18	1,901	1,936	2,491	1,162	129,457
# Elderly 65+	432	406	437	227	59,262
% African American	38.9%	21.3%	5.3%	2.6%	10.8%
% Native American	0.6%	0.6%	0.7%	1%	0.7%
% Asian/Pacific Islander	2.1%	0.3%	0.3%	0.8%	2.8%
% Latino	50.2%	71.0%	83.0%	77.5%	31.7%
% Non-Latino White	6.0%	6.0%	9.9%	17%	51.9%
% Persons on Public Assistance	12.2%	12.3%	7.9%	3.8%	4.6%
% Persons in Poverty	28.5%	26.3%	27.9%	23.2%	14.3%
Ave Household Income	$44,122	$38,990	$38,435	$33,148	$55,087

1.2 Site History and Enforcement Activities

This section provides a summary of the history and enforcement activities related to OU1 of the VB/I-70 Site. Since the VB/I-70 Site came to the attention of EPA following studies directed by CDPHE at the adjacent ASARCO Globe Site (CERCLIS ID # COD007063530), a short summary of how these studies lead to the discovery of the VB/I-70 Site is included.

1.2.1 The ASARCO Globe Site

EPA proposed the ASARCO Globe Site be included on the NPL in May 1993. The proposal was never finalized. The ASARCO Globe Site was used for the smelting and refining of metals and metal based chemicals. In July 1993, the State and ASARCO Incorporated entered into a consent decree to resolve a suit under CERCLA filed by the State of Colorado. As part of that settlement agreement, ASARCO was required to remediate soils in residential properties surrounding the Globe Plant where levels of cadmium, lead, and/or arsenic exceeded acceptable limits established by the State in a Record of Decision. The

State of Colorado has been the lead agency for overseeing the cleanup activities on the Globe Plant Site and in the Globeville neighborhood.

The consent decree required ASARCO to collect soil samples from residential yards in the Globeville neighborhood and continue remediation until the extent of contamination from the Globe Plant was established. In conducting the investigation, ASARCO continued to find random occurrences of elevated levels of arsenic in residential yards at greater distances from the Globe plant site.

CDPHE continued to be concerned about the possible health risks to area residents potentially exposed to arsenic in yard soils and about the extent of the problem in the north Denver area. In 1997, CDPHE began a limited soil sampling program in the Elyria and Swansea neighborhoods, located just east of Globeville, across the South Platte River. Figure 1 shows the relative locations of Globeville, Swansea, and Elyria. CDPHE collected soil samples from 25 homes. The results are summarized in Table 2.

Table 2

Yard Average Concentrations
Measured in Elyria and Swansea Properties

	# homes sampled	minimum	maximum
arsenic	25	below detection	1800 ppm
lead	25	39 ppm	754 ppm

These results indicated that high concentrations of arsenic in soil extended far beyond the Globeville neighborhood. Accordingly, CDPHE requested EPA's assistance in immediately responding to the elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods.

1.2.2 The Vasquez Boulevard/I-70 Site

In 1998, EPA's first action at the Site was to mobilize an Emergency Response team to conduct an extensive soil sampling effort and time critical removal actions for the houses posing immediate health risks to local residents.

The Emergency Response consisted of two phases. Phase I was an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties which were potential time critical removal candidates (remove and replace soil).

The boundaries of the Phase I sampling program were established as East 38th Avenue on the south, East 56th Avenue on the north, Colorado and Vasquez Boulevards on the east and the South Platte River on the west, and included the southwest portion of Globeville, the only area of Globeville not yet characterized by ASARCO.

Phase I sampling occurred during March and April 1998. A minimum of three grab samples were collected from each property where EPA obtained access, two samples from the surface and one from the subsurface. Soil samples were also collected from all schools and parks located within the initial study

area. Samples were collected from locations judged to present a high potential for exposure relative to other areas of the property (for example, at bare spots within the yard) and were analyzed for arsenic, lead, cadmium and zinc.

In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action. The Action Memorandum required that soil be removed and replaced at any property with an average arsenic soil level greater than 450 ppm and/or lead soil levels greater than 2000 ppm. These removal "action levels" were chosen to protect young children from adverse health effects related to short-term (sub-chronic) exposure. From the Phase I data, 37 properties were identified as potentially requiring time critical removal action. The Phase II sampling occurred in July and August 1998. Additional soil samples were collected from any residential property that had a maximum surface soil concentration equal to or greater than 450 ppm for arsenic or 2000 ppm for lead, i.e., the removal action candidates. These residential properties were revisited and a 5-point composite sample was collected from the front yard and a second 5-point composite sample was collected from the back yard of each. Arsenic and lead levels in these samples were measured. Any property with one or more composite samples exceeding the removal action levels for either arsenic or lead was identified for soil removal. Also in Phase II, the On Scene Coordinator extended the Site boundaries south to East 35th Avenue, encompassing a greater portion of the Cole and Clayton neighborhoods. Properties not sampled during Phase I were targeted for screening level sampling using the Phase I protocols. In all, 1,393 properties were sampled as part of the Phase I and II programs. Twenty-one additional properties were identified for time critical removal actions as a result of the Phase II sampling event. Removals were completed at 18 of these properties where EPA obtained access. The schools and parks sampled had very low levels of arsenic and lead and did not require removal and replacement of their soil.

Based on the results of the Phase I and Phase II sampling programs, EPA determined that residential properties within the VB/I-70 Site contained concentrations of arsenic or lead at levels that could present unacceptable health risks to residents with long term exposures. On this basis, the EPA proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for long-term response, EPA began Phase III remedial investigation activities in August 1998 as removal activities were underway.

During the public comment period on the proposed NPL listing of the VB/I-70 Site, ASARCO submitted information indicating that the source of the arsenic in residential soil may be lawn care products that were readily available for residential use in the Rocky Mountain Region and elsewhere in the west in the 1950s and 1960s. These products were legally formulated with arsenic trioxide and lead arsenate to be effective in controlling crabgrass. The specific product identified by ASARCO was "PAX 3- year Crabgrass Control," available from the 1950's until the early 1970's, and formulated with 27% arsenic trioxide and 8% lead arsenic oxide. The product is no longer available commercially.

In order to assess ASARCO's arguments, EPA's Phase III remedial investigation activities were focused on collecting all the information necessary to accurately characterize exposure and risk to residents at the VB/I-70 Site to support a quantitative baseline human health risk assessment. Secondly, efforts began to investigate the source of the arsenic and lead in residential soils. Toward that end, EPA used its CERCLA Section 104(e) information gathering authority to acquire a 6-ounce sample of the "PAX 3-year

Crabgrass Control" product from Martin Resources, a company that acquired the company that had manufactured PAX. Tests on the PAX sample formulation provided by Martin Resources were helpful to EPA, but by themselves proved inconclusive to determine whether all arsenic and lead found in the VB/I-70 residential soils were from pesticides or smelter emissions, or both.

On March 6, 2003, EPA issued an Action Memorandum that established the basis for conducting a non-time critical removal action. The Action Memorandum required that soil be removed and replaced at any property that had an arsenic soil level greater than 240 ppm and/or lead soil levels greater than 540 ppm based on the Phase III sampling results. These "action levels" were chosen to address the properties that present the highest risk of adverse health effects to children and adult residents. From the Phase II sampling results, 143 properties were identified as requiring a non-time critical removal action. This removal action is scheduled to be completed in the Fall of 2003.

1.2.3 Enforcement Activities

EPA Region 8 conducted a PRP Search for the Site to identify the current property owners and past owners and operators. EPA identified ASARCO Incorporated as the primary operator of 2 of the 3 smelters historically located in the general area of the VB/I-70 Site - the Globe Smelter and the Omaha & Grant Smelter. The City and County of Denver was also identified as a current owner and a past owner/operator of most of the property located within OU2 of the Site. Other current owners or past owner/operators of the property located within OU2 of the Site include Pepsi Bottling Group, Union Pacific Railroad, and the Forney Museum. ASARCO, the City and County of Denver, Pepsi and Union Pacific all received and responded to CERCLA Section 104(e) information requests.

Preliminary information gathered to date indicates that only ASARCO may be liable for the lead contamination found in OU1 of the Site. However, ASARCO has argued that the arsenic requiring remediation came from sources other than smelter emissions. Based on the liability arguments and on ASARCO's competing environmental and financial obligations for sites nationwide where ASARCO is a PRP, the Region decided not to issue an Order to ASARCO to perform the cleanup of OU1 of the Site.

1.3 Community Participation

Due to the high degree of public interest, the large population impacted by OU1, and the cultural differences among the communities, community involvement was expanded to provide for extensive public input throughout the Remedial Investigation and Feasibility Study and Remedy Selection process. Expanded public involvement included development of a Community Involvement Plan, establishment of a stakeholders working group, providing a technical assistance grant, and additional public meetings and fact sheet mailings. A summary of each of these activities is included in this section.

In August 1998, EPA formed a Working Group of stakeholders to provide an open forum for discussing all technical aspects of EPA's investigation, including the risk assessment and eventual cleanup alternatives. The Working Group addressed the Environmental Justice concern of having the community participate in decision making by providing direct access to decision makers. Through the Working Group, data and issues were discussed, allowing for community input into decision making throughout the development and implementation of the remedial investigations, risk assessment, feasibility study, and remedial alternatives.

The Working Group has met monthly since August 1998. EPA also provided Site updates at neighborhood association meetings periodically during the Remedial Investigation/Feasibility Study.

The stakeholders attending the Working Group meetings include representatives from all parties that have an interest in OU1 of the VB/I-70 Site. The Working Group is comprised of representatives of the City and County of Denver; CDPHE; the Agency for Toxic Substances and Disease Registry (ATSDR); ASARCO; and the Clayton, Elyria, and Swansea Environmental Coalition (CEASE), the recipient of a Technical Assistance Grant from EPA. Stakeholders also included other representatives from the four Denver neighborhoods included in OU1. Each neighborhood has its own unique ethnic and racial characteristics; two are predominately Hispanic, and two are mixed Hispanic and African-American.

The VB/I-70 Site has been of interest to local, State and Federal elected officials including the Mayor of Denver, City Council members, State legislators, Congresswoman Diana DeGette and Senator Wayne Allard. These officials or their representatives were invited and often attended Working Group meetings. In addition, individual briefings were provided to these officials or their respective staffs.

Since much of the population living within the Site boundaries is Spanish speaking, outreach materials including the proposed plan, fact sheets, and flyers were translated into Spanish. Public notices were translated into Spanish as well and published in local Spanish newspapers. For major public meetings and workshops, simultaneous translations were provided so that all participants could understand the presentations and ask questions. For small group meetings, the translator sat with those who spoke only Spanish.

The following fact sheets and fliers were prepared and mailed to the community:

DATE	DESCRIPTION	
February 1999	Fact Sheet #1	Public Comment Period Begins on the Proposed NPL
April 1999	Fact Sheet #2	Some Facts About Soil Sampling
June 1999	Fact Sheet #3	Why is the EPA in Cole & Clayton
September 1999	Fact Sheet #4	Learn More about Risk Assessment
September 2000	Fact Sheet #5	Risk Assessment for the VBI70 Site
October 2000	Fact Sheet #6	Soil Sampling Results
May 2001	Fact Sheet #7	Neighborhood Update on Arsenic and Lead in Soil
March 2003	Update	Arsenic and Lead Cleanup in Your Neighborhood
No date	General	Arsenic Fact Sheet for VB/I-70
No date	General	Lead Fact Sheet for VB/I-70

In addition to the working group meetings, the following public meetings were held:

DATE	DESCRIPTION
July 16, 1998	Availability Session on Soil Sampling and Cleanup
September 1, 1998	Meeting to Discuss Removal Process
September 25, 1998	Informational Meeting on Soil Sampling and Cleanup
October 8, 1998	Informational Meeting on Soil Sampling Cleanup
March 10, 1999	Public Meeting on NPL Proposal
September 22, 1999	Open House on the Risk Assessment

September 28, 1999	Open House on the Risk Assessment
February 22, 2000	Public Meeting on Soil Sampling Results
September 26, 2000	Public Meeting on Soil Sampling and Cleanup
September 27, 2000	Public Meeting on Soil Sampling and Cleanup
June 20, 2002	Public Meeting on Proposed Plan
June 22, 2002	Public Meeting on Proposed Plan
June 29, 2002	Public Meeting on Proposed Plan
June 19, 2003	Public Meeting on Revised Proposed Plan
June 21, 2003	Public Meeting on Revised Proposed Plan

In addition to publishing the fact sheets and conducting the meetings, EPA has made the VB/I-70 Site Administrative Record available to the public at three repositories located within the Site boundaries as well as the EPA's Region 8 Superfund Records Center.

1.4 Scope and Role of Operable Unit

In order to manage the Site effectively, the remedial program organized the VB/I-70 Site into 3 operable units (OUs). Separate investigations have been or are being conducted, and separate remedies will be selected for each OU. The OUs are:

> Operable Unit 1 (OU1) is defined as residential yards within the study area with levels of lead or arsenic in soil that present an unacceptable risk to human health. EPA's highest priority at VB/I-70 Site is OU1 because there is the highest potential for human exposure to contaminants of concern located in the residential yards. EPA is the lead agency for remedial response activities at OU1, and response activities have been and will be financed by the Superfund.
>
> Operable Unit 2 (OU2) is defined as the location of the former Omaha & Grant Smelter and includes all environmental media impacted by releases of hazardous substances that resulted from the operation of that smelter. This is EPA's second priority for the VB/I-70 Site since the Omaha & Grant Smelter was located historically on the property now home to the Denver Coliseum and other businesses. The majority of the OU2 area is paved and has been extensively redeveloped since the smelter stopped operating. Contamination is likely limited to subsurface and groundwater impacts.
>
> Operable Unit 3 (OU3) is defined as the location of the former Argo Smelter and includes all environmental media impacted by releases of hazardous substances from that smelter. OU3 is EPA's third priority in the VB/I-70 Site. EPA will be the lead agency for remedial response activities at OU3 and it is expected that response activities will be financed by the Superfund.

Each operable unit has a unique physical location and historic operation. Thus, actions taken at one operable unit can be taken independently of actions at other portions of the Site, or can be taken in conjunction with each other, if appropriate. This is the first record of decision for the VB/I-70 Site.

There have been several removal actions taken at OU1. These actions have been taken to address residential yards that pose the highest potential human health risk due to elevated levels of arsenic and

lead. This Record of Decision selects the long-term clean up approach for residential soils and selects soil clean up levels for lead and arsenic.

1.5 Site Characteristics

OU1 of the VB/I-70 Site encompasses 4.5 square miles in north-central Denver that are largely residential. OU1 includes the Denver neighborhoods of Swansea, Elyria, Clayton, Cole, southwest portion of Globeville, the northern portion of the Curtis Park. OU1 is narrowly defined as only those residential yards within the site boundaries with levels of lead or arsenic in soil present at concentrations greater than the cleanup levels established in this Record of Decision. While numerous commercial and industrial properties are also located with OU1, these properties are not considered to be part of the OU1 of the VB/I-70 Site. The only commercial properties considered to be included in the VB/I-70 site are those properties included in Operable Units 2 and 3.

The Remedial Investigation was performed to further support the baseline risk assessment and remedial risk management decisions. The data from Removal Investigations Phases I and II were judged to be too limited to be the basis of broader remedial decisions. More specifically, many samples had elevated detection limits for arsenic, the sampling density at each property was too low, and/or sampling locations were not clearly identified. Three investigations were performed between 1998 and 2000 in support of the Remedial Investigation. These investigations were:

- Physico-Chemical Characterization Study.
- Residential Risk Based Sampling Investigation.
- Phase III Field Investigation.

Data generated from these investigations are reported in the Remedial Investigation report. The key findings are as follows:

- Arsenic and lead are the contaminants of concern in residential soils.
- Generally, concentrations of arsenic and lead are highest in the first two inches of soil and decrease with depth.
- The majority of properties have low levels of arsenic. Thirty-one percent of the properties have the 95% upper confidence of the mean being either below the method detection limit of 11 ppm or near the method detection limit.
- Ninety-one percent of the properties contain mean lead concentrations below the EPA screening level for lead in soil of 400 ppm.
- The most frequently observed property mean concentrations of lead are in the range of 100 -150 ppm.
- Levels of arsenic in the bulk versus fine soil fractions are nearly equal, while lead is slightly higher in the fine fraction.
- Concentrations of arsenic and lead in indoor dust and garden vegetables remain relatively consistent over a wide range of yard soil concentrations.
- Mean arsenic concentrations in surface soils at school and parks range from below the method detection

limit of 11 ppm to 26 ppm. The mean lead concentrations range from 67 ppm to 256 ppm.

- The average background levels of arsenic ranges from 8 ppm to 15 ppm.
- The mean background level of lead in soil is approximately 195 ppm.
- The sources of elevated levels of lead and arsenic in residential soils are likely a combination of historic smelter smokestack emissions, lawn care products, and other industrial sources.
- Lead paint was detected at most locations where paint was sampled. The data suggests that interior and/or exterior leaded paint might be a source of lead exposure in area children, either directly (by paint chip ingestion), or indirectly (by ingestion of dust or soil containing paint chips).

The remainder of this section provides a summary of the purpose, design and results of the studies conducted as part of the Remedial Investigation.

1.5.1 Physico-Chemical Characterization Study and the Residential Risk Based Sampling Investigation

The Physico-Chemical Characterization Study, implemented in August 1998, conducted analyses on existing Phase I and Phase II soil samples to generate supplementary data on the relationship between:

- concentrations of metals in the bulk and fine soil fractions;
- the chemical forms of arsenic and lead (speciation);
- particle sizes; and
- the *in vitro* bioaccessibility of arsenic and lead in site soils.

The Residential Risk Based Sampling Program was conducted prior to soil excavation at properties planned for time critical removal action. The selected properties were intensively sampled by collecting 150 - 200 individual samples in the yards. Yards adjacent to the selected properties were also sampled to determine if there is a limit to the contamination at the property boundary. The program also included:

- collection of indoor household dust;
- collection of attic dust;
- collection of tap water;
- analysis of exterior and interior paint; and
- collection of garden vegetables and garden soils.

In addition, EPA established a voluntary biomonitoring service for all families whose yards were undergoing the removal actions. Any family member could have hair or urine tested for arsenic levels and/or blood lead levels tested.

The Physico-Chemical Characterization Study and the Risk Based Sampling Program generated these important findings:

- Nearly all the arsenic mass in soils is present as arsenic trioxide with a contribution from lead arsenic oxide.
- Lead occurs in several phases, including lead arsenic oxide, lead phosphate, and lead manganese oxide, which indicate that the source of lead is different from the source of arsenic.
- Concentrations of metals are about 10%-20% higher in the fine fraction of soil compared to the bulk fraction.
- Arsenic bearing particles are predominantly small-sized, between <5 and 49 micrometers (um).
- The majority of lead bearing particles are also small, between <5 um and 49 um, although lead is

consistently found in particles between 50 um and 149 um in size.

- The relative percent bioaccessibility ranges between 3% and 26% for arsenic and 64% and 83% for lead.
- There does not appear to be a significant contribution from outdoor soils to the levels of arsenic and lead in indoor dust.
- Lead was detected in paint at most locations where paint was sampled, with 130 out of 144 samples having values above 1 mg/cm^2. These data suggest that interior and/or exterior leaded paint might be a source of lead exposure in area children, either directly (by paint chip ingestion), or indirectly (by ingestion of dust or soil containing paint chips).
- The intensive soil sampling revealed that at properties with the highest concentrations of arsenic and lead, the contamination is distributed across the yard area, with a fairly clear boundary between the affected property and the adjacent property. Also, metals concentrations are highest in the first two inches of soil and decrease with depth.
- The *in-vitro* bioaccessibility results indicated that animal studies to investigate the relative bioavailability of lead and arsenic in soils at VB/I-70 OU1 were warranted.
- The biomonitoring results indicated that all blood lead results were below the benchmark value of 10 ug/dL, arsenic was not detected in any sample of urine, and arsenic was below the level of detection in 14 of 15 hair samples. In the one sample which was detected, the concentration (0.41 ug/g) was within the normal range.

1.5.2 The Phase III Remedial Investigation

The overall objectives of the Phase III Remedial Investigation were to:

1. Collect sufficient data to support a quantitative baseline human health risk assessment which would provide the basis for risk management decisions; and
2. Collect sufficient data to define the nature and extent of contamination.

The Phase III investigation was designed specifically to support quantitative risk calculations. Thus, the design of the Phase III investigation began with the development of the Site conceptual model, identification of important exposure pathways, and selection of contaminants of concern.

1.5.2.1 *Selection of Chemicals of Concern*

Data collected during Phase I and Phase II clearly indicated that arsenic and lead were both contaminants of potential concern at the VB/I-70 Site. However, no systematic evaluation had been performed to determine whether or not any other contaminants might also be of potential concern. A careful review of available data was undertaken to determine if other contaminants should be considered as contaminants of concern. The review followed EPA guidance contained in "Risk Assessment Guidance for Superfund: Human Health Evaluation Manual (Part A)" (EPA 1989). Based on the review, the contaminants of concern identified for quantitative evaluation at OU1 are arsenic and lead. All other contaminants detected in soils in OU1 are either not of concern or are present at levels that contribute minimal risk compared to arsenic and lead.

1.5.2.2 *Development of the Site Conceptual Model*

A Site Conceptual Model for OU1 showing the potential sources, release mechanisms, and main pathways by which contaminants in surface soil may come into contact with area residents was developed and is

shown in Figure 2. The Site Conceptual Model for OU1 organized the available information about arsenic and lead in soils. It also was used for identifying information needs to allow quantitative analysis of the exposure and health risk associated with the important exposure pathways. The conceptual model identified exposure pathways judged to be of sufficient potential concern to warrant quantitative exposure and risk analysis. The significant exposure pathways identified in the conceptual model were ingestion of garden vegetables, soils, and dust by Site residents. The Phase III field investigation was then designed to collect sufficient data to quantify the risks associated with each significant exposure pathway.

1.5.2.3 Exposure Pathway Data Requirements

The Phase III investigation consisted of six primary activities:

1. Sampling surface soils (0"-2") in residential yards throughout the study area,
2. Sampling indoor dust in homes,
3. Sampling vegetables and surface soils (0"-6") from residential vegetable gardens,
4. Analyzing the concentration of arsenic and lead in the fine fraction of soil,
5. Analyzing the concentration of arsenic and lead in surface soil from all schools and parks within the study area, and
6. Animal studies on the relative bioavailability (RBA) of arsenic and lead in Site soils.

In the Phase III field investigation, the properties targeted for soil sampling included all residential properties within the study area boundaries that had not been sampled as part of the Phase I and Phase II programs, as well as re-sampling of all the properties that had been sampled in Phase I and Phase II. The study area expanded from that in Phase I and II to include whole neighborhoods, and not fractions thereof. A total of 4000 residential properties were targeted for sampling in the 4.5 square mile expanded study area.

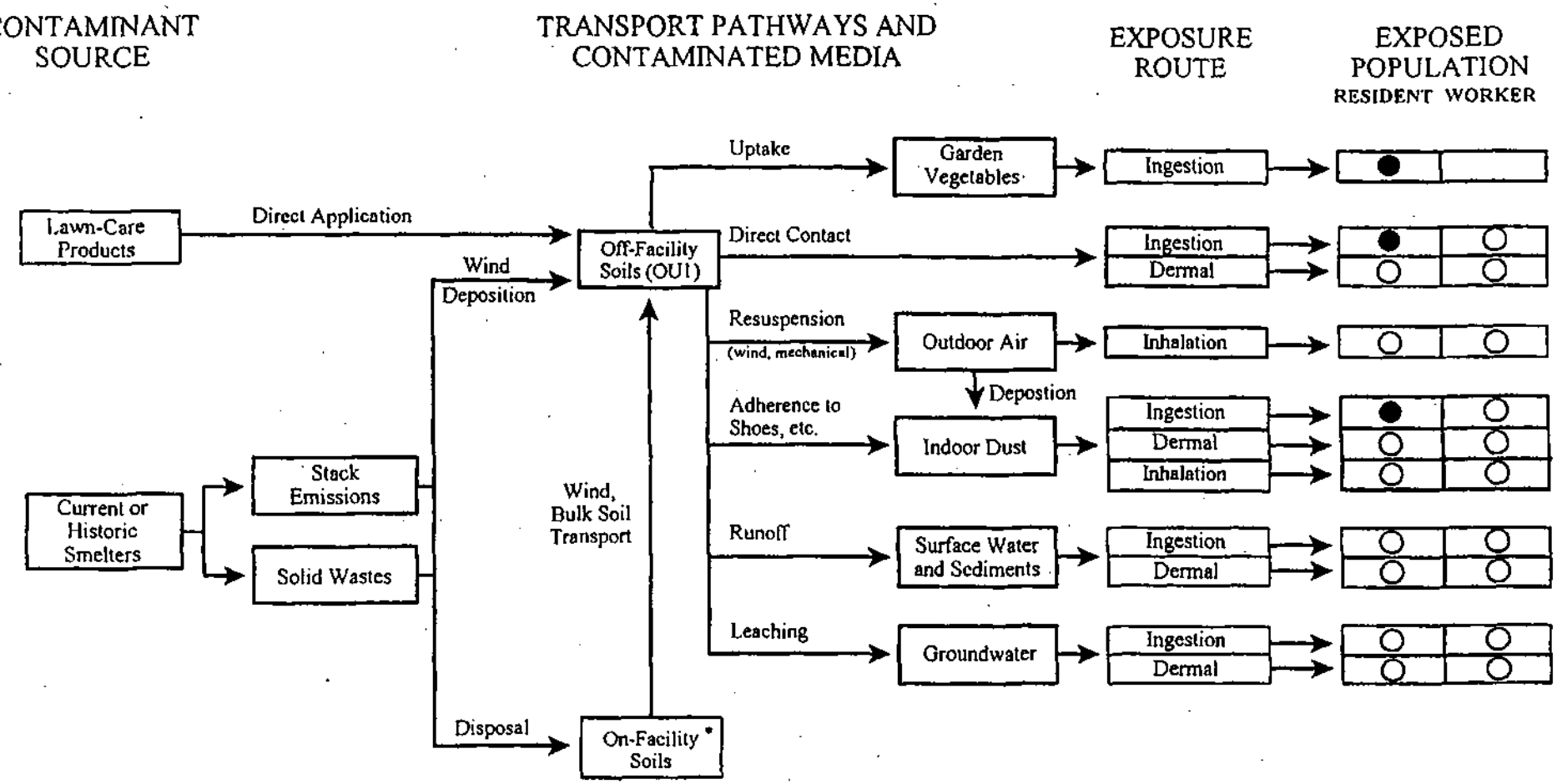
1.5.2.4 Sampling Strategy and Bioavailability Study

EPA designed the Phase III residential soil sampling program to meet or exceed data quality objectives for baseline risk assessments. At OU1, a residential property was assumed to require remedial action unless there was at least 95% confidence that no action is required.

For arsenic, the data quality objective was met by using the 95% Upper Confidence Limit (UCL) of the arithmetic mean concentration of arsenic in soil at the property as the exposure point concentration (EPC) in the baseline risk assessment, and as the basis for remedial decision making. That is, if the health risks associated with exposure to the 95% UCL are acceptable, there is at least 95% confidence that the true arithmetic mean of arsenic for the property is below this level and that risks are within acceptable limits.

For lead, the data quality objectives were met by using the EPA IEUBK model that describes the probability that an individual exposed to a specified set of environmental lead levels will have a blood lead value that is above a level of health concern. An acceptable level of lead in soil is defined as the arithmetic mean soil concentration within a yard such that a typical child or group of similarly exposed children would have a predicted risk of no more than 5% of exceeding a blood lead level of 10 micrograms per deciliter (ug/dL). This provides 95% confidence that children exposed to lead in soil will be protected.

FIGURE 2 CONCEPTUAL SITE MODEL FOR OPERABLE UNIT 1
EXPOSURES TO OFF-FACILITY SOILS



= Pathway is not complete

= Pathway is or might be complete, but is judged to be minor; qualitative evaluation

= Pathway is or might be complete and could be significant; quantitative evaluation

* To be evaluated as a separate operable unit.

The key design elements of the soil sampling component of the Phase III project are as summarized below.

Sampling Depth

Available data on lead and arsenic levels in residential soils were sufficient to establish that concentrations of contaminants in subsurface soil are lower than in the surface soil. Thus, Phase III was designed to characterize only surficial soil (0"-2" interval) in residential yards.

Calculation of the 95% UCL

Currently, USEPA has established default methods for calculating the 95% UCL for distributions that are either normal or lognormal (EPA 1992). Equations for calculating the 95% UCL of the mean for distributions other than the normal and the lognormal are not readily available.

Data from residential properties that were intensively sampled suggest the distribution of arsenic values within a residential property is not well characterized as either normal or lognormal. Therefore, use of EPA's default equations as the basis for calculating the 95% UCL based on a series of grab samples might yield results that are not accurate.

One way to minimize problems associated with calculating the 95% UCL of the mean for non-standard distributions is by combining individual samples into composite samples. This approach is taken because, regardless of the shape of the parent distribution, the distribution of the values of composite samples will approach a normal distribution if the number of sub-samples is sufficiently large and the sub-samples are thoroughly mixed. This approach supports the use of EPA's recommended equation for calculation of the 95% UCL of the mean at a property. In addition, the variability between composite samples is less than between grab samples, so uncertainty in the mean of composite samples is usually less than for an equal number of grab samples. For these reasons, the Phase III soil sampling program utilized compositing of grab samples collected within a property.

Number of Composites per Property

The design of the Phase III program required the collection of 3 composite soil samples of 10 sub-samples at each property. This design achieved an appropriate balance of cost and minimization of the false positive rate. The Phase III Project Plan specified that 30 sub-samples be located approximately equidistant throughout each property. Each composite contained 10 sub-samples representing an independent estimate of the yard-wide mean. All surface soil locations were collected from the top 0-2" interval. In areas of dense sod, the sod layer was carefully lifted and the soil immediately beneath the sod was sampled. A subset of samples was sieved through a 250um screen to isolate the "fine" fraction of the soil for subsequent land and arsenic analysis.

The proposed composite soil sampling approach was optimal for characterizing the yard wide average concentrations of arsenic and lead. However, there were concerns that the composite samples might dilute hot spots within a yard. So a method to statistically predict hot spots using the composite results was developed. In order to be protective, EPA had to ensure that the predicted value was more likely to overestimate than underestimate the true value of a potential hot spot. At yards where unacceptable short term risk was indicated, 30 individual grab samples would be collected to characterize hot spots.

Dust Sampling

As part of Phase III, EPA collected house dust samples to define the relationship between arsenic and lead levels in soil and dust at this Site. Seventy-five properties were selected for this study. These properties were chosen by stratifying the soil concentrations and randomly selecting an equal number of properties with low, medium, and high concentrations in soil and also equal spatial representativeness across the Site.

Garden Soil and Vegetable Sampling

Another pathway by which residents might be exposed to soil-related contaminants is ingestion of vegetables grown in home gardens that contain contaminated soil. In order to obtain site-specific data on this potential exposure route, garden vegetable and garden soil samples were collected from residential gardens. At each location where a vegetable sample was collected, a co-located sample of garden soil also was collected.

Candidate gardens were identified from property sketches generated during soil sampling, and residents were contacted by phone to determine whether vegetables remained available. Sampling began on October 7, 1999 and was completed in two weeks. At each vegetable sample location, a corresponding 0-6" grab soil sample was collected at a maximum of 6 inches from the plant.

Animal Studies

In order to investigate the relative bioavailability (RBA) of arsenic and lead in Site soils, EPA performed two separate studies in which samples of soil were fed to young swine. Swine were selected as the test species because the gastrointestinal system (and hence the behavior of ingested lead and arsenic) in swine is similar to that in humans.

As part of the study on the RBA of arsenic in Site soils, EPA tested a sample composed of Site soil at background levels mixed with a sample of the PAX 3-year Crabgrass Control product.

The soils used in the studies on RBA were subjected to extensive characterization including chemical analysis, mineral speciation, particle size distribution, and in-vitro bioaccessibility testing. The arsenic RBA study offered an opportunity to compare site soils impacted by arsenic with a background soil mixed with the PAX 3-year Crabgrass Control product to aid in EPA's effort to identify a source of the arsenic contamination.

1.5.3 Phase III Remedial Investigation Results

The Phase III program was implemented in August 1999. The field investigation was completed in September, 2000.

1.5.3.1 Surface Soils in Residential Yards

EPA obtained access to and sampled approximately 3000 of the 4000 targeted properties. Summary statistics for the bulk soil samples, based on the average values at each property and stratified by neighborhood, are summarized in Table 3. Based on the Phase III data, 30 more properties were identified for time critical removal action because of average arsenic concentrations above 400 ppm. The Action

Memorandum was amended and continuation of the time critical removal action was undertaken in October, 2000. Upon completion of this work, a total of 48 residential properties had been cleaned up by EPA using time critical removal authority.

Table 3
Phase III Investigation
Summary Statistics of the Average Concentrations of Arsenic and Lead in Residential Yards

Neighborhood	Total Properties Sampled	Percentile Distribution of Average Arsenic Concentrations (ppm)					
		5th	25th	50th	75th	95th	Maximum
Clayton	902	5.5 ppm	5.5 ppm	8.7 ppm	38.3 ppm	168 ppm	758 ppm
Cole	796	5.5 ppm	7.7 ppm	11.8 ppm	24.8 ppm	142.1 ppm	660 ppm
Elyria	59	5.5 ppm	8.5 ppm	12.3 ppm	22.3 ppm	97.2 ppm	431 ppm
Globeville	63	5.5 ppm	8.5 ppm	13.8 ppm	22.3 ppm	123.3 ppm	297 ppm
Swansea	1166	5.5 ppm	5.5 ppm	9.7 ppm	30.6 ppm	128.3 ppm	604 ppm
ALL	2986	5.5 ppm	5.5 ppm	10.5 ppm	30.3 ppm	144.9 ppm	758 ppm
		Percentile Distribution of Average Lead Concentrations (ppm)					
		5th	25th	50th	75th	95th	Maximum
Clayton	902	76 ppm	106 ppm	140 ppm	193 ppm	337 ppm	1131 ppm
Cole	796	135 ppm	221 ppm	288 ppm	371 ppm	538 ppm	1130 ppm
Elyria	59	181 ppm	299 ppm	372 ppm	438 ppm	601 ppm	922 ppm
Globeville	63	171 ppm	257 ppm	332 ppm	482 ppm	633 ppm	835 ppm
Swansea	1166	76 ppm	119 ppm	164 ppm	250 ppm	410 ppm	776 ppm
ALL	2986	81 ppm	127 ppm	188 ppm	292 ppm	465 ppm	1131 ppm

EPA also compared the yard mean arsenic and lead concentrations to the year of construction for each property where the construction date was available. Yards of homes built after 1960 appear to be unimpacted by arsenic. A trend exists of decreasing levels of lead in soil at homes constructed in more recent years. A steep decrease can be seen in homes constructed in the 1980-1985 time frame.

1.5.3.2 Indoor House Dust

The results from house dust sampling show that concentrations of arsenic and lead in indoor dust are relatively consistent over a wide range of yard soil concentrations, and are poorly correlated to yard soil concentrations.

1.5.3.3 Vegetables and Garden Soils

The results for garden vegetables, garden soils and corresponding yard soils show that arsenic and lead in garden soils is generally lower than levels found in the yard soils. These results may be explained by

residents adding soil amendments and/or fertilizers to garden soils. Arsenic and lead concentrations in vegetables remained consistently low throughout the range of garden soil concentrations.

1.5.3.4 Soil Fine Fraction

The results from the analysis of the fine fraction of soil in Phase III were combined with the results of the fine fraction from the Physico-Chemical Characterization Study. The combined results indicate that the concentration of arsenic in the fine fraction of soil is 21% higher than the bulk fraction and the concentration of lead in the fine fraction is 9% higher than the bulk fraction.

1.5.3.5 Sampling of Surface Soil in Schools and Parks

Thirty surface soil grab samples were collected from all schools and parks within the study area. The surface soil grab samples were collected from play areas and grassy areas at each school and park. A total of ten schools and seven parks were sampled. Mean arsenic concentrations in surface soils at school and parks ranged from below the method detection limit of 11 ppm to 26 ppm. The mean lead concentrations ranged from 67 ppm to 256 ppm.

1.5.3.6 Animal Studies

The studies on the RBA of arsenic and lead in Site soils found that:

- Arsenic in Site soils is less well absorbed than a readily soluble form of arsenic. The study determined a Site-specific arsenic RBA of 42% was appropriate for risk assessment purposes. This percentage reflects the 95% upper confidence limit of the mean arsenic RBA of the five Site soils tested.

- Lead in Site soils is less well absorbed than a readily soluble form of lead. The study determined a Site-specific RBA of 84% was appropriate for risk assessment purposes. This percentage reflects the mean of the lead RBA of the two Site soils tested. This lead RBA is higher than the EPA default value of 60%, suggesting that the lead in Site soils is in a form that can be readily absorbed.

1.6 Current and Potential Future Site and Resources Uses

OU1 is currently residential in nature. The Site covers an area of approximately 4.5 square miles which includes schools, parks, retail businesses and over 4000 residences. The Site is developed with very little vacant land available. In discussions with the City and County of Denver, there are no reasonably foreseeable changes in the future land use of the Site.

1.7 Summary of Site Risks

Using the extensive data from the Phase III program, EPA completed a quantitative baseline human health risk assessment which evaluated current and anticipated future exposure of residents within OU1 to concentrations of arsenic and lead measured in soil collected from their yards (EPA 2001a). The risk assessment was based on the following considerations:

- a residential land use as the reasonably anticipated future land use;

- the individual residential yard (or a sub-location of the yard for short term exposures) as an exposure unit, which resulted in 3000 individual risk calculations for OU1 properties;

- risk evaluation using both the average and Reasonable Maximum Exposure (RME) exposure assumptions;

- for arsenic, exposure pathways of concern that included incidental ingestion of soil and dust which could cause chronic or sub-chronic effects, ingestion of home grown garden vegetables which could cause chronic effects, and intentional ingestion of large amounts of soil by children with soil pica behavior, which could cause acute effects; and

- for lead, exposure pathways of concern included incidental ingestion of soil and dust by children as well as total exposure via all sources and pathways in the environment rather than to Site related exposures only, and use of the Integrated Exposure/Uptake Biokinetic Model (IEUBK) to evaluate risks.

For arsenic, EPA relied on guidance contained in the Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-30 (EPA 1991) to determine the level of risk that is unacceptable, warranting remedial action. Individual yards where the cancer risk based on reasonable maximum exposure to arsenic is predicted to be greater than 10^{-4} and/or the non-cancer hazard quotient (HQ) is predicted to be greater than 1 were identified as remedial action candidates. This is consistent with EPA regulations in the National Contingency Plan (NCP) (40 CFR Part 300) that establish a range of acceptable risk as 10^{-4} - 10^{-6}.

The adverse health effect associated with lead exposure that was considered by EPA is lead-induced neurobehavioral effects in children. EPA's OSWER determined that, in Superfund site cleanups, EPA will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10 micrograms per deciliter (ug/dL) (EPA 1994).

The baseline human health risk assessment indicates:

- The cancer risks exceed the acceptable risk range at properties where the arsenic Exposure Point Concentrations (EPC) is 240 ppm or greater. In accordance with EPA guidance, remedial action is warranted at these properties. At properties where the arsenic EPC is less than 240 ppm, the RME cancer risks are within the acceptable range. There are 99 properties where the arsenic EPC is 240 ppm or greater. Of these 99 properties, there are 26 properties where the predicted RME hazard quotient exceeds 1 for chronic non-cancer effects and 7 properties where the predicted RME hazard quotient exceeds 1 for both subchronic and chronic non-cancer effects. Remedial action at the 99 properties where RME cancer risks are unacceptable will also address unacceptable RME non-cancer risks (both chronic and sub-chronic).

- Screening level estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in acute HQ greater than 1 for the <u>average</u> soil pica scenario, and between 662 and 1841 for the <u>RME</u> soil pica scenario. The wide range of potentially

affected properties, 294-1841, reflects the substantial uncertainty in quantifying these risks. The RME acute HQ exceeds 1 at yards where arsenic levels are 47 ppm or higher.

- The IEUBK model predicts that there is a greater than 5% chance that a child will have a blood level of 10 ug/dL as a result of exposure to lead in soil at 1331 properties. The concentration of lead in soil at these properties is 208 ppm or greater. The results of IEUBK model runs with other than default parameters indicate that there are no properties where lead levels in soil are predicted to result in a greater than 5% chance that a child will have a blood level of 10 ug/dL, suggesting that remedial action to address lead in soil may not be warranted. In this case, the concentration of lead in soil triggering remedial action is 1,100 ppm. These factors led EPA to initially determine that, in order to be protective, remedial action is warranted at yards where the lead EPC is greater than 540 ppm, a value in the middle of the range.

A detailed summary of the baseline human health risk assessment is provided in the following sections.

1.7.1 Human Health Risks Associated with Potential Exposure to Arsenic

The exposure pathways of concern to residents are incidental ingestion of soil and dust which could cause chronic or sub-chronic effects, ingestion of home grown garden vegetables which could cause chronic effects, and intentional ingestion of large amounts of soil by children with soil pica behavior, which could cause acute effects. Table 4 summarizes the potentially exposed populations, exposure pathways, and potential health effects assessed by EPA. The potential health effects associated with arsenic exposure that were considered by EPA are:

- **Acute non-cancer effects:** irritation of the gastrointestinal tract leading to nausea and vomiting. EPA has not previously considered arsenic to be an acute toxicant in soil. This health effect was evaluated at VB/I-70 OU1 based on at the recommendation of ATSDR. This required that EPA develop a new reference dose protective of acute effects.

  EPA evaluated the risk that these effects could potentially result from a one-time exposure to arsenic by a child with soil pica behavior who happens to ingest a lot of soil from a small area of a yard that contains elevated arsenic levels.

- **Subchronic non-cancer effects:** diarrhea, vomiting, anemia, injury to blood vessels, damage to kidney and liver, and impaired nerve function.

  EPA evaluated the risk that these effects could potentially result from lower level exposure for periods of a few months to several years by a child who plays preferentially in a small area of a yard during the summer months and happens to incidentally ingest soil at a high rate (characteristic of the upper percentile of the general population).

Table 4

Potentially Exposed Populations and Exposure Pathways for Current and Reasonably Anticipated Future Scenarios Arsenic Risk Assessment, VB/I-70 OU1

Exposure Pathway	Potentially Exposed Population			Potential Health Effects			
	child	adult resident	adult worker	acute	sub-chronic	chronic non-cancer	chronic cancer
pica soil ingestion	X			+			
soil ingestion	X				+		
soil and dust ingestion	X	X	x			+	+
vegetable ingestion	X	X				+	+
particulate inhalation	x	x	x				
dermal contact	x	x	x				

x - complete but insignificant pathway, screening evaluation

X - complete and potentially significant pathway, quantitative evaluation

\+ - potential health effect assessed for given exposure pathway

- **Chronic non-cancer effects:** similar to subchronic effects but also include skin abnormalities.

  EPA evaluated the risk that these effects could potentially result from lower level exposure over a long period of time. Risks could be associated with long term incidental ingestion of soil and dust and ingestion of home grown garden vegetables by long time area residents who have spent their childhood and adult years living at the same residence.

- **Cancer effects:** skin cancer, internal cancer including cancer of the bladder and lung

  EPA evaluated the risk that these effects could potentially result from lower level exposure over a long period of time. Risks could be associated with long term incidental ingestion of soil and dust and ingestion of home grown garden vegetables by long time area residents who have spent their childhood and adult years living at the same residence.

The baseline human health risk assessment quantified potential risks to residents with average levels of exposure and to residents with "reasonable maximum" levels of exposure. Consideration of the reasonable maximum exposure scenario is required by EPA regulations in the NCP (40 CFR Part 300). The intent of the reasonable maximum exposure scenario is to estimate an exposure case that is conservative, yet still within the range of possible exposures. Reasonable maximum is generally intended to characterize the 90th-95th percentile of the exposed population.

Consideration of both average exposures and reasonable maximum exposures gives the risk manager a range of risk estimates to provide an indication of the variability, uncertainty, and inherent protectiveness in the assumptions used to quantify potential risks.

The Phase III program generated arsenic data primarily to support assessments of chronic exposure and risk. For each property sampled, a conservative estimate of the yard-wide average concentration of arsenic, the 95% UCL, was used as the EPC in the chronic cancer and non-cancer risk assessments in accordance with EPA guidance (EPA 1992).

1.7.1.1 Cancer and Non-cancer Risks from Chronic Exposure

Long term exposure is estimated using the following general equation:

$$\text{Dose} = \frac{(\text{EPC}) \times (\text{intake}) \times (\text{exposure frequency}) \times (\text{exposure duration})}{(\text{body weight}) \times (\text{averaging time})}$$

Table 5 summarizes the assumptions used for each of the parameters in the equation. Most values are default assumptions recommended by EPA. However, Site-specific data collected during the Phase III program was used to increase the accuracy of the risk assessment. The Phase III data used to better characterize exposure are:

- relationship between arsenic concentrations in the fine and bulk fractions of soil;

- relationship between arsenic concentrations in yard soil and indoor dust;
- relationship between arsenic concentrations in yard soil, garden soil, and garden vegetables; and
- measurements of RBA of arsenic in VB/I-70 Site soils.

Table 6

Exposure Parameters for Chronic Exposure to Soil, Dust, and Vegetables

	AVERAGE		REASONABLE MAXIMUM EXPOSURE	
	child	adult	child	adult
concentration of arsenic in soil (ppm)	EPC[1]	EPC[1]	EPC[1]	EPC[1]
adjustment for fine fraction	1.21	1.21	1.21	1.21
concentration of arsenic in dust (ppm)	estimated from site specific relationship of soil to dust dust = .06soil	estimated from site specific relationship of soil to dust dust = .06soil	estimated from site specific relationship of soil to dust dust = .06soil	estimated from site specific relationship of soil to dust dust = .06soil
daily intake rate of soil and dust (milligrams /day)	100	50	200	100
fraction of total intake that is soil	45%	45%	45%	45%
exposure frequency (days/year)	234	234	350	350
exposure duration (years)	2	7	6	24
body weight (kilograms)	15	70	15	70
concentration of arsenic in vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables	estimated from site specific relationship of soil to garden vegetables
daily ingestion rate of home grown vegetables (kilograms/day)	0.007	0.35	0.007	.35
Arsenic RBA (EPA 2001b)	0.42	0.42	0.42	0.42
Averaging time for cancer effects (years)	70	70	70	70
Averaging time for non-cancer effects (years)	9	9	30	30

1. EPC is the exposure point concentration. Over the long term, residents will be exposed to the average arsenic levels in their yards. EPA recommends that the 95% UCL of the average or the maximum concentration (whichever is lower) be used as the EPC (EPA 1989). At the VB/I-70 Site, the EPC is the lower of the 95% UCL of the 3 composite samples or the maximum composite sample.

Risk is quantified by multiplying the dose by the slope factor for cancer risk, and dividing the dose by the reference dose to determine the non-cancer Hazard Quotient (HQ). Table 6 summarizes the toxicity factors used in the chronic arsenic risk assessment.

Table 6
Arsenic Toxicity Values

Toxicity Factor	Value	Source
Chronic Reference Dose	0.0003 mg/kg/day	IRIS, 2000
Oral Slope Factor	1.5 /(mg-kg/day)	IRIS, 2000

The baseline human health risk assessment indicates:

- Cancer risks to area residents with **average levels of exposure** range from **2×10^{-6} to 9×10^{-5}**. There are no properties where cancer risks are predicted to exceed the unacceptable risk range of 1×10^{-4} for average levels of exposure.

- Cancer risks to area residents with **reasonable maximum levels of exposure** range from **1×10^{-5} to 8×10^{-4}** . Cancer risks exceed 1×10^{-4} for reasonable maximum levels of exposure where the arsenic EPC is 240 ppm or greater. There are 99 such properties.

- Chronic non-cancer risks to area residents with **average levels of exposure** range from less than or equal to the chronic reference dose (hazard quotient ≤ 1) to 2 times the chronic reference dose (hazard quotient = 2). The ratio of Site dose to a reference dose is the "hazard quotient (HQ)". The HQ exceeds 1 for average levels of exposure where the arsenic EPC is 1300 ppm or greater. There are only 2 such properties.

- Chronic non-cancer risks to area residents with **reasonable maximum levels of exposure** range from less than or equal to the chronic reference dose (HQ ≤ 1) to 5 times the chronic reference dose (HQ = 5). The HQ exceeds 1 for reasonable maximum levels of exposure where the arsenic EPC is 450 ppm or greater. There are 26 such properties.

1.7.1.2 Risk of Subchronic Non-Cancer Effects

Sub-chronic exposure is estimated using the same general equation. Exposure parameters are chosen to characterize short term exposures:

$$\text{Dose} = \frac{\text{(concentration) x (intake) x (exposure frequency) x (exposure duration)}}{\text{(body weight) x (averaging time)}}$$

Table 7 summarizes the assumptions used for each of the exposure parameters in the equation for sub-chronic exposure. In this scenario, during a 1 - 3 month period such in the summer months, a child is

assumed to play in a particular sub-location of a yard where the arsenic concentrations are higher than the yard average. EPA chose the 90th percentile concentration in each yard as the concentration for sub-chronic exposure. The 90th percentile concentration was estimated at each yard from the mean and the coefficient of variation. For the risk assessment, the EPC was used as a conservative estimate of the mean at each property. The 90th percentile is 2.07 times the EPC.

Table 7
Exposure Parameters for Sub-Chronic Exposure to Soil

EXPOSURE PARAMETER	AVERAGE	REASONABLE MAXIMUM EXPOSURE
	child	child
concentration of arsenic in soil (ppm)	90th percentile concentration in yard (2.07) x (EPC)	90th percentile concentration in yard (2.07) x (EPC)
adjustment for fine fraction	1.21	1.21
daily intake rate of soil (milligrams /day)	200	400
fraction of total intake that is soil	100%	100%
exposure frequency (days/month)	15	25
body weight (kilograms)	12.3	12.3
Relative bioavailability	0.42	0.42
Averaging time (days)	30	30

To calculate the sub-chronic HQ, EPA used a sub-chronic reference dose of 0.015 mg/kg/day developed by an EPA/ATSDR interagency workgroup (EPA 2001c).

The baseline human health risk assessment indicates:

- Sub-chronic risks to children with **average levels of exposure** are predicted to be less than or equal to the sub-chronic reference dose (HQ $\leq$ 1). There are no properties with arsenic concentrations that are predicted to result in a sub-chronic hazard quotient greater than 1 for average levels of exposure.

- Sub-chronic risks to children with **reasonable maximum levels of exposure** range from less than or equal to the sub-chronic reference dose (HQ $\leq$ 1) to 3 times the sub-chronic reference dose (HQ = 3). The HQ exceeds 1 where the arsenic EPC is 800 ppm or greater. There are 7 properties such properties.

EPA chose the 95th percentile concentration in each yard as the concentration for acute exposure. The 95th percentile concentration was estimated at each yard from the mean and the coefficient of variation. For the

risk assessment, the EPC was used as a conservative estimate of the mean at each property. The 95th percentile is 2.81 times the EPC.

1.7.1.3 Risk of Acute Effects

EPA's evaluation of the risk of acute effects from exposures to arsenic associated with soil pica behavior in children is considered to be a screening level evaluation because of the substantial uncertainty that exists in most of the exposure assumptions. The evaluation is complicated by the fact that EPA and ATSDR employ different values for the reference dose and the assumptions about soil ingestion rates for a child with soil pica behavior.

To account for the differences between ATSDR and EPA concerning the appropriate acute reference dose and exposure assumptions to characterize pica behavior, EPA evaluated 2 "cases" of the soil pica exposure scenario to reflect the 2 agencies' recommendations. Table 8 summarizes the assumptions used for each of the exposure parameters in the equation for acute exposure.

Table 8
Exposure Parameters for Soil Pica Exposure to Soil

EXPOSURE PARAMETER	AVERAGE	REASONABLE MAXIMUM EXPOSURE
	child	child
concentration of arsenic in soil (ppm)	95th percentile concentration in yard (2.81) x (EPC)	95th percentile concentration in yard (2.81) x (EPC)
adjustment for fine fraction	N/A	N/A
daily intake rate of soil (milligrams /day)	5,000 (case 1) 2,000 (case 2)	10,000 (case 1) 5,000 (case 2)
fraction of total intake that is soil	100%	100%
body weight (kilograms)	12.3	12.3
Relative bioavailability	0.42	0.42

To calculate the acute HQ, EPA used the ATSDR Minimum Risk Level of 0.005 mg/kg/day as the reference dose for "Case 1". EPA used an acute reference dose of 0.015 mg/kg/day developed by an EPA/ATSDR interagency workgroup (EPA 2001c) for "Case 2".

The screening level calculations of acute risk indicate:

- Acute risks to children with **average soil pica exposures** range from less than or equal to the reference dose (HQ $\leq$ 1) to 100 times the reference dose (HQ = 100). The HQ exceeds 1 for average soil pica exposures where the arsenic EPC is greater than 16 ppm (case 1) or 118 ppm (case 2). There are between 294 and 1511 such properties.

- Acute risks to children with **reasonable maximum soil pica exposures** range from less than or equal to the reference dose (hazard quotient $\leq$ 1) to 300 times the reference dose (hazard quotient =300). The HQ exceeds 1 for reasonable maximum soil pica exposures where the arsenic EPC is greater than 8 ppm (case 1) or 47 ppm (case 2). There are between 662 and 1841 such properties.

Table 9 summarizes the results of the baseline human health risk assessment for arsenic.

Unacceptable Risks that Warrant Remedial Action

EPA relied on the Baseline Risk Assessment results to determine which properties in OU1 require remedial action. As a first step, EPA considered the cancer risks, the chronic non-cancer risks, and the sub-chronic non-cancer risks. This is because EPA has more confidence in these risk calculations than those for the acute risks which are considered screening level only.

Table 10 summarizes the arsenic EPCs associated with various cancer risk estimates for the reasonable maximum exposure scenario. From this table, it is clear that cancer risks exceed the acceptable risk range at properties where the arsenic EPC is 240 ppm or greater. In accordance with EPA guidance, remedial action is warranted at these properties. At properties where the arsenic EPC is less than 240 ppm, the RME cancer risks are within the acceptable range.

There are 99 properties where the arsenic EPC is 240 ppm or greater. Of these 99 properties, there are 26 properties where the predicted RME hazard quotient exceeds 1 for chronic non-cancer effects and 7 properties where the predicted RME hazard quotient exceeds 1 for both subchronic and chronic non-cancer effects. Remedial action at the 99 properties where RME cancer risks are unacceptable will also address unacceptable RME non-cancer risks (both chronic and sub-chronic).

As the second step in determining where remedial action should be undertaken, EPA next considered if remediation is appropriate even though risks appeared to be within the acceptable risk range. EPA consulted the guidance in OSWER Directive 9355.0-30 (EPA 1991) which states that:

- EPA should clearly explain why remedial action is warranted if baseline risks are within the acceptable risk range of 10^{-4} to 10^{-6}, and

- A risk manager may decide that a level of risk lower than 10^{-4} warrants remedial action where, for example, there are uncertainties in the risk assessment results.

EPA carefully evaluated the uncertainty in the OU1 risk assessment.

Table 9
Summary of Cumulative Risks to Residents
Arsenic Risk Assessment, VB/I-70 OU1 Soils

Exposure Pathways and Health Effect	Average or Central Tendency Exposure		Reasonable Maximum Exposure	
	Range of Calculated Risks	# properties where risks are predicted to be unacceptable	Range of Calculated Risks	# properties where risks are predicted to be unacceptable
acute non-cancer effects • soil ingestion / pica	0.07 ≤ HQ[1] ≤ 100	294-1511[2]	0.2 ≤ HQ ≤ 300	662- 1841[2]
subchronic non-cancer effects • incidental soil ingestion	0.003 ≤ HQ ≤ 0.8	0	0.01 ≤ HQ ≤ 3	7
chronic non-cancer effects • incidental soil and dust ingestion, and • vegetable ingestion	0.04 ≤ HQ ≤ 2	2	0.1 ≤ HQ ≤ 5	26
cancer effects • incidental soil and dust ingestion, and • vegetable ingestion	**2×10^{-6} ≤ Cancer Risk ≤ 9×10^{-5}**	**0**	**1×10^{-6} ≤ Cancer Risk ≤ 8×10^{-4}**	**99**

1. HQ = hazard quotient, defined as ratio of predicted site dose to EPA reference dose
2. There is a range of properties instead of a discrete number because EPA calculated risks using the EPA acute reference dose for one case and the ATSDR provisional acute MRL for the second case.

Table 10
Summary of RME Cancer Risks and Associated Arsenic EPCs

Cancer Risk based on Reasonable Maximum Exposure Assumptions	Arsenic EPC	# properties in VB/I-70 at this risk level
8×10^{-4}	1356 ppm - 1418 ppm	2
6×10^{-4}	927 ppm	1
5×10^{-4}	839 ppm - 898 ppm	4
4×10^{-4}	595 ppm - 688 ppm	11
3×10^{-4}	413 ppm - 522 ppm	12
2×10^{-4}	240 ppm - 410 ppm	69
1×10^{-4}	146 ppm - 238 ppm	131
9×10^{-5}	129 ppm - 145 ppm	38
8×10^{-5}	113 ppm - 127 ppm	47
7×10^{-5}	94 ppm - 111 ppm	58
6×10^{-5}	77 ppm - 93 ppm	78
5×10^{-5}	60 ppm - 76 ppm	100
4×10^{-5}	43 ppm - 59 ppm	159
3×10^{-5}	26 ppm - 42 ppm	275
2×10^{-5}	11 ppm - 25 ppm	1068
1×10^{-5}	5.5 ppm	933

Uncertainty in the Risk Estimates

The Phase III program included several studies specifically designed to increase the accuracy (reduce uncertainty) of the risk estimates for OU1. The first was a study to investigate the RBA of arsenic in soil at the VB/I-70 Site (EPA 2001d).

In the absence of Site-specific information on RBA, it is common practice to use a default assumption as the value for this parameter or to ignore RBA altogether in risk estimates. However, where accuracy of risk estimates is important to risk managers, measurements of RBA based on site specific soils significantly reduce the uncertainty in estimates of this parameter.

In the study on OU1 soils, the RBA of arsenic was measured in 5 different soils collected from residential

yards in the 4 main neighborhoods of the site. As expected, the RBA of arsenic varied between the five different site soils. EPA used the 95% UCL of the mean of the five values in the baseline risk assessment. This approach is expected to overestimate the true value of this parameter for any given soil in the residential yards in the Site. Thus the accuracy of the risk estimate was increased by using a VB/I-70 Site-specific value, and protectiveness was achieved by using a conservative estimate of the mean of all values measured.

The second study provided Site-specific relationships between:

- arsenic in yard soil and arsenic in house dust;
- arsenic in yard soil and arsenic in garden soils;
- arsenic in garden soils and arsenic in garden vegetables; and
- arsenic in the bulk fraction and the arsenic in the fine fraction of soil.

Establishing these Site-specific relationships reduces the uncertainty in quantifying exposure and risk associated with incidental ingestion of soil and dust and ingestion of garden vegetables.

Uncertainties in the Estimates of Acute Risks

As the third step in determining which properties require remedial action, EPA considered the screening level assessment of acute risks associated with soil pica behavior. The RME acute HQ exceeds 1 at yards where arsenic levels are 8 ppm or higher (case 1) or 47 ppm or higher (case 2). In evaluating the uncertainty in these calculations, two important facts were considered: (1) the distribution of soil ingestion rates for children with soil pica behavior is not known, and (2) the frequency with which such children exhibit the behavior is also not known. Therefore, the application of Monte Carlo techniques to analyze the uncertainty in the calculations of acute risk is difficult and was not performed by EPA for the VB/I-70 Site.

However, these screening level estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in acute HQ greater than 1 for the average soil pica scenario, and between 662 and 1841 for the RME soil pica scenario. The wide range of potentially affected properties, 294-1841, reflects the substantial uncertainty in quantifying these risks.

EPA also considered the following:

- EPA is not aware of any reported cases of acute arsenic toxicity attributable to ingestion of arsenic in soil.
- Limited data on urinary arsenic levels in residents of the nearby Globeville neighborhood do not reveal the occurrence of high soil intakes by children.
- Inquiries by CDPHE into reports of known or suspected cases of arsenic poisoning in the community surrounding the VB/I-70 site resulted in its conclusion, stated in a July 25, 2001 letter, that ". . . it appears that there is no obvious or identifiable problem of arsenic exposure from environmental

sources in the area of concern." (CDPHE 2001).

- Extensive data on urinary arsenic levels in children who live in VB/I-70 OU-1 were collected during the "Kids at Play" Health Survey conducted by CDPHE and the University of Colorado Health Sciences Center during the summer of 2002. These important data indicate there is no evidence of exposures to arsenic at levels indicative of acute exposures.

The above facts suggest that risk of acute arsenic exposure from soil pica behavior may not be as significant as the theoretical calculations for OU1 suggest. However, because of the high uncertainty regarding the magnitude and frequency of soil pica behavior, more reliable risk estimates for this scenario will not be possible until better data are collected on soil intake rates characteristic of soil pica behavior along with direct measurements of soil related exposures to arsenic. Therefore, given this uncertainty, EPA determined it was appropriate to consider a lower action level to develop remedial alternatives to decrease the possibility that a child exhibiting soil pica behavior will be at risk for acute arsenic exposure from soil in his/her yard.

Weighing the substantial uncertainty in the acute risk assessment, and recognizing that the calculations are theoretical, EPA determined that in order to be protective, remedial alternatives would be developed and evaluated for effectiveness in addressing the theoretical acute risks to children with soil pica at all properties where the arsenic EPC is 47 ppm or greater, based on the "Case 2" scenario. In choosing 47 ppm as the level triggering response, EPA is recognizing that existing exposure data provides no evidence of the widespread acute exposures suggested by the "Case 1" scenario.

In summary, EPA determined that remedial action at properties where the arsenic EPC is 240 ppm or greater will protect residents from unacceptable RME cancer, chronic non-cancer, and subchronic non-cancer risks. Remedial action at properties where the arsenic EPC is 47 ppm or greater will be evaluated for effectiveness in protecting soil pica children from theoretical unacceptable acute risk.

1.7.2 Human Health Risks Associated with Potential Exposure to Lead

EPA's quantitative baseline human health risk assessment for OU1 also considered the health risks to young children associated with exposure to lead in soil. Table 11 summarizes the potentially exposed populations, exposure pathways, and potential health effects assessed by EPA.

EPA evaluates risks associated with exposure to lead by considering total exposure via all sources and pathways in the environment rather than to site related exposures only. This evaluation requires assumptions about the level of lead in food, air, water, and paint as well as the level of lead measured in yard soils. The Integrated Exposure/Uptake Biokinetic Model (IEUBK) is the recommended tool for assessing lead risks.

In order to increase the accuracy of the model results, EPA used VB/I-70 site-specific data on the relationship between lead in the fine and bulk fractions of soil, the relationship between lead in yard soil and lead in house dust (EPA 2001d), and the RBA of lead in soils (EPA 2001e) as inputs to the model. Tables 12 and 13 summarize the values used for the IEUBK model parameters.

Table 11
Potentially Exposed Populations and Exposure Pathways for Current and Reasonably Anticipated Future Scenarios
Lead Risk Assessment, VB/I-70 OU1 Soils

Exposure Pathway	Potentially Exposed Population			Potential Health Effects			
	child	adult resident	adult worker	acute	sub-chronic	chronic non-cancer	chronic cancer
pica soil ingestion							
soil ingestion							
soil and dust ingestion	X		x		+		
vegetable ingestion	x						
particulate inhalation	x		x				
dermal contact	x		x				

x - complete but insignificant pathway, screening level evaluation
X - complete and potentially significant pathway, quantitative evaluation
\+ - potential health effect assessed for given exposure pathway

The adverse health effect associated with lead exposure that was considered by EPA is lead-induced neurobehavioral effects in children. EPA OSWER guidance directs that, in Superfund site cleanups, EPA will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10

micrograms per deciliter (ug/dL) (EPA 1994).

Using the values summarized in Tables 12 and 13, the IEUBK model predicts that there is a greater than 5% chance that a child will have a blood level of 10 ug/dL as a result of exposure to lead in soil at 1331 properties. The concentration of lead in soil at these properties is 208 ppm or greater.

Table 12
IEUBK Model Inputs

IEUBK Model Input	Value
concentration of lead in soil	EPC[1]
adjustment for fine fraction	1.09
concentration of lead in dust	estimated from site specific relationship of soil to dust dust = 0.34 soil + 150
concentration of lead in outdoor air	0.10 micrograms per cubic meter
concentration of lead in indoor air	30% of concentration in outdoor air
concentration of lead in drinking water	4 micrograms per liter
absorption fractions: air diet water soil and dust	 32% 50% 50% 84% of 50% = 42% (from lead RBA study)
fraction of daily intake that is soil	45%
geometric standard deviation of blood lead values	1.6

1. The EPC is the average of 3 composite samples collected from the property

Table 13
Age Dependent IEUBK Model Inputs

Age	AIR		DIET	WATER	SOIL
(Years)	time outdoors (hours)	breathing rate (m^3/day)	dietary intake (micrograms/day)	intake (liters/day)	intake (milligrams /day)
0-1	1.0	2.0	3.87	0.20	85
1- 2	2.0	3.0	4.05	0.50	135
2- 3	3.0	5.0	4.54	0.52	135
3- 4	4.0	5.0	4.37	0.53	135
4- 5	4.0	5.0	4.21	0.55	100
5- 6	4.0	7.0	4.44	0.58	90
6- 7	4.0	7.0	4.90	0.59	85

1.7.2.1 Consideration of Uncertainties in the Baseline Human Health Risk Assessment for Lead

In order to investigate uncertainty in the IEUBK model predictions for OU1, EPA ran the model again varying the values for dietary lead intake, geometric standard deviation of blood lead levels, and soil intake rate to reflect recently published data. The results of the alternative model runs are presented in the final Baseline Human Health Risk Assessment.

Each alternative IEUBK model run predicts that EPA's health goal for lead in soil will be met at a specific average soil lead concentration or lead EPC in an individual yard. The alternative model runs performed by EPA resulted in a range of such EPCs presented in Table 14. Remedial action may be warranted at properties where the lead EPC is greater than a value within this range to achieve EPA's health goal.

EPA considered the following factors in determining what concentration in the range warrants remedial action:

- Available blood lead data indicates that elevated blood lead levels are not observed in children in the VB/I-70 Site.
- Predictions using blood lead models suggest a range of possible responses, from soil not being required to be removed to achieve EPA's health goal for lead in soil, to removing soil contaminated with 208 ppm lead.

These factors led EPA to initially determine that, in order to be protective, remedial action is warranted at yards where the lead EPC is greater than 540 ppm, a value in the middle of the range of values in Table 14. Remedial action at properties where the lead EPC is greater than 208 ppm, the low end of the range, will be evaluated for effectiveness in achieving EPA's health goal for lead in soil.

Table 14
Range of EPCs predicted to meet EPA's Health Goal for Lead in Soil at OU1 of the VB/I-70 Site

IEUBK Model Run	soil intake rates	Dietary Lead Intake Values	Geometric Standard Deviation of Blood Lead Values	Predicted Lead Soil Level at P10 < 5% [1] (ppm)
1	default	default	1.6 (default)	208
2	default	revised	1.6 (default)	246
3	default	default	1.4	326
4	default	revised	1.4	362
5	default	revised	1.3	443
6	default	default	1.2	542
7	default	revised	1.2	581
8	Stanek and Calabrese, 2000	default	1.6 (default)	1100

1. P10 < 5% = less than 5% probability that blood lead levels exceed 10 ug/dL

EPA also predicted blood lead levels in children in the VB/I-70 Site using a model other than the IEUBK. The results of this modeling effort, also presented in the final Baseline Human Health Risk Assessment, indicate that there are no properties where lead levels in soil are predicted to result in a greater than 5% chance that a child will have a blood level of 10 ug/dL, suggesting that remedial action to address lead in soil may not be warranted.

1.7.2.2 Consideration of Observed Blood Lead Values in Children Who Reside in VB/I-70

EPA reviewed the available information on measured blood lead levels in the population of children in the VB/I-70 Site to better understand how well the IEUBK model was predicting blood lead levels at OU1. The CDPHE offered three separate blood lead testing programs to children living in the VB/I-70 Site during the period 1995 through 2000 and provided the results of this testing to EPA. Although the blood lead testing was not designed or intended to support risk assessment, the data support the following conclusions:

- elevated blood lead levels do occur in children residing within the Site;
- soil is not likely to be the main source of elevated blood lead levels in children; and
- the elevated blood lead levels that were observed in children within the VB/I-70 Site are not clearly different from the elevated levels observed in children who live outside of the VB/I-70 Site.

In addition, recently available data from the "Kids at Play Health Survey" indicate that EPA's health goals for children exposed to lead may currently be met. The study data indicates that less than 3.2% of the approximately 1340 children tested have elevated blood lead levels.

1.8 Remedial Action Objectives

The overall Remedial Action Objective (RAO) is to protect human health. The following OU1 specific RAOs were developed for arsenic and lead in soil:

RAOs for Arsenic in Soil

- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in an excess lifetime cancer risk associated with ingestion of soil which exceeds 1×10^{-4}, using reasonable maximum exposure assumptions.
- For residents of the VB/I-70 Site, prevent exposure to soil containing arsenic in levels predicted to result in a chronic or sub-chronic hazard quotient associated with ingestion of soil which exceeds 1, using reasonable maximum exposure assumptions.
- For children with pica behavior who reside in the VB/I-70 Site, reduce the potential for exposures to arsenic in soil that result in acute effects.

RAO for Lead in Soil

- Limit exposure to lead in soil such that no more than 5 percent of young children (72 months or younger) who live within the VB/I-70 Site are at risk for having blood lead levels higher than 10

ug/dL from such exposure. This provides 95% confidence that children exposed to lead in soil will be protected.

The first and second RAOs for arsenic in soil are consistent with guidelines set out in the OSWER Directive 9355.0-30 "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions". The objective for lead in soil is consistent with EPA's guidance in OSWER Directive 9355.4-12 that EPA should, ". . . limit exposure to soil lead levels such that a typical child or group of similarly exposed children would have an estimated risk of no more than 5 percent of exceeding the 10 ug/dL blood lead level (EPA 1994)."

Preliminary Remediation Goals (PRGs) for arsenic and lead in soil were established based on the evaluation and findings of the Baseline Human Health Risk Assessment. In accordance with the NCP (40 CFR Part 300), PRGs are the desired endpoint concentrations of lead and arsenic in soils that are protective of human health for the various exposure scenarios. The PRGs help to focus the development of remedial alternatives on technologies that can achieve the goals. At OU1, PRGs were set at background concentrations for both lead and arsenic. Remedial alternatives were evaluated for how effective they are in achieving the PRGs at those properties where remedial action is warranted.

It is estimated that background levels of arsenic range up to about 15 ppm. Lifetime cancer risk associated with exposure to background concentrations of arsenic in soil is approximately $1x10^{-5}$, a level within EPA's acceptable risk range. However, the screening level calculations of acute risk associated with soil pica behavior indicate that the acute HQ exceeds 1 (indicating an unacceptable risk) under some scenarios even where arsenic is at background levels.

Lead levels in bulk soil range below the detection limit (about 52 ppm) up to a maximum of more than 1,000 ppm. If it is assumed that the upper range of lead concentrations resulting from natural and area-wide anthropogenic sources is about 400 ppm, then the mean of all samples that are less than 400 ppm is about 195 ppm. This value is considered by EPA to be a rough estimate of the average background concentration of lead in soil at OU1.

In order to identify the specific properties for which remedial alternatives will be developed and evaluated, EPA established Preliminary Action Levels in the FS. These are exposure point concentrations (EPCs) above which some remedial action is warranted. An EPC is a conservative estimate of the mean concentration within an individual yard. These preliminary action levels are:

a. an EPC of 47 ppm arsenic, which is the level at which the Baseline Human Health Risk Assessment predicts the RME acute non-cancer HQ is greater than 1 for the Case 2 pica scenario;

b. an EPC of 240 ppm arsenic, which is the level at which the Baseline Human Health Risk Assessment predicts RME lifetime cancer risks exceed 1×10^{-4};

c. an EPC of 208 ppm lead, which equates to a less than 5% chance that any child will have a blood lead value above 10 ug/dL based on the IEUBK model adjusted by using Site-specific data on the levels of lead in house dust and the relative bioavailability of lead in site soils; and

d. an EPC of 540 ppm lead, which also equates to a less than 5% chance that any child will have a

blood lead value above 10 ug/dL based on an alternate IEUBK model run.

These concentrations equate to the EPCs used in the Baseline Human Health Risk Assessment and any evaluation of concentrations of lead or arsenic in residential yard soils must use the same sampling methodology as the RI and same evaluation methodology as the risk assessment to provide comparable results.

1.9 Description of Alternatives

Based on Site conditions and RAOs, a range of General Response Actions (GRAs) were identified. GRAs are general categories of remedial activities (e.g., no action, institutional controls, containment, etc.) that may be undertaken, either singly or in combination, to satisfy the requirements of the RAOs. Remedial technologies and process options are more specific applications of the GRAs. Remedial technologies and process options were identified for each GRA and screened in accordance with procedures described in RI/FS guidance. In the first screening step, remedial technologies that have limited or no potential for implementation at the Site were eliminated. Remedial technologies and process options that passed the initial screening test were then subjected to a second, more rigorous, screening evaluation of their anticipated effectiveness, potential implementability and relative cost.

1.9.1 Remedial Technologies

Three remedial technologies were retained from the screening evaluation: (1) Community Health Program, (2) Soil Tilling/Treatment, and (3) Soil Removal/Disposal. These remedial technologies were used individually or in combination to develop the remedial alternatives. In addition, a similar set of technologies were used in several alternatives. In this case, the primary difference between the alternatives is the soil clean up action levels for lead and arsenic. A description of each of these technologies is provided below.

1.9.1.1 Community Health Program

The Community Health Program would be composed of two separate (but partially overlapping) elements. The first element would be designed to address risks to area children from non-soil sources of lead, and to the extent that they exist, risks from lead in soils not yet remediated that are above the action level. The second element would be designed to address risks to area children from pica ingestion of arsenic in soil above the preliminary action level of 47 ppm. Participation in one or both elements of the program would be strictly voluntary, and there would be no charge to eligible residents and property owners for any of the services offered by the community health program. Each of these two main elements of the program is described below.

Community Health Program for Lead. The program for reduction of lead risks is intended to be general. That is, it is intended to assess risks from lead from any and all potential sources of exposure, with response actions tailored to address the different types of exposure source that may be identified. The lead program will consist of three main elements:

1. Community and individual education about potential pathways of exposure to lead, and the potential

health consequences of excessive lead exposure.

2. A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure.

3. A program to respond to any observed lead exposure that is outside the normal range. This program will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure, and to implement an appropriate response that will help reduce the exposure.

A key component of the response program is that all potential sources of lead at a property would be sampled, including soil and interior/exterior paint. If soil is judged to be the most likely source of exposure, a series of alternative actions will be evaluated to identify the most effective way to reduce that exposure. These will include a wide range of potential alternatives, including such things as education, sodding or capping of contaminated soil, tilling/treatment, etc. If the main source is judged to be non-soil related, responses may include things such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

Community Health Program for Arsenic. Chronic cancer and non-cancer risks from incidental ingestion of arsenic in soil will be addressed by the soil removal/disposal component of this remedial alternative. The public health program for arsenic is designed to focus specifically on the potential risks to young children from pica behavior. The program for arsenic will consist of three main elements:

1. Community and individual education about identification and potential hazards of soil pica behavior and the potential health consequences of excessive acute oral exposure to arsenic.

2. A biomonitoring program by which any child may be tested to evaluate actual soil pica exposure to arsenic.

3. A program that provides a response to any observed inorganic arsenic exposures that are outside the normal range. This program will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure, and to implement an appropriate response that will help reduce the exposure.

1.9.1.2 Soil Tilling and Treatment

Soil tilling and treatment would be implemented on properties that only the lead levels exceeded the action level designated for the alternative. For properties which soil tilling is implemented, surface soils would be tilled to a depth of 6 inches and treated with phosphate to reduce the bioavailability of lead. The yard will be restored as close as possible to preconstruction condition.

1.9.1.3 Soil Removal

Soil removal would be implemented on properties that the lead and/or arsenic levels exceed the action level designated for the alternative. Accessible soils would be removed to a depth of 12 inches and transported for disposal at an appropriate location. The excavated areas would be backfilled with clean soil. The yard will be restored as close as possible to preconstruction condition.

1.9.1.4 Sampling Program

During the Remedial Investigation, approximately 75% of the residential properties within the Site boundaries had their yards tested for lead and arsenic. The sampling program is for residential yards that have not yet been sampled. In addition, sampling will be conducted at residential properties in an area outside the Remedial Investigation study area based on the Remedial Investigation soil results and the proximity of the properties to the smelters. This triangular shaped area located in the Curtis Park Neighborhood of the City of Denver and is bounded by Downing Street, Blake Street and 34th Avenue.

Each of these technologies were used in combination with differing soil clean up action levels for lead and arsenic to develop five remedial alternatives. A proposed plan describing these five alternatives was issued in May 2002. During the public comment period associated with this proposed plan, EPA received extensive comment requesting that an alternative with a lower lead soil action level, and to a lesser extent, a lower arsenic soil action level, than included in the preferred alternative, Alternative 4, be considered. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluate the new alternative, Alternative 6, which considered these lower soil action levels. The following is a detailed description of the alternatives EPA considered.

1.9.2 Remedial Alternatives

1.9.2.1 Alternative 1 - No Action

The No Action alternative provides a baseline for the evaluation of other alternatives in accordance with the NCP. Soils have already been removed from 48 residential properties at the Site in Time Critical Removal Actions conducted by EPA in 1998 and 2000. No additional protective or remediation measures would be taken for the No-Action option.

1.9.2.2 Alternative 2 - Community Health Program, Tilling/Treatment (Lead), Targeted Removal (Arsenic)

Alternative 2 contains the following principal components:

- Implementation of a Community Health Program;
- Tilling and treatment of yards with lead soil concentrations greater than 540 ppm;
- Soil Removal for all yards with arsenic soil concentrations greater than 240 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to

determine if a clean up is required.

1.9.2.3 Alternative 3 - Community Health Program, Soil Removal

Alternative 3 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 540 ppm and/or arsenic soil concentrations greater than 240 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.4 Alternative 4 - Community Health Program, Soil Removal

Alternative 4 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 540 ppm and/or arsenic soil concentrations greater than 128 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.5 Alternative 5 – Soil Removal Only

Alternative 5 contains the following principal components:

- Soil removal for all yards with lead soil concentrations greater than 208 ppm and/or arsenic soil concentrations greater than 47 ppm; and
- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.9.2.6 Alternative 6 - Community Health Program, Soil Removal

Alternative 6 contains the following principal components:

- Implementation of a Community Health Program;
- Soil removal for all yards with lead soil concentrations greater than 400 ppm and/or arsenic soil concentrations greater than 70 ppm; and

- Implementation of a sampling program to sample yards which have not been previously sampled to determine if a clean up is required.

1.10 Comparative Analysis of Alternatives

The 6 remedial alternatives were evaluated against the threshold and balancing criteria specified in the NCP. The NCP criteria are:

Threshold Criteria

- Overall Protection of Human Health and the Environment
- Compliance with ARARs

Primary Balancing Criteria

- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility and Volume Through Treatment
- Implementability
- Cost

Modifying Criteria

- State Acceptance
- Community Acceptance

Detailed analyses were performed for each alternative, applying each of the threshold and primary balancing criteria. The remedial alternatives were also comparatively evaluated within each criterion.

The No Action Alternative is not evaluated in the comparative analysis, but is considered as the baseline condition. The Baseline Human Health Risk Assessment indicates that no further action would be effective in preventing exposures to arsenic in soil above a $1x10^{-4}$ lifetime cancer risk, a chronic hazard greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. However, if no further action is taken at the Site, screening level calculations suggest that children with soil pica behavior may be at risk from doses of arsenic that exceed an acute hazard quotient of 1, even for the central tendency pica exposure scenario. Also, the No Action Alternative would not meet the RAOs for arsenic.

For lead, the probability of elevated blood lead levels predicted by the IEUBK Model provides the basis for EPA's evaluation of the No Action Alternative. When the IEUBK model is run using recently published data on soil ingestion rates for children (Stanek & Calabrese 2000), the site-specific relative bioavailability and

site-specific soil/dust ratio adjustments, it predicts that no further action is necessary to achieve the RAO for lead. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that the No Action Alternative would not be effective in achieving the RAO for lead in soil. The range of results reflects the uncertainty in using the IEUBK Model to predict whether further action is required to achieve the RAO for lead at the Site.

In order to help determine whether the IEUBK model is yielding reliable predictions at the VB/I-70 Site, USEPA compared the IEUBK model predictions to actual observations of blood lead levels in the population of children currently living at the Site. Even though the available data are from studies that were not designed to support risk assessment, they do support the following:

1. Elevated blood lead levels occur in children residing within the Site.

2. Soil is not likely to be the main source of elevated blood lead levels.

3. Elevations are not clearly different from areas outside the VB/I-70 Site.

Recently available preliminary results from the Kids at Play Survey indicate that of the approximately 1340 children that have participated in the KAP survey, less than 3.2% of children tested have blood lead levels greater than 10 ug/dL. The data on blood lead levels in children residing in OU1 suggest that the No Action Alternative may be effective in meeting the RAO for lead in soil as predicted by the IEUBK Model run. This IEUBK model run uses recently published data on soil ingestion rates for children, the site-specific relative bioavailability, and the site-specific soil/dust ratio instead of using previous default parameters in order to generate these predictions.

A summary of the comparative analysis is presented below.

1.10.1 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health. The overall protection of human health of the alternatives slightly increases as the soil clean up levels decrease. The overall protectiveness increase from lowest to highest for the alternatives in this order: Alternatives 2, 3, 4, 6, 5. Alternatives 2, 3, 4, 5, and 6 all achieve the RAO's; however, there is uncertainty associated with the tilling/treatment component of Alternative 2.

In Alternative 3, removal and disposal of yard soils with arsenic EPCs at or above 240 mg/Kg or lead EPCs greater than 540 ppm would be effective in preventing exposure to these soils, which are the greatest human health concern. This would effectively achieve the RAO for lead and the first 2 RAOs for arsenic in soil. The Baseline Risk Assessment indicates that below 240 ppm arsenic and 540 ppm lead, soil is not a major source of exposure and risk in OU1. Implementation of a Community Health Program would be effective in achieving the RAO for lead and the third RAO for arsenic in soil by addressing the risks of exposure to non-soil sources of lead and the risks from soil pica behavior through the components of education, biomonitoring, source sampling and analysis, and response actions as necessary. The Community Health Program would provide additional protection for the community, because it would provide the mechanism for evaluating other sources of lead (such as lead paint) that may cause exposures in the future, and for addressing soil pica behavior that may be associated with other risks in addition to the

risk of acute arsenic exposure. Even if there were no detectable arsenic or lead in soil, soil pica behavior may lead to development of significant gastrointestinal disturbances and/or blockages, abdominal pain, parasitic infection, and iron deficiency. The Community Health Program would include strategies to reduce soil pica behavior within the population of children living in the VB/I-70 Site. Reduction in soil pica behavior would reduce the risk of these other health effects. Alternative 3 would also minimize short-term risks.

Alternative 2 may provide a similar level of protection compared to Alternative 3, but there is some uncertainty associated with the tilling/treatment component to address soils with lead EPCs above 540 ppm. Uncertainties are associated with the effect of tilling on surface soil concentrations. This uncertainty remains because concentration profiles were not generated with depth or in different yard locations for the target properties, and therefore the resultant lead concentrations in surface soil after tilling are difficult to predict. Also, the effectiveness of phosphate treatment is uncertain. This is because site-specific testing would be required to determine the chemical form and application rate necessary to achieve the preliminary remediation goals for lead in soil; and would delay implementation of this alternative for at least a year.

Alternative 4 differs from Alternative 3 by adding soil removal from properties with arsenic concentrations greater than 128 ppm. This alternative was developed and evaluated at the request of CDPHE. Specifically, CDPHE requested that EPA develop alternatives that would protect residents from cancer risks greater than a range of 3×10^{-5} to 8×10^{-5} to be consistent with cleanup objectives at the adjacent ASARCO Globe Site. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic EPC of 128 ppm corresponds to a point estimate risk level of 8×10^{-5}. Alternative 4 is as protective as Alternative 3 (and may be more protective) of overall human health and environment since it removes soil where predicted risk is lower.

Alternative 5 would provide the highest level of overall protection of human health because soils with arsenic and lead levels above 47 ppm and 208 ppm respectively would be removed.

Alternative 6 differs from Alternatives 2, 3, and 4 by adding soil removal from properties with arsenic EPCs greater than 70 ppm and/or lead EPCs greater than 400 ppm. This alternative was developed and evaluated in response to comments received on the May 2002 Proposed Plan. Those comments requested an explanation of why EPA was not considering removing soil from properties where arsenic exceeds 70 ppm as was done at the ASARCO Globe Site and where lead exceeds 400 ppm to be consistent with EPA's screening level for lead in soil. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic EPC of 70 ppm corresponds to a point estimate risk level of 5×10^{-5}. Alternative 6 would provide a higher level of long-term protection when compared to Alternatives 2, 3 and 4 because soils with arsenic and lead levels above 70 ppm and 400 ppm respectively would be removed, but would provide a somewhat lower level of long-term protection when compared to Alternative 5 because of the potential risk to children with soil pica behavior.

1.10.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

All of the remedial alternatives, except Alternative 1, evaluated in the comparative analysis would be expected to comply with ARARs identified in Tables 15, 16, and 17. ARARs related to the generation of fugitive dust and lead concentrations in ambient air would be applicable to the range of engineering actions

TABLE 15

SUMMARY OF POTENTIAL CHEMCIAL-SPECIFIC ARARs

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/I-70 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.
Resource Conservation and Recovery Act (RCRA), Subtitle C	No	Yes	40 CFR Part 264	Provides regulation of hazardous waste.	Although RCRA Subtitle C is not generally applicable to mining related wastes, it may be relevant and appropriate if the VB/I-70 excavated soils fail EPA's Toxic Characteristics Leachability Procedure. If the soils do fail EPA's TCLP, soils will be disposed of in an off-site RCRA Subtitle C facility.
Colorado Air Pollution Prevention and Control Act	Yes No	 Yes	5 CCR 1001-14 5 CCR 1001- 3 Regulation No. 1	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS. Regulation No. 8 sets emission limits for	Construction activities associated with potential remedial actions at the Site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
			5 CCR 1001-10Part C (I) Regulation No. 8	lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the Site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 16
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
Resource Conservation and Recovery Act (RCRA), Subtitle D	Yes		40 CFR 257	Facilities where treatment, storage, or disposal of solid waste will be conducted must meet certain location standards. These include location restrictions on proximity of airports, floodplains, wetlands, fault areas, seismic impact zones, and unstable areas.	Applicable to any on-site repository constructed or to any existing off-site facility that receives these solid wastes.
Executive Order No. 11990 Protection of Wetlands	Yes		40 CFR § 6.302(a) and Appendix A	Minimizes adverse impacts on areas designated as wetlands.	Will be applicable if soil repository receiving the VB/I-70 soils is located in wetlands or has the potential to impact adjacent wetland areas.
Executive Order No. 11988 Floodplain Management	Yes		40 CFR § 6.302(a) and Appendix A	Pertains to floodplain management and construction of impoundments in such areas.	Will be applicable if soil repository receiving the VB/I-70 soils is located in floodplain.
Section 404, Clean Water Act (CWA)	Yes		33 USC 1251 et seq. 33 CFR Part 330	Regulates discharge of dredged or fill materials into waters of the United States.	Will be applicable if soil repository receiving the VB/I-70 soils is located in wetlands or has the potential to impact adjacent wetland areas.
Endangered Species Act	Yes		16 USC § 1531 et seq.; 50 CFR 200 and 402	Provides protection for threatened and endangered species and their habitats.	Due to the urban nature of the Site, threatened or endangered species are highly unlikely to be present. However, the Act would be applicable if endangered or threatened species were identified and affected by the selected remedial alternative.
Wilderness Act	No	No	16 USC 1311; 16 USC 668; 50 CFR 53; 50 CFR 27	Limits activities within areas designated as wilderness areas or National Wildlife Refuge Systems.	These types of areas are not present at the Site and therefore the Act is not an ARAR.

TABLE 17
POTENTIAL ACTION-SPECIFIC ARARS

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments
State Solid waste Regulations	Yes		6 CCR 1007-2, Section 1 6 CCR 1007-2, Section 2 6 CCR 1007-2, Section 3	These regulations provide the location, design, operating, closure, post-closure and maintenance criteria and requirements for facilities or sites receiving solid wastes.	Applicable to alternatives where contaminated soil is excavated and disposed in either an on-site or off-site facility. All substantive provisions of the State solid waste regulations will be met during the implementation of the remedial action. A permit or certificate of designation, however, will not be required for any on-site soil repository pursuant to CERCLA Section 121(e).
Determination of hazardous waste.	Yes		6 CCR 1007-3 Part 262.11 6 CCR 1007-3 Part 261.24	Wastes generated during soil excavation activities must be characterized and evaluated according to the following method to determine whether the waste is hazardous. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 milligrams per liter. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 milligrams per liter.	Applicable to alternatives where contaminated soil is excavated and disposed.
Disposal of excavated soils at the Globe Plant site.	Yes		CRS Sec. 25-15-320	An environmental covenant with the State of Colorado is required for any environmental remediation project in which the relevant regulatory authority makes a remedial decision on or after July 1, 2001, that would result in either or both of the following:	Applicable to alternatives where excavated soil is disposed at the Globe Plant site.

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments
				(a) Residual contamination at levels that have been determined to be safe for one or more specific uses, but not all uses; or (b) Incorporation of an engineered feature or structure that requires monitoring, maintenance, or operation or that will not function as intended if it is disturbed.	
State of Colorado v. ASARCO Consent Decree	No	No	CV 83-C-2383 (1993)	The work plan accompanying this legal document establishes cleanup criteria for the Globe Plant Site that may be useful in developing the plan for placement of VB/I-70 soil if this receiving facility is chosen.	To-Be-Considered for alternatives where excavated soil is disposed at the Globe Plant Site to ensure the remedies are consistent.

under evaluation. Although the potential exists for dust generation during soil tilling and excavation, and transport and backfilling activities, engineering controls would be readily implementable and effective to achieving compliance with the applicable regulations. ARARs relating to the characterization, transport and disposal of solid wastes would be applicable for excavated soils and would be met by standard construction and transportation practices. All alternatives (except the No Action Alternative) have common ARARs which will be met during implementation.

1.10.3 Short-Term Effectiveness

Alternative 3 provides the highest level of short-term effectiveness. Soil removal actions could be quickly and effectively implemented with less risk to workers or the community than Alternatives 4, 5, and 6. Implementation of the Community Health Program would be effective in the short term due to the components of education, biomonitoring, soil sampling and analysis, and response actions when warranted.

Consistent with the NCP (40 CFR Part 300), the evaluation of short-term effectiveness also considered the environmental impacts of soil removal actions, specifically water use required to establish grass cover in remediated yards. Watering of replacement lawns and plants is a critical component of soil removal actions. The Denver area is a semi-arid environment subject to occasional drought conditions. Watering restrictions, which have been imposed in the recent past, could impact implementability by delaying the establishment of grass cover. Soil removal actions within the adjacent Globeville neighborhood required an estimated 9.35 gallons of water to establish one square foot of replacement sod. An average yard in VB/I-70 OU1 has an estimated 5,200 square foot area of soil (EPA 2001d). Assuming that 70% of the soil area is sod, approximately 50,000 gallons of water would be required to establish sod at a typical property. Based on these assumptions, Alternative 3 would require 10 million gallons of water to implement.

Alternative 2 could be implemented with less risk to workers and the community than Alternatives 3, 4, 5, and 6. However, Alternative 2 provides a slightly lower level of short-term effectiveness than Alternative 3, primarily because tilling/treatment actions would be delayed while treatability testing was performed. Further, there would be some uncertainties about the immediate effectiveness of the tilling/treatment activities due to lack of data on lead concentrations with depth and at different locations in the targeted yards. Alternative 2 would require an amount of water equal to that required under Alternative 3.

Alternative 4 provides a slightly lower level of short-term effectiveness than Alternative 3. The additional soil removals at properties with arsenic EPCs greater than 128 ppm as provided in Alternative 4 would entail greater risks to the community due to the operation of heavy equipment in residential areas over a longer period of time and to truck traffic associated with transportation of excavated soil and import of clean backfill through neighborhood streets. Alternative 4 would require an estimated 20 million gallons of water to implement. This is twice as much water as estimated would be required by Alternatives 2 and 3.

Alternative 6 provides a lower level of short-term effectiveness than Alternative 4, primarily because additional soil removals at properties with arsenic EPCs greater than 70 ppm and with lead EPCs greater than 400 ppm would entail greater risks to the community. Increased short term risks are due to the larger scope of soil removal, which would require transportation of a larger volume of excavated soil and clean

backfill through neighborhood streets by truck. Alternative 6 would require an estimated 43 million gallons of water to implement. This amount is 4 times as much water as estimated would be required by Alternatives 2 and 3.

Alternative 5 would provide the lowest level of short-term effectiveness because of increased risks to workers and the community due to the prolonged operation of heavy equipment in the residential areas. There would also be increased risk to the community from truck traffic associated with transportation of the largest volume of excavated soil and import of clean backfill (approximately 43,000 truck trips would be required). Alternative 5 would require an estimated 106 million gallons of water to implement. This amounts to 10 times more water than is estimated would be required by Alternatives 2 and 3. An additional consideration is that Alternative 5 does not include a Community Health Program component and so it is uncertain whether it would be effective in achieving the third RAO for arsenic in soil.

1.10.4 Long-Term Effectiveness and Permanence

To the extent that unacceptable health risks are associated with exposure to soil with high levels of arsenic and lead, Alternative 5 would provide the highest level of long-term protection and permanence because soils would be removed from the most properties, reducing the risk for the most people. Alternatives 6, 4, 3, and 2 would provide, in decreasing order, lower levels of long-term protectiveness. Alternative 2 would also provide slightly less long-term effectiveness compared to the alternatives with soil removal since the effectiveness of tilling and treatment is less certain than soil removal.

For arsenic, potential health risk where arsenic EPCs are below 240 ppm is associated with soil pica behavior. Screening level calculations suggest that removing and replacing soil below 240 ppm will not effectively protect children from the risk of acute effects since under at least one set of assumptions, the acute HQ is greater than 1 at background levels of arsenic. Also, children with soil pica behavior are at risk of experiencing other health risks unrelated to arsenic that will not be addressed by removing and replacing soil.

In the case of lead, Alternative 5 may not provide the highest overall protection since, in OU1, it is likely that there are other, non-soil sources of lead (such as lead-based paint), which would not be evaluated and addressed. Alternatives 2, 3, 4, and 6 would provide an equal level of long-term effectiveness by addressing soils with lead or arsenic EPCs above preliminary action levels of 240 ppm arsenic and 540 ppm lead by tilling and treatment and/or removal. The benefit of Alternatives 2, 3, 4, and 6 are that risks associated with non-soil sources of lead and with soil pica behavior would be effectively addressed by implementation of a Community Health Program under these alternatives. The additional benefit of the Community Health Program is that it would provide the community a mechanism to identify sources of lead exposure other than soils, and a means of addressing them (e.g., through lead paint abatement). Abatement of lead-paint would be accomplished by referral to another program. The Community Health Program would also provide a program to reduce the likelihood of soil pica behavior in children within VB/I-70 OU1 neighborhoods.

1.10.5 Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 3, 4, 5 and 6 do not contain a treatment component. Therefore, Alternative 2 would result in

the highest reduction of toxicity and mobility due to treatment. However, there are uncertainties associated with the treatment process in achieving long-term RAOs. Site-specific testing would have to be performed to evaluate the chemical form and application rate of phosphate and to evaluate the overall treatment effectiveness once implemented.

1.10.6 Implementability

Alternatives 3, 4, 5 and 6 would be readily implementable with standard equipment and services, and adequate personnel would be readily available for this type of work. The construction technologies required to implement these alternatives are commonly used and widely accepted. For Alternative 2, tilling of residential soils may be difficult to implement. Areas of accessible soils within yards are relatively small and typically have features such as trees or large shrubs, which would make access and implementation of deep tilling difficult unless the features were removed and replaced. It is likely that due to access constraints, tilling would have to be performed using rototillers, which typically have a working depth of about 6 inches. Lead concentrations at depth have not been generated for the target properties and if deeper tilling were found to be necessary to meet the RAOs, tilling would be difficult to implement.

1.10.7 Cost

Estimated costs for each alternative considered in the comparative analysis are shown below. These costs include direct and indirect capital costs and review costs for 30 years (there are no operation and maintenance costs associated with any of the alternatives).

Remedial Alternative	Net Present Worth Cost (Millions)
Alternative 2	10.6
Alternative 3	11.1
Alternative 4	17.5
Alternative 5	61.0
Alternative 6	31.1

The costs would be reduced by 10 to 15 percent if the excavated soils were placed on the Globe Plant Site.

1.10.8 State Acceptance

The State of Colorado supports the selected remedy, Alternative 6, as described in the New Proposed Cleanup Plan (May 2003). The State has worked closely with EPA and the community during the evaluation of cleanup options for the VBI70 Site and in the development of this Record of Decision. The State supports this cleanup because it is consistent with CERCLA and the NCP. The State also notes EPA's selected remedy for OU1 of the VB/I-70 Site is consistent with the remedy and cleanup levels implemented at the adjacent, State-lead ASARCO Globe Site. Further, Alternative 6 directly addresses community concerns and offers a reasonable balance of cost and benefit for the citizens of Colorado.

1.10.9 Community Acceptance

EPA conducted two public comment periods prior to issuing this Record of Decision. The first Proposed

Plan was issued in May 2002 and considered Alternatives 1 through 5. During the public comment period associated with the Proposed Plan, EPA received extensive comment requesting that an alternative with lower arsenic and lead soil action levels than included in the preferred alternative, Alternative 4, be considered. Community representatives who participated in the VB/I-70 Working Group often expressed concern about the potential health effects of exposure to multiple chemicals in their immediate environment. This concern is related to the EJ nature of the Site, i.e., the community is disproportionately affected by environmental impacts from many sources other than the lead and arsenic in residential soils. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluated a new alternative, Alternative 6, which considered lower soil action levels. A revised Proposed Plan was issued in May 2003. During the public comment period associated with the revised Proposed Plan, extensive comment was received supporting Alternative 6, the revised preferred alternative. EPA selected Alternative 6 based on the overwhelming community support and acceptance for it.

Table 18 contains a summary of the comparative analysis of Alternatives 2 through 6.

TABLE 18
SUMMARY OF THE COMPARATIVE ANALYSIS

Evaluation Criterion	Alternative 2 Community Health Program, Tilling/Treatment (Lead), Targeted Removal and Disposal (Arsenic)	Alternative 3 Community Health Program, Soil Removal and Disposal	Alternative 4 Community Health Program, Soil Removal and Disposal	Alternative 5 Removal And Disposal	Alternative 6 Community Health Program, Soil Removal and Disposal
Threshold Criteria					
Overall Protection of Human Health	Yes, however there is some uncertainty with respect to treatment/tilling component	Yes	Yes	Yes, however there is uncertainty with respect to preventing acute exposures associated with soil pica behavior	Yes
Compliance with ARARs	Yes	Yes	Yes	Yes	Yes
Primary Balancing Criteria					
Short-Term Effectiveness	Less than Alternative 3 because implementation would be delayed to allow for treatability testing of tilling/phosphate treatment component and because of uncertainties associated with effectiveness of tilling/treatment	Highest level of short-term effectiveness	Less than Alternative 3 because of risks associated with soil removal for additional properties, and the use of additional water for replacement lawns	Lowest level of short-term effectiveness because of risks associated with soil removal for the most properties and the use of the most water for replacement lawns	Less than Alternative 4 because of risks associated with soil removal for additional properties and the use of additional water for replacement lawns
Long-Term Effectiveness and Permanence	Yes, however there is uncertainty regarding the effectiveness of tilling	Yes	Yes	Yes, however it would not provide information on other sources of lead. Would not reduce or prevent soil pica behavior.	Yes
Reduction of Toxicity, Mobility or Volume Through	Yes, but there is uncertainty regarding the effectiveness of tilling	No	No	No	No

Evaluation Criterion	Alternative 2 Community Health Program, Tilling/Treatment (Lead), Targeted Removal and Disposal (Arsenic)	Alternative 3 Community Health Program, Soil Removal and Disposal	Alternative 4 Community Health Program, Soil Removal and Disposal	Alternative 5 Removal And Disposal	Alternative 6 Community Health Program, Soil Removal and Disposal
Treatment					
Implementability	Yes, however studies are first required before the action can be designed	Yes	Yes	Yes	Yes
Cost	$10.6 million	$11.1 million	$17.5 million	$61.0 million	31.8 million
Modifying Criteria					
State Acceptance	No	No	Yes	No	Yes
Community Acceptance	No	No	No	Yes	Yes

1.11 Principal Threat Waste

The NCP states that, in general, "EPA expects to use treatment to address the principal threats posed by a site, whenever practicable." Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials" (40 CFR 300.430(a)(1)(iii)(A)). Contaminated soils at OU1 of the VB/I-70 Site are not considered contaminated with high concentrations of arsenic and lead, and these metals are relatively immobile in the environment. Therefore treatment of the OU1 soils is not expected by the NCP.

1.12 Selected Remedy

Based on the Comparative Analysis of Alternatives, the remedy selected for OU-1 of the VB/I-70 Site is Alternative 6. State and Community Acceptance were the overriding factors in selecting Alternative 6 as the remedy. The selected remedy consists of 3 components, a Community Health Program, soil removal, and sampling. A detailed description of each component of the remedy follows.

1.12.1 Community Health Program

The Community Health Program is composed of two separate, yet partially overlapping, elements. The first element will address risks to area children from non-soil sources of lead and from lead in soils above the action level of 400 ppm. The second element would be designed to address children with soil pica behavior to reduce their risks to arsenic in soil above 47 ppm, the preliminary action level determined in the Baseline Risk Assessment for children with soil pica behavior. Participation in one or both elements of the program would be strictly voluntary, and there would be no charge to eligible residents and property owners for any of the services offered by the Community Health Program. The Community Health Program will be implemented on an ongoing basis until the residential soil removal portion of this remedial action has been completed. Each of these two main elements of the program is described below.

Community Health Program - Lead Exposure Risk Reduction

The program for reduction of lead risks is intended to be general. That is, it is intended to assess risks from lead from any and all potential sources of exposure, with response actions tailored to address the different types of exposure source that may be identified. The lead program will consist of three main elements:

1. Community and individual education about potential pathways of exposure to lead, and the potential health consequences of excessive lead exposure,

2. A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure, and

3. A program that provides a response to any observed lead exposure that is outside the normal range. This response will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure. If the source of lead is found to be from residential soils, the property will receive a high priority for soil removal. If the main source is judged to be non-soil

related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

Community Health Program - Arsenic Exposure Reduction, Soil Pica Behavior

The Community Health Program for arsenic is designed to focus specifically on the potential risks to young children that exhibit soil pica behavior. Pica behavior is a rare behavior which children intentionally eat unusually large amounts of soil. The program for arsenic will consist of three main elements:

1. Community and individual education about identification and potential hazards of soil pica behavior and the potential health consequences of excessive acute oral exposure to arsenic.

2. A biomonitoring program by which any child may be tested to evaluate actual soil pica exposure to arsenic.

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

1.12.2 Soil Removal

Soil removals will occur at properties that have lead or arsenic soil concentrations greater that the action levels. The action level for lead is exceeded when the average lead concentration from the three composite soil samples taken from the property is greater than 400 ppm. The action level for arsenic is exceeded when the highest arsenic concentration from the three composite soil samples taken from the property is greater than 70 ppm.

For properties which soil removal is conducted, all accessible soils will be removed to a depth of 12 inches. The excavation depth may be reduced in order to prevent damage to large trees or structures.

At the homeowner's request, flower beds and vegetable gardens may be sampled individually. If the concentrations of lead and arsenic in the flower beds or vegetable gardens are found to be below the action levels, then soil removal is not required in these areas. This is the only situation where a partial soil removal could occur at a property.

The excavation areas will be backfilled with clean soil containing arsenic and lead concentrations at or below action levels, and pre-remediation yard features restored. If sprinkler systems are present, the system will be removed and reinstalled. Based on Remedial Investigation data, it is estimated that soil removal would occur at a total of 853 residential properties within VB/I-70 OU1 (508 properties for arsenic only, 108 properties for both lead and arsenic, and 237 for lead only).

All excavated soils will be transported to a local solid waste landfill where they may be used as daily cover material. Alternatively, soils could be placed at the ASARCO Globe Plant Site to be used as cover and grading consistent with the provisions of the Statement of Work as set forth in the Final Consent Decree pursuant to State of Colorado vs. ASARCO, Civ. Action No. 83-C-2383 or as otherwise approved by the State. For purposes of this remedial action, and consistent with Section 300.400(e)(1) of the NCP, EPA has determined that the ASARCO Globe Plant is a suitable area in very close proximity to the contamination, which is necessary for the implementation of the response action. Further, since EPA notes that the ASARCO Globe Plant and the adjacent VB/I-70 OU1 neighborhoods are "reasonably related on the basis of geography", and since "the basis of threat or potential threat to the public welfare or welfare of the environment" are similar (i.e., smelter wastes containing, among other constituents, arsenic and lead), EPA has elected to treat the contiguous ASARCO Globe Plant as part of the VB/I-70 Site for remediation purposes. Accordingly, a permit is not required for EPA to dispose of residential soil removed from yards within the Cole, Clayton, Swansea, or Elyria neighborhoods at the ASARCO Globe Plant. See, CERCLA Section 121(e). EPA also notes that depositing the VB/I-70 residential soils at the ASARCO Globe Plant will be protective of human health and the environment, will comply with all ARARs for the remedy selected at VB/I-70 OU1, and will accelerate the cleanup at that portion of the ASARCO Globe Site. Lastly, EPA believes disposal of the VB/I-70 residential soil at the ASARCO Globe Plant will enhance its prospects for future reuse as a commercial or recreational facility. Land use restrictions and/or controls will be imposed on the ASARCO Globe Plant to ensure that the soils deposited there as part of this cleanup will not pose a future risk in the event the Plant's current land use changes. EPA will decide whether to place the soils removed from the VB/I70 residences in an off-site receiving facility or the ASARCO Globe Plant after obtaining public input from members of the Globeville community. The State's concurrence is contingent upon acceptance of the plan by the Globeville community. The State will be the lead agency for the soil placement and remediation of the ASARCO Globe Plant Site.

1.12.3 Sampling Program

Prior to this Record of Decision, approximately 75% of the residential properties within the VBI-70 Site boundary had been sampled for lead and arsenic. Because the spatial pattern of lead and arsenic contamination is variable throughout the Site, it is not possible to assess if a specific property requires a soil removal without data from that property. Therefore, a program of on-going soil sampling will be implemented at residential properties within the Site boundaries that have not already been adequately tested. This sampling program will continue through the completion of the soil removal portion of this remedy.

Soil sampling will also occur in a residential area adjacent to the Remedial Investigation study area not previously sampled. Data collected from the Remedial Investigation suggest this area may have been impacted by historic smelter emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if the soil is impacted by smelter related lead contamination and if soil removals are required.

The soil sampling program will begin with the identification of properties that require sampling. Once access has been obtained from the property owner to conduct the sampling, soil samples will be collected from the property and analyzed for lead and arsenic. The results will be provided to the property owner and

evaluated to determine if a soil removal is needed. If a soil removal is needed, the property will be referred to the contractor conducting the soil removal.

1.13 Statutory Determinations

The Selected Remedy meets the mandates of CERCLA § 121 and the National Contingency Plan. The remedy is protective of human health and the environment. It complies with all Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy for OU1 of the VB/I-70 Site does not satisfy the statutory preference for treatment as a principal element of the remedy because the large volumes of soils contaminated with low levels of lead and arsenic can not be treated cost effectively, and treatment was not acceptable to the community.

If VB/I-70 soils are disposed of at the ASARCO Globe Plant, a 5-Year Review will be required. If the soils are disposed of off-Site, this remedy will not result in hazardous substances, pollutants or contaminates remaining on-Site above levels that allow for unlimited use and unrestricted exposures, and a 5-Year Review will not be required.

1.14 Documentation of Significant Changes

During the public comment period associated with the May 2002 Proposed Plan, EPA received extensive comment requesting that an alternative with lower lead, and to a lesser extent arsenic, soil action levels than included in the preferred alternative, Alternative 4, be considered. In response to public comment, EPA prepared an addendum to the feasibility study to develop and evaluate a new alternative, Alternative 6, which considered soil removal action levels at properties with lead and/or arsenic concentrations of 400 ppm and 70 ppm, respectively. As a result of public comment on the original proposed plan, EPA decided to propose the new alternative as the preferred alternative. The Colorado Department of Public Health and Environment concurred with this decision. In compliance with statutory requirements for ensuring the public has the opportunity to comment on major remedy selection decisions, a new proposed plan was prepared presenting the new preferred alternative. The second proposed plan was made available to the public for comment in May 2003. No significant changes were made to the new proposed remedy.

2.0 RESPONSIVENESS SUMMARY

2.1 Stakeholder Comments and Lead Agency Responses

EPA conducted two public comment periods prior to issuing this Record of Decision. In May 2002, the original proposed plan was issued. A 60-day public comment period was held on this Proposed Plan that lasted from May 20, 2002 to July 19, 2002. Due to extensive comments received by EPA during this first public comment period requesting EPA consider a new alternative, EPA revised the Proposed Plan including a new alternative, Alternative 6. Alternative 6 was presented as the preferred alternative in the revised Proposed Plan, which was issued to the public in May 2003. Due to the significant changes to the preferred remedy, a 30 day public comment period was held on the revised Proposed Plan lasted from May 28 through June 26, 2003.

During the public comment periods, there were many comments provided on the May 2002 and May 2003 Proposed Plans. The comments had common themes addressing various elements of the selected remedies, and accordingly, have been summarized in accordance with these themes in order to provide an overall response. The comment summaries for each Proposed Plan and EPA's responses are provided herein.

2.1.1 May 2002 Proposed Plan

Public comments were provided orally at three public meetings, and also in writing. The three public meetings held were:

- Harrington Elementary School on 6/20/02
- Swansea Recreation Center on 6/22/02
- St. Charles Recreation Center on 6/29/02

A public comment period was held from May 28 through June 26, 2003 on the May 2002 Proposed Plan. The following is a summary of the written and oral comments received during the public period and EPA's responses to the comments.

1. *Although there were several commentors who agreed with the clean up goals of Alternative 4, the preferred alternative, there were concerns that the cleanup goals for Alternative 4 were not sufficiently protective, and conversely, that the cleanup goals for Alternative 4 were over protective.*

Available information from the Baseline Human Health Risk Assessment and other EPA studies indicates that below 240 ppm arsenic and 540 ppm lead, soil is not a major source of exposure and risk at OU1. The arsenic level represents a cancer risk of 10^{-4}, which is within the CERCLA risk range of 10^{-6} to 10^{-4} for a final remedy. These arsenic and lead cleanup goals define the remedial actions for Alternatives 2 and 3, and cleanup to lower levels on the basis of risk is not warranted. Alternative 4 differs from these alternatives by adding soil removal from properties with arsenic concentrations greater than 128 ppm. This alternative was developed and evaluated at the request of CDPHE. Specifically, CDPHE requested that EPA develop alternatives that would protect residents from cancer risks greater than a range of 3×10^{-5} to 8

x 10^{-5} to be consistent with cleanup objectives at the adjacent ASARCO Globe Site. Based on the findings of the Baseline Human Health Risk Assessment, an arsenic Exposure Point Concentration (EPC) of 128 ppm corresponds to a point estimate risk level of 8 x 10^{-5}. The State of Colorado and several members of the community and the City and County of Denver supported the selected remedy, Alternative 4. State and community acceptance are important evaluation factors in remedy selection. However, because of additional community concerns regarding the cleanup goals of Alternative 4, a new alternative (Alternative 6) was developed and presented in the May 2003 Proposed Plan. Alternative 6 was chosen as the preferred alternative (see response to comment 1 for the May 2003 Proposed Plan).

2. *A few commentors were concerned over exterior lead-based paint continuing to cause lead contamination of the soil, and were concerned over interior lead-based paint and other sources of lead, e.g., lead pipes.*

A key component of the Community Health Program (if a child has abnormal blood lead levels) is that all potential sources of lead at the child's property would be sampled, including soil and interior/exterior paint. If soil lead sampling results demonstrate that a soil removal is required, EPA will make the soil removal at that property a priority. If the main source is judged to be non-soil related, responses may include approaches such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior lead-based paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

3. *Several commentors expressed concern over the adequacy of the Community Health Program. Concerns included: the need to see a comprehensive community-based health program with biomonitoring so that the source of lead contamination can be determined for individuals; performance of a health study on the effect of exposure to arsenic contaminated soil to address the protectiveness of the arsenic standard; provision of adequate funding of the program to be successful (funds are insufficient - only one 3/4 time person for 4000 homes); and provision of appropriate outreach services to educate the community on these environmental health hazards.*

The Community Health Program addresses risks to area children from non-soil sources of lead. Also, it addresses children with soil pica behavior to reduce their risks to arsenic in soil. The program will consist of three main elements:

- Community and individual education about potential pathways of exposure to lead and arsenic, the potential health consequences of excessive lead and arsenic exposure, and identification of soil pica behavior;

- A biomonitoring program by which any child (up to 72 months old) may be tested to evaluate actual exposure to lead or arsenic; and

- A program that provides a response to any observed lead or arsenic exposure that is outside the normal range. This will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure. If the source of lead or arsenic is found to be from residential soils, the property will receive a high priority for soil removal. If the main

source is judged to be non-soil related, responses may include education, counseling, and/or referral to environmental response programs offered by other agencies.

The budget for the Community Health Program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

4. *Several residents expressed concern that cancer or other illnesses they have contracted are a result of the lead and arsenic soil contamination on their properties.*

Contracting cancer or other illnesses by virtue of living in the area and being exposed to arsenic and lead in the soil is unlikely. The Baseline Human Health Risk Assessment indicates that no further action at the Site would be effective in preventing exposures to arsenic in soil above a $1x10^{-4}$ lifetime cancer risk, a chronic hazard quotient greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. With regard to lead (a non-carcinogen), when the IEUBK model is run using recently published data on soil ingestion rates for children, and the site-specific relative bioavailability and Site-specific soil/dust ratio adjustments are used, adequate protection is provided without further action at the site. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that remedial action may be necessary to meet the blood lead remedial action objective. Although there is a possibility that contracting an illness is related to exposure to lead and arsenic in the soil, the analyses that have been performed indicate that the possibility is very low.

5. *Several residents expressed concern that soil testing at untested properties and cleanup activities are moving too slowly.*

In 1997, CDPHE requested EPA's assistance in immediately responding to elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods. In response to the 1997 request from CDPHE, EPA immediately began work on what would become the VB/I-70 Site. EPA's first action at the Site was to mobilize an Emergency Response team to direct an extensive soil sampling effort and time critical removal actions in the area. The Emergency Response included an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties that were potential time critical removal candidates (remove and replace soil). The sampling occurred during March and April 1998. In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action for 37 properties. EPA then proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for a long-term response, EPA began the Remedial Investigation/Feasibility Study (RI/FS) in August 1998 as removal activities were underway. The RI/FS process was completed with the issuance of a Proposed Plan in May 2002. Because of community concerns regarding the preferred alternative in the Proposed Plan, a new Proposed Plan was issued in May 2003. EPA feels it has moved as expeditiously as possible while meeting all statutory requirements and the needs of the community.

6. *There were a few concerns that the extent of arsenic and lead contamination in soil has not been determined.*

In response to this concern, soil sampling will also occur in a residential area adjacent to the study area not previously sampled. Data collected to date suggest this area may have been impacted by historic smelter

emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if soil removals are required and if the extent of the smelter related lead contamination extends further to the south of this area.

7. *One resident of the neighborhood was upset that there was no disclosure of contamination in the soil when he purchased the property.*

EPA has tried to inform all residential landowners within the Site of the sampling results of their properties. However, nothing in the Superfund law requires EPA or a seller to disclose this information to someone seeking to buy properties within a Superfund site. State or local real estate laws or practices may cover this disclosure. EPA nonetheless is committed to working with all residential landowners, whether they bought their properties before the area became a Superfund site or after, to make sure the property, if it needs it, is cleaned up to landowner's satisfaction.

8. *A comment was made that twice as many properties could be cleaned up if only 6 inches of soil were removed rather than the 12 inches as proposed in the preferred remedy.*

During the Remedial Investigation, soil samples were collected at several locations at two-inch depth intervals from 0 to 12 inches total depth. While this data demonstrated that the highest concentrations of lead and arsenic occur in the 0 – 2 inch depth, levels of lead and arsenic above the clean up levels selected in this Record of Decision could be present at 6 inches depth. At 12 inches depth, the concentrations would likely be below the clean up levels established in this Record of Decision.

9. *One resident was concerned about breathing fugitive dust during cleanup operations.*

EPA is required to meet all applicable laws, including fugitive dust regulations, when it implements the remedy. The remediation contractor will conduct all remedial activities in accordance with these laws and a Health and Safety Plan that describes the health and safety requirements and guidelines designed to protect workers and other potentially exposed individuals. The plan will be designed to identify, evaluate and control health and safety hazards at the properties, and will follow promulgated EPA and OSHA regulations and industry standards. The plan will include an air monitoring and dust suppression programs which will be implemented during construction.

10. *Several comments were made with respect to the adequacy of the Environmental Justice (EJ) program for the Site. There were references to the cleanup not being more aggressive than at any other Superfund site, that the residents are not being heard or are being treated unfairly, and that EPA has had a demeaning attitude to some citizens at times.*

In August 1998, EPA formed a Working Group of stakeholders to provide an open forum for discussing all technical aspects of EPA's investigation, including the risk assessment and eventual cleanup alternatives. Through the working group, data and issues were discussed, allowing for community input into decision-making throughout the development and implementation of the remedial investigations, risk assessment, and feasibility study. The group has been meeting monthly since August 1998. The Working Group is EPA's response to the EJ concern of providing community members open and equal access to decision makers in EPA Region 8's Superfund Program. All aspects of EPA's remedial activities at the VB/I-70 site have been discussed in the Working Group forum to address the community's desire to have a voice in decisions that directly affect them. This level of community participation is much greater than at other non-EJ Superfund Sites. Also, community input was a significant factor in lowering the cleanup standards from

those in Alternative 4 to those in Alternative 6, the preferred alternative. EPA apologizes if the views expressed by employees or contractors were interpreted as demeaning. The views of the citizens within the Site are very important to EPA, and we try to address those concerns as best we can given the legal and financial constraints imposed on us by the Superfund program.

11. *There were many requests for information that was not readily available, and some concerns that the Feasibility Study was missing some information on the Site's physical characteristics, the form of arsenic in the soil, and that the Site is part of the Environmental Justice program.*

EPA has strived to provide all information requested by the public. Although the Feasibility Study may not have provided all the information identified by the commentor, it did provide sufficient information to develop and evaluate the alternatives in accordance with CERCLA guidance.

12. *A few members of the public requested an extension to the public comment period.*

The public comment period was not extended for the revised Proposed Plan because of the amount of public comment already received by EPA on both Proposed Plans for the Site. Further, EPA tried to accommodate the other public comments requesting an acceleration of the cleanup work. Given these competing comments and interests, EPA thought it appropriate not to extend the public comment period.

13. *A few commentors disagreed that properties where there are no children, or properties that include 4 or more dwellings would not be cleaned up regardless of the contamination.*

All properties - single family, multi-family, and apartments will be remediated where arsenic and lead are above the cleanup levels. This action will protect children that may move into these homes and live there in the future.

14. *One commentor requested that xeriscape should be offered as an alternative to conventional landscaping because of the drought condition in the Denver area.*

EPA will develop a landscaping plan with each property owner prior to soil removal. The landscaping plan will reflect the property owners' preferences. In developing this plan, the homeowner will be provided with xeric alternatives such as wood mulch and rock landscaping materials instead of sod.

15. *One commentor was concerned with road damage from the construction traffic, and who would be responsible for repairs?*

Any road damage that occurs as a result of the remedial activities implementing this ROD will be repaired and funded by EPA.

16. *The arsenic slope factor of $(1.5\ mg/kg\text{-}day)^{-1}$ has been in the IRIS database since 1988. Data from current National Research Council reports, that are the basis for the new arsenic Maximum Contaminant Level (MCL) of 10 µg/l, indicate a slope factor of $(7.0\ mg/kg\text{-}day)^{-1}$ is more appropriate, and should be both qualitatively and quantitatively discussed in the Baseline Human Health Risk Assessment.*

As discussed in the Baseline Human Health Risk Assessment, the current oral slope factor for arsenic $(1.5\ (mg/kg\text{-}d)^{-1})$ is based on skin cancer only. EPA recognizes that although arsenic does increase the risk of several other types of cancer (namely, those of the urinary bladder and lung), this slope factor is not necessarily inappropriate. If cancers of the lung and bladder are very unlikely to occur in an individual that

does not also develop skin cancer, then the slope factor for skin cancer and for all cancers combined are essentially identical. Several alternative approaches for quantification of cancer risk at low doses have been reviewed by the (NRC 1999). It was noted that the risk estimates depend heavily on the mathematical approach employed as well as the cancer data set utilized. For example, based on the incidence of urinary bladder cancer in males in Taiwan, several different methods yielded estimates of the EC01 (the concentration in water that results in a 1% increase in excess lifetime cancer risk) of about 400 - 450 µg/L. If the dose response curve is assumed to be linear and to have no threshold, this corresponds to an oral slope factor of about 0.8 - 0.9 $(mg/kg\text{-}day)^{-1}$, slightly lower than the EPA value that is based on skin cancer.

Additionally, several alternative risk models have been used to analyze urinary bladder and lung cancer incidence in the Taiwanese populations exposed to arsenic-contaminated drinking water (Morales *et al.* 2000). After reviewing these models and consulting with the authors, EPA concluded that a concentration of 10 µg/L in water would yield estimates of excess cancer risk of 0.6E-04 to 3.0E-04 for an average individual and from 1.3E-04 to 6.1E-04 for an individual at the 90th percentile of the risk distribution (EPA 2001d). These risk estimates are similar to the risk estimates derived previously by USEPA and by (NRC 1999). Therefore, the current slope factor of 1.5 $(mg/kg\text{-}day)^{-1}$, although based on the incidence of skin cancer, is also likely to be generally appropriate for estimation of risks from cancers of the urinary bladder and lung. Nevertheless, the implications of a higher slope factor were addressed qualitatively by selecting the proposed value of 70 ppm for arsenic for Alternative 6 in the May 2003 Proposed Plan

17. *In the Baseline Human Health Risk Assessment, Dr. Robert Benson's report is cited for establishing an acute reference dose for arsenic of 0.015 mg/kg-day, which is used in setting the preliminary action level of 47ppm to be protective of a child with pica behavior. Considering the many uncertainties regarding the study used to establish 0.015 mg/kg-day, why was equal consideration was not given to selecting an acute RfD of 0.005 mg/kg-d, which is supported by the ATSDR and a FIFRA Scientific Advisory Panel.*

The Baseline Human Health Risk Assessment does present ATSDR's alternative RfD value, and does provide a set of calculations using this value. However, ATSDR considers that this value is a screening level RfD, and EPA believes the value of 0.015 mg/kg-day is adequate to reliably characterize risks from subchronic and acute exposures to arsenic.

18. *In the uncertainty evaluation section of the Baseline Human Health Risk Assessment, there is no mention of recent studies that indicate 10 µg/dL of blood lead may not be sufficiently protective, as acknowledged by the CDC. A study by Lanphear in 2000 indicates 5 µg/dL or lower is more acceptable.*

The Baseline Human Health Risk Assessment does address this issue, stating:

> "It is currently difficult to identify what degree of lead exposure, if any, can be considered safe in young children. Some studies report subtle signs of lead-induced neurobehavioral effects in children beginning at blood lead levels around 10 µg/dL or even lower, with population effects becoming clearer and more definite in the range of 30-40 µg/dL (CDC 1991, ATSDR 1999). On the other hand, some researchers and clinicians believe the effects that occur in children at low blood lead levels are so minor that they need not be cause for concern. After a thorough review of

all the data, the EPA has identified 10 µg/dL as the blood lead level at which effects that warrant avoidance begin to occur, and has set as a goal that there should be no more than a 5% chance that any child will have a blood lead value above 10 µg/dL (EPA 1994). This approach focuses on the risks to a child at the upper bound (about the 95th percentile) of the exposure distribution, very much the same way that the approach used for other chemicals focuses on risks to the RME individual. The Centers for Disease Control (CDC) has also established a guideline of 10 µg/dL in preschool children which is believed to prevent or minimize lead-associated cognitive deficits (CDC 1991)."

19. *EPA should clarify the manner in which it will consider the likelihood that children in the VB/I-70 study area have an elevated baseline blood lead concentration from non-soil sources such as lead paint. EPA should indicate how it will consider cumulative lead exposure in devising, implementing, and verifying the effectiveness of the remedy. EPA should revise the FSR and its presentation of a preferred alternative to explicitly discuss how Environmental Justice concerns have been factored into the design and selection of the remedy in light of the cumulative lead exposure, a recent cancer study by CDPHE (2001) that indicates adults within the VB/I-70 community may have increased exposure or vulnerability to other lung carcinogens, and the increased vulnerability of African-American and Hispanic children because they suffer from greater iron deficiency compared to white children, a condition that may be at least additive with lead poisoning in having adverse impacts on neurocognitive development. EPA should analyze whether existing mechanisms for detection and abatement of lead-based paint within the VB/I-70 community have adequate scope and funding to reduce the vulnerability of the community's children to this component of cumulative lead exposure, and in so doing, examine its authority under Section 104(a)(4) of CERCLA for mitigation of this non-soil source of lead. EPA should examine whether direct EPA support for lead paint abatement is warranted to help EPA achieve, in what may be a cost-effective manner, a remedial action plan for lead that incorporates the impact of cumulative lead exposure.*

The basic method that EPA uses to evaluate risks from lead does consider cumulative exposures from all sources, including lead released to soil and dust from lead-based paint. Because Superfund does not have authority to respond to risks from direct ingestion of lead paint, this pathway is not included. It should be noted that the results of the community-wide survey of childhood blood lead levels do not indicate that the frequency of elevated blood lead values in area children is higher than EPA's health-based goal.

20. *Justification for the selection of a GSD value of 1.2 would be enhanced if EPA could provide a statistical analysis of the parameters used in the IEUBK model that reveals that the overestimation inherent in the default value of 1.6 quantitatively supports a revised value of 1.2. A GSD value of 1.2 reported for the ISE model was derived using an age range for childhood exposure of 1-84 months, which is somewhat inconsistent with the remedial action objective for lead in soil stated on page 2 of the Feasibility Study Report, which cites an age range of less than 72 months.*

The Baseline Human Health Risk Assessment does present this analysis. In brief, it is well established in statistical theory that the between-child variation in blood lead level on any given day of observation will be larger than the variation in the long-term average blood lead values for each child. The ISE model illustrates that the expected GSD for short-term observations is about 1.6, and that a value of about 1.2 is

expected if the long-term average is used. There is only a small difference between the long-term average for 1-84 months versus 1-72 months.

21. *Can EPA report how many of the properties require soil removal because of the cancer risk from RME soil exposure alone, and how many because of the combined cancer risk of RME soil exposure plus CTE garden vegetable consumption?*

Calculations already presented in the Baseline Human Health Risk Assessment indicate that the frequency of properties that exceed EPA's risk-based target of 1E-04 for arsenic is about 3.1% based on RME soil exposure alone, and about 3.3% based on RME soil exposure plus CTE vegetable ingestion.

22. *Can EPA examine and comment on whether the rate of participation in the nearby Globeville biomonitoring program provides confidence that a somewhat similar program for VBI-70 will achieve an acceptable participation rate? At moderate dose levels, the half-time of arsenic excretion via the urine is a matter of a few days to a week. Can EPA provide a statistical power analysis that examines the feasibility of a urine arsenic biomonitoring program for detecting, with an acceptable degree of confidence, the true prevalence or incidence of elevated arsenic exposure from soil-pica behavior? What criteria would EPA apply to assess whether health education was an acceptable remedy for reduction of soil pica behavior?*

EPA has performed a number of calculations to estimate the ability of a community study of urinary arsenic values to detect cases of pica. If pica is considered to be any single high intake of soil by a child, and if it is assumed that a child will engage in this behavior very rarely (*e.g.*, once per childhood), then the chances of observing the event in the study are low. However, EPA is much less concerned with a child who eats a mouthful of soil only once during childhood than with the child who ingests large amounts of soil fairly often. This is the true definition of pica, and children with this behavior have a much higher risk of experiencing an acute dose of concern. The ability of a community-wide survey of urinary arsenic levels to detect this type of activity depends on the fraction of all children who engage in this activity. If the behavior is common, the study has a high chance of observing the effect. If it is very rare, the study has low power to detect the effect. It should be noted that after the collection of more than 1500 urinary arsenic samples, very few cases of potential pica exposure to soil were detected. This means that the health risks posed by ingestion of arsenic due to soil pica are apparently either very infrequent and/or are of relatively low magnitude.

23. *Can EPA explain how it proposes to utilize the results of the blood lead monitoring program to assess the effectiveness of the CHP in meeting the RAO for lead? What criteria will be employed in the assessment? How will the relative contribution of lead in soil and paint be determined, particularly when lead is present in both media? What level of participation in the biomonitoring program will be necessary to detect this level of success with confidence?*

The CHP is intended to provide a service to the community during the time that remedial activities are occurring, and data from the study will not be used as a criterion for evaluating compliance with the RAO for lead. Compliance with the RAO will be achieved by soil removal. The CHP will provide a response to any observed lead or arsenic exposure that is outside the normal range. This will include any necessary follow-up sampling, analysis, and investigation at a child's home to help identify the likely source of exposure.

24. *By what criteria will EPA judge the CHP to have successfully contributed to a permanent remedy that persists after the CHP is discontinued?*

The CHP is intended to provide a service to the community during the time that remedial activities are occurring. The permanence of the remedy is achieved by removal of contaminated soil with arsenic and lead levels that are above the cleanup levels.

25. *To what extent will the effectiveness of the CHP developed by EPA be dependent on the continued existence of these state and local programs? Will EPA provide funding, above and beyond that envisioned for the VB/I-70 CHP alone, to assure the long-term stability and existence of the state and local lead hazard reduction programs?*

As stated in the response to comment 23, the CHP is intended to provide a service to the community during the time that remedial activities are occurring. The permanence of the remedy is achieved by removal of contaminated soil with arsenic and lead levels that are above the cleanup levels. The awareness of the community to arsenic and lead hazards, and on-going biomonitoring will be dependent on the continued existence of state and local programs; however, their continued existence is not part of the remedy and the EPA Superfund Program cannot provide the funding for the programs. EPA is not aware that there is, or will be, a funding problem with these programs.

26. *EPA should present a relatively detailed narrative that explains how the seemingly modest level of subject recruitment, case management, and residential investigations set forth in the budget will constitute a CHP sufficient to assure that the public health needs of the community are addressed.*

The budget for the Community Health Program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

27. *The results of the University of Colorado Health Sciences Center study of childhood soil contact, and arsenic and lead exposure in the VB/I-70 study area will contribute to a greater understanding of the risks posed at this site and the capacity of a biomonitoring program to effectively assess the situation.*

EPA agrees the University of Colorado Health Sciences Center (UCHSC) study is very important in understanding of the risks posed at this site and the capacity of a biomonitoring program to effectively assess the situation, and has utilized the results in planning the monitoring program for the site. The UCHSC has not yet released results of the Kids At Play survey, but will prepare a report to the Colorado Department of Public Health and Environment (CDPHE) and ATSDR to provide those results. As the agency performing the chemical analyses of the biological samples, EPA has access to blood lead and urinary arsenic test results from the Kids At Play survey. These results have been useful for development of the Community Health Program design and are presented in general terms here. Importantly, the information presented here should not be cited as the final results or conclusions of the Kids At Play study. However, unless the UCHSC/CDPHE's final analysis proves otherwise, given the apparently high participation rates, EPA presents the following preliminary conclusions.

The Kids At Play survey collected a total of nearly 1600 blood lead samples and nearly 1400 urinary arsenic samples for testing at EPA's contracted laboratory. Samples were collected mainly from young children, but some of the participants were older than 72 months (6 years). The UCHSC is currently preparing a detailed summary of analysis of the results, but this report is not yet available. However, by virtue of having performed the analyses, EPA is able to calculate preliminary summary statistics for the

study. Because the UCHSC report is not finalized, these data should be considered draft and should not be cited as the final results or conclusions of the Kids At Play survey.

Based on the data set of all original samples, approximately 5% of the blood lead test results were greater than or equal to 10 µg/dL. Participants with blood lead values greater than 10 µg/dL were retested, and most of these repeat values were also higher than 10 µg/dL. The results from the retests indicate that less than 4% of children tested have confirmed elevated blood lead levels. These preliminary data suggest that the current incidence of elevated blood lead levels in children who reside within the VB/I-70 site is approximately the same as reported by CDPHE (6%) for children under six years tested during 2000 (CDPHE 2001a) and somewhat lower than reported by the Centers for Disease Control and Prevention's (CDC's) National Health and Nutritional Evaluation Survey (NHANES) and local health agencies for similar, older urban communities in the northeastern and Midwestern United States within the last five years (CDC 2000, City of St. Louis Department of Health 2000).

Based on the data set of all original samples, less than 1% of the urinary arsenic values were above 30 µg/L. Participants with urinary arsenic values above 30 µg/L were also retested, and nearly all of these were below 30 µg/L in the repeat test. At present, data are insufficient to judge if this pattern is significantly different than expected for other similar urban locations, but the results suggest that elevated arsenic exposures at VB/I-70 are both infrequent and intermittent.

28. *The arsenic cleanup level needs to be lowered. At an average arsenic concentration of 128 ppm, portions of the yard could contain arsenic as high as 800 ppm, and consumption of this higher contaminated soil by a child with soil pica behavior will exceed the dose known to cause a variety of adverse health effects. Testing of a child's urine for arsenic still allows the child to potentially have serious arsenic exposure before EPA would take action. The cleanup levels need to be more stringent than proposed for Alternative 4 but not as stringent as Alternative 5.*

EPA agrees that health risks from arsenic ingestion due to soil pica behavior may exist at the proposed action level of 128 ppm (yard-wide average), but emphasizes that these risks are entirely hypothetical and very uncertain. This is because the actual soil intake rates and absorption rates from soil pica are not known, nor are the frequencies of such behaviors or the probability that pica events will actually occur at arsenic hot spots. In calculating the risk of acute effects from exposures to arsenic associated with soil pica behavior in children, EPA considered several sources of uncertainty: 1) the distribution of soil ingestion rates for children with soil pica behavior is not known; and 2) the frequency with which such children exhibit soil pica behavior is also not known. Therefore, the application of Monte Carlo techniques to analyze the uncertainty in the calculations of acute risk is difficult and was not performed by EPA for the VB/I-70 Site.

However, EPA characterized the theoretical average and Reasonable Maximum Exposure (RME) point estimates of acute risk in screening level calculations. These estimates suggest that there are between 294 and 1511 individual properties with soil arsenic concentrations that are predicted to result in an acute hazard quotient greater than 1 for the average soil pica scenario. There are between 662 and 1841 individual properties with soil arsenic concentrations that are predicted to result in an acute hazard quotient greater than 1 for the RME soil pica scenario. The wide range of potentially affected properties, 294 - 1841, reflects the substantial uncertainty in quantifying these risks.

EPA guidance (OSWER Directive 9355.0-30) states that where the non-carcinogenic hazard quotient for an individual based on the Reasonable Maximum Exposure (RME) for both current and future land use is less than 1, action generally is not warranted. EPA considered the range of 662 – 1841 properties where application of this guidance indicated remedial action is warranted. This range is referred to as Case 1 (1841 properties) and Case 2 (662 properties) in the Baseline Human Health Risk Assessment. EPA also considered the following: 1) EPA is not aware of any reported cases of acute arsenic toxicity attributable to ingestion of arsenic in soil; 2) limited data on urinary arsenic levels in residents of the VB/I-70 area and the nearby Globeville neighborhood do not reveal the occurrence of high soil intakes by children; 3) inquiries by the CDPHE into reports of known or suspected cases of arsenic poisoning in the community surrounding the VB/I-70 site resulted in their conclusion, stated in a July 25, 2001 letter, that "... it appears that there is no obvious or identifiable problem of arsenic exposure from environmental sources in the area of concern" (CDPHE 2001). Additionally, in the summer of 2001, a community health study known as the "Kids At Play" survey was conducted within the VB/I-70 Site by the CDPHE and the University of Colorado Health Sciences Center (UCSHC). The survey was funded through a grant from ATSDR. The door-to-door survey included: 1) a census of resident children less than 6 years old; 2) a questionnaire about child behaviors related to soil contact; 3) collection of blood samples for lead analysis and urine samples for arsenic analysis. To date, nearly 1400 children have participated in the Kids At Play survey. Preliminary results indicate that less than 1% of children tested have initial urinary arsenic levels greater than 30 µg/L, a level that ATSDR considers to be within normal levels. Upon repeat sampling, nearly all of these children had urinary arsenic levels below 30 µg/L.

These considerations suggest that arsenic risk from soil pica behavior may not be as significant as the theoretical calculations suggest. However, because of the high uncertainty regarding the magnitude and frequency of soil pica behavior, more reliable risk estimates for this scenario will not be possible until better data are collected on soil intake rates characteristic of soil pica behavior along with direct measurements of soil–related exposure to arsenic. EPA also notes that reducing the soil action level for arsenic is not likely to entirely eliminate the hypothetical risks from soil pica behavior. Nevertheless, EPA has chosen to accept recommendations to lower the action level for arsenic in soil to 70 ppm. Increased soil removal coupled with the educational components of the Community Health Program should help reduce risks to children with soil pica behavior.

29. *The arsenic cleanup level of 128 ppm is not sufficient to reduce the risk of cancer because 1) the level is based on the bioavailability of arsenic from a singe swine study where there were technical problems with the control pigs; 2) only 5 soil samples were used from the study area; 3) the 95% upper confidence limit of bioavailability may not account for all variability in this parameter; 4) the swine study was not critically reviewed; 5) 30 years was used to estimate cancer risks when in fact some residents live in the neighborhood for longer periods of time; 6) the assumption was made that half of the soil exposure came from indoor dust which is based on a single study; and 7) a whole house indoor dust sample was used to estimate indoor dust exposure.*

EPA disagrees with the commentor's assumptions. First, the basic design of the swine study protocol has undergone peer review, and there were no important technical problems with the conduct of the swine study. Testing of "only" five soil samples from the site provides a much more extensive characterization of site-specific RBA than has ever been performed at any other site, and use of the 95% UCL of the site-wide average RBA is very likely to provide a conservative estimate of the true site-specific RBA. Use of 30 years

as the RME exposure duration is an EPA national standard for human health risk assessment, and the text already acknowledges that risks could be higher for individuals who do reside at the site for longer AND who also ingest high amounts of soil over that entire period. Use of a "whole house" composite sample of dust to characterize indoor dust exposure is fully consistent with the fact that cancer risk from arsenic is based on long-term average exposures, and that long-term average exposure is related to average concentration in a medium, not in a random grab sample (which may be either too low or too high). While data are limited on the fraction of total soil plus soil that is derived from dust, the default value is based on the best data available, and ATSDR offers no additional information.

30. *The cleanup goal for arsenic of 128 ppm is inconsistent with the cleanup goals for other Region 8 Superfund sites, with goals as low as 35 ppm. The adjacent Globeville Superfund Site had a cleanup level of 70 ppm.*

EPA establishes the action levels for the contaminants of concern based on the best available science and the best site-specific data available. EPA has numerous studies and investigations in developing the proposed action level for arsenic at OU1 of the VB/I-70 Site of 128 ppm. Nevertheless, based on State and public comment, EPA has chosen to reduce the action level for arsenic to 70 ppm in order to maintain consistency with decisions at the ASARCO Globe Superfund Site.

31. *The lead cleanup level of 540 ppm is much higher than the cleanup level for the Eureka Mills Superfund Site of 231 ppm, largely because a geometric standard deviation (GSD) of 1.2 was used rather than 1.4. In fact, the default GSD value of 1.6 is recommended in the IEUBK Guidance Manual unless there are great differences in child behavior and lead biokinetics at a particular site. Supporting data is not provided by EPA for the use of a GSD of 1.2.*

The Baseline Human Health Risk Assessment demonstrates that a short-term GSD of 1.6 is likely to be equivalent to a long-term GSD of about 1.2 (the long-term value is what the IEUBK model requires). Also, the Baseline Human Health Risk Assessment provides the results of a range of alternative risk calculations, and the central range of those calculations was used to identify a protective action level. Nevertheless, EPA has decided to lower the action level for lead to 400 ppm, in part to account for the uncertainties in the lead risk assessment process, and in response to public comment on the originally proposed action level for lead.

32. *To be effective, the CHP requires not only educational activities but also developing advocacy groups, changing local policy to support educational activities, developing economic support for the program, developing engineering controls to reduce pollution, and developing a comprehensive program to address the problem at multiple levels. EPA should evaluate the Ruston North Tacoma CHP for input to the VB/I-70 OU1 CHP, and should consider more funding to improve effectiveness. Also, the CHP should be developed jointly with community representatives. This will improve participation in the biomonitoring program, which is necessary to identify children with exposure to arsenic and lead.*

The scope of the CHP has not been fully determined at this time. Community input will continue to be used in defining this program, as will the results of other programs.

33. *It is requested that EPA develop and evaluate an additional alternative which includes developing lower cleanup levels for arsenic and lead, involving the community representatives in the development of new cleanup levels and the CHP, evaluating similar programs at other sites, and implementing a*

CHP that will be in place until cleanup is finished.

In consideration of these elements of a remedy, Alternative 6 was developed and presented in the May 2003 Proposed Plan as the preferred alternative.

The following individuals addressed EPA at the public meetings in order to be recognized as a concerned citizen and/or member of a concerned organization.

Kara Piccirilli	Colorado Peoples Environmental and Economic Network
Rose Prieto	Latin American Research Services Agency
Terry Smith	Youth Wise
Tafari Lumumba	Clayton Neighborhood Association
Sandra Douglas	Cole Neighborhood Association
Lorraine Granado	CEASE
Joan Hooker	CEASE

2.1.2 May 2003 Proposed Plan

Public comments were provided orally at two public meeting and in writing. The two public meetings were:

- Swansea Recreation Center on 6/19/03
- Harrington Elementary School on 6/21/03

A public comment period was held from May 28 through June 26, 2003 on this proposed plan. The following is a summary of the written and oral comments received during the public period and EPA's responses to the comments.

1. *Although many commentors agreed with the cleanup goals of Alternative 6 (the preferred alternative), there were concerns that the cleanup goals were not sufficiently protective, and conversely, that the cleanup goals for Alternative 6 were over-protective, i.e., the goals do not offer additional risk reduction relative to the goals of Alternative 4 (as stated in the May 2002 Proposed Plan) but result in greater expenditure of federal money and classification of many properties as contaminated, thus devaluing the properties. One commentor stated that there should be a range of concentrations below the current cleanup goal where the option exists for a homeowner to have the soil replaced in the yard because of the uncertainty in establishing the goal, and another commentor requested grants for cleanup of properties that were below the cleanup goals.*

Alternative 6 differs from Alternatives 2, 3, and 4 (see response to Comment 1 on the May 2002 Proposed Plan) by adding soil removal from properties with arsenic Exposure Point Concentrations (EPCs) greater than 70 ppm and/or lead EPCs greater than 400 ppm. This alternative was developed and evaluated in response to comments received on the May 2002 Proposed Plan. Those comments requested an explanation of why EPA was not considering removing soil from properties where arsenic exceeds 70 ppm (represents a 5×10^{-5} cancer risk) as was done at the ASARCO Globe Site, and where lead exceeds 400 ppm to be consistent with EPA's screening level for lead in soil. Cleanup of arsenic to lower concentrations would partly address children with soil pica behavior; however, it is noted that these children are at risk of

experiencing other health risks unrelated to arsenic that will not be addressed by removing and replacing the soil. Cleanup to lower concentrations of lead may not reduce health risks because results from the Kids At Play survey indicate that of the nearly 1600 children who have participated in the survey, less than 4% of children tested had unacceptable blood lead levels. However, EPA decided to lower the action levels of lead and arsenic to respond to the community's request.

2. *A few commentors were concerned over exterior lead-based paint continuing to cause lead contamination of the soil.*

A key component of the Community Health Program (if a child has abnormal blood lead levels) is that all potential sources of lead at the child's property would be sampled, including soil and interior/exterior paint. If soil lead sampling results demonstrate that a soil removal is required, EPA will make the soil removal at that property a priority. If the main source is judged to be non-soil related, responses may include approaches such as education and counseling, or referral to environmental sampling/response programs offered by other agencies, as appropriate. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

3. *Several commentors expressed concern over the adequacy of the Community Health Program. Concerns included: the need to see a comprehensive community-based health program with biomonitoring so that the source of lead contamination can be determined for individuals; performance of a health study on the effect of exposure to arsenic-contaminated soil to address the protectiveness of the arsenic standard; provision of adequate funding of the program to be successful; and provision of appropriate outreach services to educate the community on these environmental health hazards.*

The Community Health Program addresses risks to area children from non-soil sources of lead. Also, it addresses children with soil pica behavior to reduce their risks to arsenic in soil. The program will consist of three main elements:

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

The budget for the Community Health Program is an order of magnitude estimate. Actual cost and labor required to implement the community health program will be reevaluated after the scope of work is further defined.

4. *Several residents expressed concern that cancer or other illnesses they have contracted is a result of the lead and arsenic soil contamination on their properties.*

Contracting cancer or other illnesses by virtue of living in the area and being exposed to arsenic and lead in the soil is unlikely. The Baseline Human Health Risk Assessment indicates that no further action at the Site would be effective in preventing exposures to arsenic in soil above a $1x10^{-4}$ lifetime cancer risk, a chronic hazard quotient greater than 1, or a sub-chronic hazard quotient greater than 1 for residents who have average or central tendency exposures. With regard to lead (a non-carcinogen), when the IEUBK model is run using recently published data on soil ingestion rates for children, and the site-specific relative bioavailability and Site-specific soil/dust ratio adjustments are used, adequate protection is provided without further action at the site. When the IEUBK model is run using default assumptions for all parameters except the site-specific relative bioavailability and soil/dust ratio, it predicts that remedial action may be necessary to meet the blood lead remedial action objective. Although there is a possibility that contracting an illness is related to exposure to lead and arsenic in the soil, the analyses that have been performed indicate that the possibility is very low.

5. *Several residents expressed concern that soil testing at untested properties and cleanup activities are moving too slowly.*

In 1997, CDPHE requested EPA's assistance in immediately responding to elevated levels of arsenic and lead in soil found in the Elyria and Swansea neighborhoods. In response to the 1997 request from CDPHE, EPA immediately began work on what would become the VB/I-70 Site. EPA's first action at the Site was to mobilize an Emergency Response team to direct an extensive soil sampling effort and time critical removal actions in the area. The Emergency Response included an extensive screening level soil sampling effort. The objective was to collect soil samples from as many residential properties as possible to identify properties that were potential time critical removal candidates (remove and replace soil). The sampling occurred during March and April 1998. In September 1998, EPA issued an Action Memorandum that established the basis for conducting a time critical removal action for 37 properties. EPA then proposed the VB/I-70 Site for inclusion on the NPL in January 1999. Anticipating the need for a long-term response, EPA began the Remedial Investigation/Feasibility Study (RI/FS) in August 1998 as removal activities were underway. The RI/FS process was completed with the issuance of a Proposed Plan in May 2002. Because of community concerns regarding the preferred alternative in the Proposed Plan, a new Proposed Plan was issued in May 2003. EPA feels it has moved as expeditiously as possible while meeting all statutory requirements and the needs of the community.

6. *There were a few concerns that the extent of arsenic and lead contamination in soil has not been determined.*

In response to this concern, soil sampling will also occur in a residential area adjacent to the study area not previously sampled. Data collected to date suggest this area may have been impacted by historic smelter emissions. The area identified is triangular in shape, bounded by Downing Street, Blake Street, and 34th Avenue. Data collected from residential properties in this area will be used to determine if soil removals are required and if the extent of the smelter related lead contamination extends further to the south of this area.

7. *One resident of the neighborhood was upset that there was no disclosure of contamination in the soil when he purchased the property.*

EPA has tried to inform all residential landowners within the Site of the sampling results of their properties. However, nothing in the Superfund law requires EPA or a seller to disclose this information to someone seeking to buy properties within a Superfund site. State or local real estate laws or practices may cover this disclosure. EPA nonetheless is committed to working with all residential landowners, whether they bought their properties before the area became a Superfund site or after, to make sure the property, if it needs it, is cleaned up to landowner's satisfaction.

8. *A comment was made that twice as many properties could be cleaned up if only 6 inches of soil were removed rather than the 12 inches as proposed in the preferred remedy.*

During the Remedial Investigation, soil samples were collected at several locations at two-inch depth intervals from 0 to 12 inches total depth. While this data demonstrated that the highest concentrations of lead and arsenic occur in the 0 – 2 inch depth, levels of lead and arsenic above the clean up levels selected in this Record of Decision could be present at 6 inches depth. At 12 inches depth, the concentrations would likely be below the clean up levels established in this Record of Decision.

9. *One resident was concerned about breathing fugitive dust during cleanup operations.*

EPA is required to meet all applicable laws, including fugitive dust regulations, when it implements the remedy. The remediation contractor will conduct all remedial activities in accordance with these laws and a Health and Safety Plan that describes the health and safety requirements and guidelines designed to protect workers and other potentially exposed individuals. The plan will be designed to identify, evaluate and control health and safety hazards at the properties, and will follow promulgated EPA and OSHA regulations and industry standards. The plan will include an air monitoring and dust suppression programs which will be implemented during construction.

10. *One commentor requested that xeriscape should be offered as an alternative to conventional landscaping because of the drought condition in the Denver area.*

EPA will develop a landscaping plan with each property owner prior to soil removal. This landscaping plan will reflect the property owners' preferences. In developing this plan, the homeowner will be provided with xeric alternatives such as wood mulch and rock landscaping materials instead of sod.

11. *One commentor was concerned with road damage from the construction traffic, and who would be responsible for repairs?*

Any road damage that occurs as a result of the remedial activities implementing this ROD will be repaired and funded by EPA.

12. *One commentor was concerned that, because of the possible presence of hot spots of contamination on the property, taking an average concentration was not the best metric to determine compliance with the cleanup standard.*

Except under extremely rare conditions, health risks from arsenic and lead are dependent on the long-term average exposure level, and long-term average exposure is a function of the area-wide average concentration. The composite soil sampling approach was optimal for characterizing the yard wide average

concentrations of arsenic and lead. However, because community representatives and other members of the Working Group were concerned that the composite samples might dilute hot spots within a yard, EPA devised a method to predict hot spots using the composite results. If the prediction method indicated there may be unacceptable short-term risk, 30 individual grab samples were collected to further characterize potential hot spots.

13. *One commentor expressed an opinion that it would be cost-effective to clean up entire blocks regardless of contamination levels that would also reduce a child's exposure to contamination from neighbors.*

Although it may appear to be cost effective to cleanup entire blocks, hundreds of additional uncontaminated properties would receive soil removal although there was no human health risk. Superfund monies, however, cannot be spent unless there is a release or threat of release of a hazardous substance. Further, since each property is being remediated in conjunction with the homeowners' wishes and his or her approved design, there would be little cost savings from cleaning up the Site on a block-by-block basis rather than a house-by-house basis.

14. *One commentor requested that the Proposed Plan indicate that the properties south and west of the convergence of Blake and Downing Streets that test higher than the cleanup goals for Alternative 6 will be cleaned up.*

The EPA National Remedy Review Board recommended that the northern portion of the Curtis Park Neighborhood be investigated to determine if soils in this neighborhood were impacted by lead due to smelter related aerial emissions. All properties included within the expanded Site boundaries in the Curtis Park Neighborhood will be eligible for soil removal if the action level is exceed for lead or arsenic.

15. *In the discussion of Alternative 6 contained in the addendum to the Feasibility Study report issued on December 20, 2002, EPA notes that notwithstanding their preference for Alternative 6, the more stringent clean-up levels it contains in comparison to the prior preferred plan are not necessary to achieve the Remedial Action Objectives for arsenic and lead. For example, it is stated that it is not necessary to perform soil removals where arsenic Exposure Point Concentrations (EPCs) exceed 70 mg/kg but are lower than 240 mg/kg, or where lead exceeds 400 mg/kg but is less than 540 mg/kg in order to achieve protectiveness for the RME scenario. These statements appear to indicate that previous comments issued in 2002 on the Baseline Human Health Risk Assessment have not been addressed, e.g., concern over EPA's use of the current IRIS slope factor for arsenic, EPA's selection of the non-default GSD in the IEUBK model, and EPA's use of a 10 µg/dL blood lead level for children. EPA should note that the more stringent clean-up levels established by Alternative 6 are defensible based on a reasonable reassessment of the health risks presented in the Baseline Human Health Risk Assessment.*

EPA does not agree that the concerns raised previously and reiterated here constitute a basis for concluding that the original action levels would not be protective of human health. Please see response to comments 16 and 18 on the May 2002 Proposed Plan.

16. *In the Feasibility Study Report Addendum of December 20, 2002, EPA states that abatement of exterior lead-based paint would be performed under this program if soils at a property are*

remediated and paint abatement is required to protect the remedy. However, the preferred remedy in the Proposed Plan should discuss how provisions would be made to coordinate paint abatement with soil abatement. It should also provide an option for residents to conduct abatement of interior lead paint (e.g., using non-EPA funds) at the same time as their home's exterior paint and soil are being remediated. Allowance for a coordinated approach would greatly facilitate an overall reduction in lead risk in OU1 of the VB/I-70 Site. The preferred remedy in the Proposed Plan should provide greater emphasis on how such abatement will be encouraged. The budget for the preferred remedy should also reflect allowances for assessment of exterior lead paint risk, and for remediation in some cases.

Through the Community Health Program, EPA will coordinate with other federal, State, or local agencies that can provide funding and/or conduct lead paint abatement on the exterior of homes concurrent with soil removal. Superfund dollars may be used to respond to exterior lead paint to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA 2003).

The following individuals addressed EPA at the public meetings in order to be recognized as a concerned citizen and/or member of a concerned organization.

Jesus Mendez	Clayton Cole Healthy Children Partnership
Amalio Bayan	Clayton Cole Healthy Children Partnership
Ricardo Guerrero	Clayton Cole Healthy Children Partnership
Nefertiti Kiel	Clayton Cole Healthy Children Partnership
Michael Waheside	Clayton Cole Healthy Children Partnership
Victoria Castille	Clayton Cole Healthy Children Partnership
Brisa Bayan	Clayton Cole Healthy Children Partnership
Jasmine Jusch	Clayton Cole Healthy Children Partnership
Janette	Clayton Cole Healthy Children Partnership
Kian Kelky	Clayton Cole Healthy Children Partnership
Dominique Hope	Clayton Cole Healthy Children Partnership
Liset Mendez	Clayton Cole Healthy Children Partnership
Joshua Beasui	Clayton Cole Healthy Children Partnership
Vicentio Mendez	Clayton Cole Healthy Children Partnership
Marisol Vasquez	Clayton Cole Healthy Children Partnership
Irving Bayan	Clayton Cole Healthy Children Partnership
Jordan Hope	Clayton Cole Healthy Children Partnership
Euzard Jackson	Clayton Cole Healthy Children Partnership
Ira Moran	Clayton Cole Healthy Children Partnership
Christopher Kiel	Clayton Cole Healthy Children Partnership
Paloma Gonzalez	Clayton Cole Healthy Children Partnership
Angelo Brown	Clayton Cole Healthy Children Partnership
Dominique Brian	Clayton Cole Healthy Children Partnership

2.2 Technical and Legal Issues

All excavated soils will be transported to a local solid waste landfill where they may be used as daily cover material. Alternatively, soils could be placed at the ASARCO Globe Plant Site to be used as cover and grading consistent with the provisions of the Statement of Work as set forth in the Final Consent Decree pursuant to State of Colorado vs. ASARCO, Civ. Action No. 83-C-2383 or as otherwise approved by the State. For purposes of this remedial action, and consistent with Section 300.400(e)(1) of the NCP, EPA has determined that the ASARCO Globe Plant is a suitable area in very close proximity to the contamination, which is necessary for the implementation of the response action. Further, since EPA notes that the ASARCO Globe Plant and the adjacent VB/I-70 OU1 neighborhoods are "reasonably related on the basis of geography", and since "the basis of threat or potential threat to the public welfare or welfare of the environment" are similar (i.e., smelter wastes containing, among other constituents, arsenic and lead), EPA has elected to treat the contiguous ASARCO Globe Plant as part of the VB/I-70 site for remediation purposes. Accordingly, a permit is not required for EPA to dispose of residential soil removed from yards within the Cole, Clayton, Swansea, or Elyria neighborhoods at the ASARCO Globe Plant. See, CERCLA Section 121(e). EPA also notes that depositing the VB/I-70 residential soils at the ASARCO Globe Plant will be protective of human health and the environment, will comply with all ARARs for the remedy selected at VB/I-70 OU1, and will accelerate the cleanup at that portion of the ASARCO Globe Site. Lastly, EPA believes disposal of the VB/I-70 residential soil at the ASARCO Globe Plant will enhance its prospects for future reuse as a commercial or recreational facility. Land use restrictions and/or controls will be imposed on the ASARCO Globe Plant to ensure that the soils deposited there as part of this cleanup will not pose a future risk in the event the Plant's current land use changes. The EPA will decide whether to place the soils removed from the VB/I70 residences to an off-site receiving facility or on the ASARCO Globe Plant after obtaining additional public input from members of the Globeville community. The State's concurrence is contingent upon acceptance of the plan by the Globeville community. The State will be the lead agency for the soil placement and remediation of the ASARCO Globe Plant Site.

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REMEDIAL DESIGN WORK PLAN
FOR SOIL SAMPLING AND REMEDIATION PROGRAM
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO

July 2004

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VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE
SOIL SAMPLING AND REMEDIATION PROGRAM
REMEDIAL DESIGN WORK PLAN

This work plan was originally prepared at the request of the U.S. Environmental Protection Agency (USEPA), Region 8, by MFG, Inc. and Tetra Tech EM Inc., and revised by Project Resources Inc., to address soil sampling and remediation activities in the residential portion of the Vasquez Boulevard / Interstate 70 Superfund Site in Denver, Colorado.

TITLE AND APPROVAL SHEET

This Remedial Design Work Plan is approved by USEPA without conditions.

Victor Ketellapper
Work Assignment Manager
U.S. Environmental Protection Agency

_____
Date

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
ASARCO	American Smelting and Refining Company
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
CDOT	Colorado Department of Transportation
CRS	Colorado Revised Statutes
OU	Operable Unit
RI	Remedial Investigation
ROD	Record of Decision
SOP	Standard Operating Procedure
TCLP	Toxicity Characterization Leaching Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VB/I70	Vasquez Boulevard and Interstate 70

1 INTRODUCTION

This document presents the design for remediation in the Off-Facility Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site in Denver, Colorado. The purpose of this Remedial Design Work Plan is to present the design details of measures to implement soil removal and replacement and soil sampling actions required by the U.S. Environmental Protection Agency's (USEPA's) Record of Decision (ROD) for lead and arsenic contaminated soils in residential yards within the VB/I70 Site.

1.1 Site Description

The VB/I70 site covers an area of approximately four square miles in north-central Denver, Colorado (see Figure 1-1). For the purpose of investigation and remediation, the site has been divided into three operable units (OUs). The residential soils discussed in this report are known as the Off-Facility Soils Operable Units 1 (OU1) portion of the site. The location of the former Omaha & Grant Smelter and Argo Smelter are identified as On-Facility Soil OU2 and OU3, respectively. The site is composed of a number of neighborhoods that are largely residential, including Swansea/Elyria, Clayton, Cole, and portions of Globeville. Most residences at the site are single-family dwellings, but there are also some multi-family homes and apartment buildings. There are approximately 4,000 residential properties within the site boundaries. The site also contains a number of schools, parks, and playgrounds, as well as commercial and industrial properties.

1.2 Report Organization

Site-specific factors that form the basis of the remedial design, including the properties to be remediated, the planned measures to address flowerbed and gardens in yard scheduled for remediation, requirements for clean replacement materials, and options for disposing of the excavated materials are discussed in Section 2.0. The remedial design is presented in Section 3.0. Specific details regarding procedures and practices to be followed during remediation construction are described in Section 4.0, and

additional construction-related considerations are identified in Section 5.0. Project reporting requirements are identified in Section 6.0.

2 BASIS OF DESIGN

This section presents a summary of previous sampling results and associated technical analyses that form the basis of the remedial action design.

2.1 Candidate Properties for Soil Removal

Extensive soil sampling of the majority of the residential areas was conducted during the Phase III Investigation in 1999 and 2000. The results of the investigation were reported in the RI report (Washington Group, 2001), which was issued in the final form in July 2001. Data from the investigation were used to calculate arsenic and lead exposure point concentrations for each yard. These exposure point concentrations were compared with the residential soil remedial action levels established by USEPA in the ROD of 70 mg/kg arsenic and 400 mg/kg lead to identity properties with yard soils concentration that equaled or exceeded the action levels.

Soil sampling has yet to be completed for approximately 1,000 residential yards at the Site. Soil in these yards will be sampled and analyzed for arsenic and lead (see section 3.1), and the sample results will be evaluated using the procedures described above to identify additional properties in this group that are candidates for remediation.

Based on the Phase III Investigation results and assuming that the frequency of properties with lead/or arsenic above the removal action levels are the same in the unsampled properties, it is estimated that a total of 853 properties will be candidates for soil removal are listed in Appendix A. Properties that have not been sampled are listed in Appendix C.

A portion of the properties to be remediated were expedited as part of a non-time critical removal action. The removal action targeted 138properties with arsenic exposure point concentrations greater than or equal to 240 mg/kg, and lead exposure point concentrations greater than 540 mg/kg (identified in Appendix A).

2.2 Gardens and Flowerbeds

During soil removal remediation activities, residents are often reluctant to allow gardens and flowerbeds to be removed. Based on an understanding of site conditions, as described in the Remedial Investigation report (Washington Group, 2001), it is likely that gardens and flowerbeds will typically have lower arsenic and lead concentrations than other areas of the yard.

As described in Section 4.0, the scope of soil removal activities at a given property will be agreed upon with the property prior to remediation. At the initial meeting with the property owner, USEPA's designated representative during construction (hereafter termed "Supervising Contractor") will, among other things, identify gardens and flowerbeds that the owner would prefer to keep.

Soil samples will be collected from each vegetable garden/flowerbed area identified by the owner. The soil samples will be analyzed for arsenic and lead, and the sample results will be compared to the Site remedial action levels. Gardens/flowerbeds with arsenic and/or lead concentrations equal to or exceeding 70 mg/kg arsenic or 400 mg/kg lead will be recommended to the property owner for removal and replacement. Gardens/flowerbeds with soil concentrations below the action levels will be left in-place.

Details of the garden and flowerbed sampling program are discussed in Section 4.3.

2.3 Clean Replacement Material

Excavations will be backfilled and restored in kind with clean replacement materials. Clean replacement material will have contaminant concentrations less than or equal to the values listed on Table 2-1. In addition, the replacement soil will have properties that are appropriate for their intended use. For example, replacement soils will have properties that promote plant growth and provide suitable drainage, while replacement gravel for unpaved driveways and parking areas will have appropriate gradation.

Specific textural requirements for the replacement soil was established by the Supervising Contractor and approved by USEPA prior to beginning construction on the non-time critical removal action according to the following procedure. Representative soil samples were collected from 10 yards to be remediated. Samples were collected as follows: 3 from the Cole neighborhood; 3 from the Clayton neighborhood; 1 from Elyria neighborhood; and 3 from the Swansea neighborhood (at least one from north and south of I-70). Within each neighborhood, the Supervising Contractor selected properties that are spatially distant from each other to provide data across the site. The soil samples were analyzed for clay, silt and sand composition according to American Society for Testing and Materials (ASTM) Method D-422, or another suitable method. The results of these analyses were plotted on a textural triangle, (Figure 2-1).

2.4 Disposal of Excavated Materials

Excavated materials will be transported off-site for disposal. Disposal options for these materials include a number of the regional solid and hazardous waste disposal facilities. Anther potential option for non-hazardous materials is to relocate the materials to a nearby American Smelter and Refining Company, Inc. (ASARCO) Globe Plant, where they could be managed in conjunction will materials from other local residential soil remediation action (i.e., the South Globeville Residential Soil Remediation Project) and site closure plan. Disposal at the ASARCO Globe Plant would be contingent on an agreement between ASARCO and USEPA prior to soil excavation activities.

Time critical removal actions were performed in 1998 and 2001, which addressed yards with higher arsenic and lead concentrations than the properties to be addressed in this remedial action. Soil excavated during these actions was disposed as solid waste, indicating the excavated materials were not toxicity characteristic hazardous waste (URS, 1999). Therefore, based on the prior removal action activities, it is not anticipated that the excavated materials will require management as hazardous waste. However, soil samples were collected from the yards during Phase I of the scheduled removal to confirm this belief. These waste characterization samples were collected , as described in Section 4.3.3. The samples were analyzed to measure the concentrations of metal, pesticide,

herbicide, semi-volatile and volatile constituents in sample leachate to support classifying the materials as solid waste. USEPA will consider these data when selecting the designated disposal location(s) and methods for the yard materials, and the final disposal locations will be identified prior to be beginning removal action remediation.

3 REMEDIAL ACTION DESIGN

This section presents the Off-Facility Soil Operable Unit remediation program design. Specific details regarding implementation of the design are discussed in Section 4.0. Technical specifications for implementing the design are presented in Appendix G.

3.1 Soil Sampling Program

As discussed in Section 2.1, a component of the remedial action is to sample the approximately 1,000 previously unsampled residential yards at the Site. Samples will be collected in accordance with the RI Phase III procedures (USEPA, 1999), and the most recent standard operating procedures (SOPs). Residential yards with lead or arsenic above the soil removal action levels will be remediated.

3.2 General Remediation Design

Each of the candidate properties listed in Appendix A, and any additional candidate properties identified by sampling of the approximately 1,000 unsampled residential yards will be remediated. Specific details of the remediation sequencing (i.e., the order in which properties and neighborhoods will be targeted) will be identified in a Construction Sequence Plan, to be prepared by the Supervising Contractor prior to construction, and approved by USEPA, as described in Section 5.1.

The properties will be remediated by excavating and removing accessible surface soils to a depth of 12 inches. Accessible excavation areas mean grass-covered and bare yard areas; gravel-covered driveways and parking areas, flower gardens and vegetable gardens (except where exempted based on pre-remediation sampling) and beneath sheds that may be moved without causing structural damage to them. Excavation will not be preformed in areas that are covered by brick or pavement surfaces (such as concrete pads, patios, paths, and driveways); areas where permanent structures are present (such as houses, garages and crawl spaces); or areas covered by large landscaping items (such as retaining walls, water features, etc.).

Soil will be excavated to a depth of 4 inches and removed from beneath decks that are located 18 inches or higher above the ground surface. Soil will not be excavated from beneath decks lower than 18 inches.

Soil remediation will also be preformed in road apron areas (soil areas between sidewalks and streets) adjacent to properties being remediated. Access to these areas will be obtained from the City of Denver before beginning remediation.

The removal soils will be loaded into trucks and transported to either a municipal solid or hazardous waste disposal facility or the ASARCO Globe Plant; soils are expected to be non-hazardous based on existing site data, however, sampling will be preformed as a part of the remedial action to verify this (see Section 4.3.3). USEPA will select the disposal location prior to Construction Contractor mobilization based on the results of the pre-remediation waste characterization program and discussions with ASARCO.

Excavation areas will be backfilled and restored in kind with clean replacement materials. At a minimum, excavated yard, gardens and flowerbeds will be restored with 12 inches of soil that meets the USEPA approved replacement soil composition. Excavated driveways and parking areas will be restored with 8 inches of compacted soil and 4 inches of gravel. All replacement materials will meet the replacement material chemical criteria specified in Table 2-1. Replacement soil will also have properties that promote plant growth and provide suitable draining. Specific requirements for replacement soil composition will be developed as described in Section 2.3. Replacement gravel will meet the Colorado Department of Transportation (CDOT) requirements for Type IV cover coat aggregate.

Following backfill, the fill areas will be restored in a manner that reasonable approximates original condition. For example, areas previously covered by grass will be re-vegetated with grass or other replacement materials as discussed in the next paragraph. Produce gardens will not be replanted. USEPA may provide replacement certificates to be redeemed at a local nursery to the property owner to cover the cost of replacing flower gardens removed during the excavation. . Decorative gravels, mulch and other landscape

finishes will be installed in bare soil areas and as necessary to reasonably restore the yards to near original condition. To facilitate the restoration process, the Contractor will develop a menu of available replacement materials and will work with the property owner to develop a plan for restoring the property. During restoration, any fences of land survey monuments disturbed by the excavation will be replaced and restored.

In light of Denver's current drought situation, special procedures will be necessary during property restoration to minimize the water usage. These procedures will include informing the homeowner of minimizing the use of high water consumptive replacement plants, reducing the total area of grass on the property, implementing work practices that emphasize dry clean-up rather than use of water sprays, and strategic watering of replacement vegetation. In addition, a special use permit for the Denver Water Board may be required so that the project may be performed. Further details of the project water conservation measures and Denver Water Board requirements are described in the project Water Conservation/Management Plan included in Appendix H.

The USEPA will maintain the replacement vegetation after the property restoration is completed. Restored properties will be maintained for a maximum period of thirty days, or until established, following restoration. The maintenance will consist of watering as required , but will not include mowing. The homeowner will be encouraged to assist in the initial maintenance to assist in establishment of vegetation.

3.3 Property- Specific Design Considerations

Specific remediation details will be developed on a property-by-property basis. Individual Site Restoration Agreements (an example is shown as Figure 3-1) will be prepared for each property to identify the soil removal areas and associated excavation or restoration requirements. Draft Site Restoration Agreement will be prepared and reviewed with the property owner during a pre-excavation property inspection. If requested by the owner, sampling of gardens and flowerbeds will be scheduled at this time. After the inspection and sample analysis, the Site Restoration Agreement will be

revised to incorporate the property owner input and determinations regarding the need to remove any gardens and/or flowerbeds based on the sampling results.

Once the Site Restoration Agreement has been finalized, the property owner will also be asked to authorize the remedial actions by signing the Site Restoration Agreement. The property owner's signature on the Site Restoration Agreement will be required before any remedial activities can begin on their property.

Upon completion of remediation at a particular property, yard maintenance will be performed as described in Section 3.2. Once the maintenance period is completed, any repairs are completed, and all disputes associated with the soil removal/replacement activities are resolved at a property, the Construction Contractor, will inspect the property with the owners. Following this inspection, the property owner will be asked to sign a Completion Agreement, stating that all work has been completed on the property in accordance with the Site Restoration Agreement. An example of the Property Remediation Completion letter is included in Appendix B. . After the remediation construction and maintenance periods have been completed on a particular property, USEPA will issue a letter to the owner to document that the property has been remediated.

3.4 City Property Design Considerations

For many residential properties, the "yard" includes a small strip of grass-covered or bare soil located between the sidewalks and the streets. These areas, termed "road aprons", are typically owned by the City of Denver, but are perceived by the property owner to be part of the yard and, in many cases, have been maintained by the property owner in conjunction with the yard.

Because these road aprons are effectively part of the yard exposure unit, and were sampled during the RI, they will be remediated along with the adjacent yard. The individual Site Restoration Agreement will identify the remedial actions that will be performed on the adjacent road aprons. To facilitate this process, USEPA met with the

City of Denver to discuss the project and obtained a blanket authorization for road apron remediation. The City of Denver has requested an effort be made to install non-vegetative cover to minimize the water usage and maintenance requirements.

4 REMEDIATION CONSTRUCTION

This section describes the construction procedures necessary to implement the remediation design described above. Excavation activities will be planed to minimize physical and chemical hazards to workers and residents. Work practices will include the use of sounds safety measures, operating heavy equipment in a safe manner, and performing actions at each property quickly and effectively to reduce the extent of disturbances to residents and the general public.

As described earlier, approximately 3,000 residential properties have been sampled at the site, and approximately 1,000 remain to be sampled. The remaining properties will be sampled in accordance with the RI Phase III procedures (USEPA, 1999). Sampling will be performed independently of the remedial construction, but will facilitate timely identification of properties that will need to be added to the list of candidates for remediation. It is currently estimated that remediation will take three to four years to complete. Therefore, the optimum schedule for sampling would be to complete the program by the end of the first construction season to allow for identification of a complete list of candidate properties prior to the second construction season.

4.1 Project Team Roles

The remediation project team will consist of the USEPA, a Supervising Contractor, a Construction Contractor and its subcontractors. The USEPA is the lead agency and will be responsible for overall project implementation. USEPA has selected the USACE to support USEPA by managing the Construction Contractor and performing field oversight and quality assurance activities. The Construction Contractor will serve as general contractor for the project and will be experienced in residential remediation projects of this type. The Construction Contractor will hire specialty subcontractors (e.g., transporters, landscapers, etc.) as necessary to complete the project. The property owner will provide access to the affected properties, review and approve the construction activities on their property and confirm that the work has bee satisfactorily

completed. Section 4.2 provides an overview of the interactions between project team members associated with property sampling and remediation activities and property owners.

4.2 Access Agreements and Property Owner Authorization

This section provides a description of the access agreement and property owner authorization required for sampling and remediation of each property.

Property owner authorization, in the form of a signed access agreement, will be required before any pre-remediation sampling or remediation activities can begin on a property. Property owners must agree to the full remediation of their property. Partial remediation will not be preformed. The USACE, on behalf of USEPA, will perform the initial contract with the property owner and schedule a meeting. At this meeting, the Construction Contractor will explain that the property is a candidate for remediation, the nature of the remediation and that the owner may elect to save gardens and flowerbeds if sampling determines that lead and arsenic concentrations are below the action levels. The Construction Contractor will then request the property owner sign an Access Agreement (see Appendix B). Once the Access Agreement has been signed, the Construction Contractor will work with the property owner to develop the draft Site Restoration Agreement. If the owner does not wish to save any gardens or flowers, the Site Restoration Agreement will be finalized. If the property owner does elect to try to save certain gardens or flowerbeds, sampling will proceed as described in Section 4.3.1 and the sample results will be incorporated into the final Site Restoration Agreement.

Each property owner will have an opportunity to review and will be required to approve the Site Restoration Agreement for their property before remediation begins. After property remediation and maintenance has been performed, the property owner will sign a Completion Agreement to document that the work has been satisfactorily completed, and USEPA will issue a letter to the property owner certifying that the property has been remediated.

The typical sequence of reviews and approvals associated with property remediation are listed on Table 4-1. As indicated, the USACE will lead all interactions with the property owners. The Construction Contractor will support the USACE as indicated. USEPA will review and approve the final site documentation.

4.3 Supplemental Sampling

This section includes a description of supplemental sampling in yards, gardens and flowerbeds and disposal characterization sampling and analyses.

4.3.1 Garden and Flowerbed Sampling

If a property owner expresses a wish to save gardens or flowerbeds, defined as an area with a defined border dedicated to gardens and flowers, the Construction Contractor will collect soil samples from the identified gardens and flowerbed area. The garden and flowerbed samples will be analyzed for arsenic and lead. Based on the sampling results, gardens and flowerbeds with soil arsenic and/or lead concentrations equal to or above the Site remedial action levels (70 ppm As and 400 ppm Pb) will be remediated, while those with soil concentrations below the remedial action levels will not be remediated. These results will be incorporated into the final Site Restoration Agreement and approved by the property owner before property remediation begins.

Further details of the garden and flowerbed sampling and analysis procedures are described in Section 4.0 of the Construction Quality Assurance Plan, which is included in Appendix F.

4.3.2 Yard Soil Composition Sampling

Prior to beginning construction on the OU1, the Construction Contractor collected and analyzed soil samples from a subset of the yards scheduled for remediation. These samples were analyzed for clay, silt and sand composition. The results of these analyses were used in establishing specific textural requirements for the replacement yard soil, as described in Section 2.3. Details of the yard composition sampling procedures are described in the Construction Quality Assurance Plan in Appendix F.

4.3.3 Disposal Characterization Sampling

The Construction Contractor will collect samples of the materials to be removed during property remediation. The material samples will be collected prior to excavation and will be analyzed for leachate concentrations of metal, pesticide, herbicides, semi-volatile and volatile constituents by the Toxicity Characterization Leaching Procedures (TCLP). Eleven samples were collected by the Construction Contractor to establish baseline data of the disposal characteristics. The Construction Contractor will subsequently collect one disposal sample per twenty homes that will be analyzed for total lead and arsenic. USEPA will use the results of these analyses in identifying a suitable disposal site(s) for the materials.

Further details of the disposal characterization sampling and analysis procedures are described in the Construction Quality Assurance Plan, which is included in Appendix F.

4.4 Soil Removal

This section presents a description of residential yard soil removal activities. Included in this section are the details for the pre-excavation area preparation; noise control; odor control; dust control; and clean access for the property residents and decontamination procedures.4.4.1 Pre-Excavation Area Preparation

Preparation of areas where excavation activities are to occur will commence following property owner approval to begin construction, as indicated by the owner's signatures on the Access Agreement and (if different) of the intended start date and time at least one week prior to the start of construction at a particular property. Access for any adjacent road apron areas will also be obtained in advance of construction.

Prior to beginning work on a particular property, the Construction Contractor will mark the limits of excavation (note: these limits will include any adjacent road apron areas). The Construction Contractor will also identify any land survey monuments (property corner pins, etc.) within the construction area. The location of such monuments

will be documented on the Site Restoration Agreement, and the monuments will be protected to prevent damage during construction. If disturbed, the monuments will be reset by a professional land survey following completion of property restoration.

Also prior to construction, the Construction Contractor will survey (via photographs and/or videotape) each property to establish pre-remediation conditions. The condition of buildings and other fixtures will also be noted, including characterizations of the integrity of structures and foundations with respect to the anticipated depth of excavation. Basement and ground-level rooms will be photographed from inside the home. Homeowners or tenants will also be asked about any existing drainage problems, and these will be noted on the Site Restoration Agreement.

Immediately prior to beginning work on a particular property, the Construction Contractor will have the local utility companies locate the electrical, water, sewer, gas, cable, and phone lines. The owner/tenant will be notified of this activity and will be asked to participate, if needed, to provide information on subsurface obstacles such as septic system and abandoned lines. The utility companies will mark the position of the utilities on the ground with colored spray paint. The Construction Contractor will inspect each excavation area for visible obstacles, and may utilize electro-magnetic detector if there is reason to suspect buried obstacles have not been adequately marked. The Construction Contractor will confirm locations of subsurface obstacles by hand digging to trace the orientation of the obstacle and to mark it adequately with spray paint. The Construction Contractor will be particularly diligent in locating and hand excavating around all gas lines and will develop a project procedure to be used at all properties to ensure that gas lines are not disturbed or damaged during property remediation. The type and location of the obstacle will be noted on the Site Restoration Agreement, which will be issued to all work crews prior to construction startup at the property. Shields for subsurface pipelines and support members for retaining walls will be installed prior to the start of excavation activities, as warranted.

Surface obstacles to be removed by the property owner to permit remediation will be identified by the Construction Contractor during the site visit and indicated on the final Site Remediation Map. The property owner will be required to relocate the surface obstacles and large possessions, such as RVs, boats, or vehicles, to a location where they will not hinder remediation construction. The property owners will be asked to discuss any concerns or special requests they may have in removing surface obstacles or in otherwise preparing their property for remediation. The Construction Contractor will request that property owners remove and store inside their buildings all yard ornaments, personal possessions and keepsakes requiring special care. The Construction Contractor will temporarily relocate woodpiles, walkway stepping-stones, and other miscellaneous small landscape articles on the property, if possible. Large obstructions such as fences and gates will be removed if necessary to allow for ingress of equipment and access for the work crews. Removed obstructions will be stored onsite and replaced at the end of construction.

4.4.2 Excavation Activities

The Construction Contractor will remove soil using a variety of powered equipment and hand tools. Primary equipment will consist of bucket-equipped skid steers (e.g., bobcats) and small excavators, or equivalent. Soil will be removed to the specified 12 inch depth (4-inches beneath decks), taking care to hand excavate next to buildings, sidewalks, and other structures to maintain support and prevent damage. Soil will be sloped at a 45° angle away from the edges of rock structures, or weak concrete foundations or other supporting structures to prevent loss of support and potential weakening of these features.

Where subsurface utilities have been identified within an excavation area, soil around (but not beneath) these utilities will be hand excavated. If interruptions to any services occur as a result of removal activities, utilities will be hand excavated. If interruptions to any services occur as a result of removal activities, utility companies will be contacted immediately (no more than ½ hour after initial interruption) to aid in rapid re-establishment of services. Utility lines (including water, electric, gas, cable and

telephone) damaged during remedial construction will be re-installed to current building code requirements.

Excavation by hand will be required for all areas susceptible to potential damage from construction equipment operations. Areas of concern include excavations adjacent to structures (i.e., trees, hedges, and large shrubs). The Construction Contractor will inspect structures and large tree roots during excavation operations, and will take immediate appropriate steps if either is damaged. Excavation around shrubs and tree roots will be performed by a combination of equipment and handwork to remove as much soil as practical without causing undue damage to the root system. This will generally result in a shallow excavation (typically 2 to 4 inches) from the trunk to the drip line and a tapering excavation from the drip line outward. Shrubs and trees that have a cumulative root stalk of over two inches in diameter can be left in place and hand dug around if the owner requests. If the shrubs and trees cover a property to an extent that hand digging is not feasible, the tree or shrubs will be removed. Shrubs and trees under two inches in diameter will be removed.. Once excavation around plants is completed, backfill will be initiated as soon as possible and the replacement soil will be dampened to reduce plant stress.

If sprinkler systems are present, the system will be removed and reinstalled. The owner will be requested to demonstrate that the sprinkler system is in good working order. The sprinkler system will be replaced in kind. In some instances the sprinkler system will be replaced in a more efficient manner, such as utilizing less sprinkler heads or zones. In general, the sprinkler heads will be removed and disposed. Prior to backfill, new pipes will be installed, and the salvaged components will be replaced.

Fences will generally be removed, salvaged, and replaced upon completion of backfill. Where feasible to leave in place during excavation, handwork around posts will be performed to maintain fence stability and prevent damage. Damaged fences or fences which cannot be re-installed following removal will be repaired or replaced with a new fence of similar type to the original.

Structures and buildings will be inspected for evidence of deformation of changes in condition attributable to the excavation or backfilling activities based on review of the pre-excavation photographs/videotape documentation. The USACE will contact the homeowners when conditions are discovered that warrant such notifications.

The Construction Contractor will perform field surveys and measurements to confirm that the required excavation extent and depth have been achieved (see Appendix F: Draft Construction Quality Assurance Plan). Once the Construction Contractor has verified an excavation meets project requirements, the area will be cleared for backfilling.

If conditions are encountered which are beyond the control of the Construction Contractor that delay or prevent the performance of the construction at a particular property, the Construction Contractor will stop work at that location and immediately inform the Supervising Contractor and the property owner. The types of conditions that could delay or prevent construction include:

- Uncovering of artesian well or other subsurface flow phenomena:
- Building or structural impairments: and
- Discovery of previously unidentified utilities or subsurface features such as abandoned septic systems.

4.4.3 Noise Control

Construction activities will be performed in a manner that complies with the state statue for noise abatement (Colorado Revised Statutes [CRS], Section 25-12-103). Specifically, during the normal working hours of 7:00 a.m. to 7:00 p.m., the construction noise will be maintained at a level below 80 db (measured at a distance of less than 25 feet from the property line). Noise levels may periodically increase but nor exceed 90 db for more than 15 minutes in any one-hour period.

In order to ensure compliance with the statute, all equipment shall be maintained in proper condition with exhaust controls to minimize noise levels, and proper driving

habits will be enforced. Additionally, use of compression-type brakes ("Jake Brakes") will not be allowed in the work area. A local telephone number will be set by the USACE and provided to the residents to allow reporting of noise complaints. If noise complaints are received, the USACE will conduct periodic, unannounced noise surveys within 25 feet of the property line at the active work zones using a sound level meter. If noise levels are found to exceed the statue requirements, the Construction Contractor will be required to take corrective actions to bring its work area into compliance.

4.4.4 Dust Control

Water application will be used to minimize the potential for fugitive dust emissions. Application rates will be regulated to control dust yet not result in the generation of mud that could be transported offsite on haul trucks or other mobile equipment. Dust suppression equipment may consist of standard garden hoses and spray regulators, misters or other equipment purposed by the Construction Contractor and acceptable to USEPA. Water for dust control will be provided from a central metered source (i.e., hydrant) and transported to the work area by tanker truck or trailer.

The Construction Contractor will minimize water application during the course of excavation and restoration operations and will only use water on an as-needed basis to control dust as follows:

- During soil removal operations by heavy equipment and by hand crews;
- At work intervals where wind and/or dry weather require such action to minimize visible dust generation; and
- During temporary stockpiling and loading of soils at staging areas before transportation to the disposal site.

Dust control requirements and provisions for periodic air monitoring are discussed in the Fugitive Emissions Dust Control Plan (Appendix E).

4.4.5 Odor Control

Soil removal replacement activities are not expected to result in the emission of odorous air contaminants. However, construction activities will comply with State requirements for odor control (5 Colorado Code of Regulations [CCR] 1001-4, Regulation 2). Specifically, any emissions of odorous air diluted with seven more volumes of odor-free air will not be permitted.

4.4.6 Clean Access for Property Residents

During construction activities, clean access will be provided to the residents at all times. Clean access means the resident will not have to walk though soil prior to entering their home. Sidewalks will be thoroughly brushed off after each workday to provide as clean an entry as possible. If there is no sidewalk, a clean pathway will be provided by laying down plywood, pallets, plastic, or other means to prevent exposure and tracking of contaminated soils. All residents (especially children) will be asked to stay away from the construction area.

4.4.7 Decontamination Procedures

Heavy equipment and tools used in the construction process will be decontaminated prior to leaving the work area site. Decontamination will first involve a brush down of remediation equipment in the work area to remove visible accumulations of materials from the body and tires. Limited quantities of water may be used to remove residual visible contamination following dry brushing. However, water use will be minimized. If washing is necessary, equipment will be washed while on the premises to minimize the migration of mud and water to the street.

Workers will be required to decontaminate daily, or whenever leaving a work area where soil removal activities are being reformed. Streets, right-of-way and access routs will be cleaned of visible accumulations of soil, dust, or debris that attributable to construction activities.

Additional decontamination practices will be specified in Construction Health and Safety Plan to be prepared by the Construction Contractor as a required submittal under the construction contract.

USEPA and the USACE will review the Construction Contractor's plan to confirm that it adequately specifies decontamination practices and procedures to protect workers and the public. Revisions to the plan will be required until it meets project requirements.

4.5 Soil Transportation and Disposal

Excavated material will be removed to the selected disposal location(s) in accordance with the Transportation and Disposal Plan (Appendix D). The disposal location will be either a licensed solid or hazardous waste disposal facility or the ASARCO Globe Plant. USEPA will review the result of the waste characterization analyses and will identify and appropriate disposal location based on these data.

If the excavated materials are relocated to a solid or hazardous waste disposal facility, the materials will be managed in accordance with State and Federal regulations pertaining to waste characterization, transportation and disposal. If the materials are relocated to the ASARCO Globe Plant, any incidental scrap materials and debris will be removed from the soil and shipped off-site for disposal at a licensed solid waste disposal facility. The remaining soils will be managed in accordance with existing State orders regarding management of metal-containing materials at the Globe Plant (State of Colorado, 1993).

Loading and transport activities will generally be performed at the same rate excavation, to eliminate the need for stockpiling of large quantities of material in the residential neighborhoods.

4.6 Backfill and Restoration of Excavated Areas

After field measurements have confirmed that the design excavation depths have been achieved (see Appendix F), excavation areas will be cleared for backfill. Backfill will immediately follow excavation in order to minimize the amount of time excavated areas are left open. Clean material will not be carried in the same trucks as excavated soils unless the truck bed is cleared of visual dust first.

The excavated areas will be backfilled with clean materials that are of comparable or better physical quality than the materials that were removed and meet the minimum requirements set out in Section 3.2. At a minimum, yard, gardens and flowerbeds will be replaced with 12 inches of soil. Driveways, parking areas, and other areas subject to vehicular traffic will be replaced with 8 inches of compacted soil and 4 inches of aggregate gravel.

Replacement materials will be imported from approved off-site sources. Samples of the proposed replacement materials will be collected and analyzed to confirm that they meet the project requirements identified in Section 3.2 before the material sources are approved. Following source approval, quality control and quality assurance samples will be collected and analyzed on an on-going basis to confirm that the replacement materials continue to meet the project requirements. Details of the project quality control and quality assurance checks of the replacement materials are described in the Construction Quality Control Plan (Appendix F).

Where access allows, dump trucks with replacement materials will drive onto the excavation areas and deposit their load while driving slowly to spread the material. Where access is limited, the trucks will dump their load at an adjacent staging area from which a backhoe of bobcat can transport the material to the excavation. Some handwork using wheelbarrows and shovels may be necessary to backfill areas of difficult access. Following placement, the replacement materials will be graded and shaped to the approximate original conditions and slightly crowded to promote positive drainage. Gardens and flowerbeds will be slightly overfilled to compensate for material settling, as

directed by USACE. Compaction of the replacement soil and gravel will be performed as deemed necessary by the USACE. Suitable measures may include use of a plate compactor or hand tamping.

Following backfilling, the excavated areas will be restored to match their original conditions to extent practicable, or as otherwise indicated on the Site Restoration Agreement. Areas covered with grass will be re-vegetated with sod to achieve vegetation cover similar to that which was originally present. However, total area of grass may be reduced as necessary to achieve the project objectives for grass coverage, as described in Section 3.2. (Bare soil areas will be replaced with mulch, decorative gravel, or other surface finished). Produce gardens will not be replanted. USEPA may provide replacement certificates to cover the cost of replacing flower gardens. Mulch, decorative gravels and other surface finishes will be installed to reasonably restored the yards to their original condition.

Finally, all materials such as fences, lawn ornaments, dog, runs, etc. that were moved to allow remediation will be restored to their original location, and any incidental damage to buried sprinkler systems, sidewalks, etc. will be repaired. In addition, any land survey monuments present within the excavation areas will be inspected. A professional land surveyor registered in Colorado will restore any monuments that have been damaged or disturbed during construction to their original (pre-construction) condition.

4.7 Post-Construction Maintenance

The Construction Contractor will maintain the replacement vegetation following property restoration. Restored properties will be maintained for a maximum of thirty days. Maintenance will include all required vegetation watering as needed but will not include mowing. The homeowner will be encouraged to assist in the initial maintenance to assist in establishment of vegetation. (See Section 3.2 for a discussion of current bans on lawn watering). Once the vegetation has been established, or the maintenance period has expired, care of the vegetation will be turned over to the property owner/tenant.

4.8 *Follow-Up Activities*

Follow-up activities will be conducted to verify that the work preformed at each property satisfies the project requirements.

4.8.1 *Photo Documentation*

Photographs and/or videotapes will be used to document pre- and post-construction conditions of properties, streets, and side walks. Photographs and video will be taken by the Construction Contractor immediately prior to construction and upon completion of the maintenance period. The Supervising Contractor will provide the Construction Coordination with a checklist of the minimum photo documentation requirements. The Construction Contractor will provide all documentation to the Supervising Contractor at the end of the construction period.

4.8.2 Repair Work

Soil removal and replacement activities will be conducted to minimize damage to property. Any damaged features such as walkways or utilities will be repaired or replaced upon discovery and determination that the damage was caused by the construction activities. Structures (buildings, sidewalks, fence, etc.) and landscape features (tree, shrubs, etc.) damaged during property remediation will be repaired.

If doubt exists whether damage was caused during the construction process, video and photographic documentation taken before initiation of activities will be reviewed on a case-by-case basis. The decision to repair disputed damages will be made by the USACE.

4.8.3 Property Inspection

Once the construction is completed, any repairs are completed and all disputes associated with the property remediation are resolved, the Construction Contractor will inspect the property with the property owner. At this inspection, the as-built Site Restoration Agreement will be finalized and the property owner will sign-off that work performed

meets their satisfaction. If the property owner fails to show or declines to sign the as-built Site Remediation Map, the USACE will inspect the property. If the property has been remediated and restored in a manner that has been acceptable to owners of other properties, the USACE will sign the Completion Agreement and provide an assessment of the site conditions to USEPA. USEPA will then review the final as-built drawing signed by the owner and USACE. The property inspection will be performed no later than at the end of the vegetation maintenance period.

5 CONSTRUCTION CONSIDERATIONS

This section describes overall construction management considerations associated with implementing the remedial action. This section also identifies specific sequences and dependencies of activities, logistical requirements of various aspects of the work, material quantity estimates and health and safety considerations.

5.1 Project Sequence and Schedule

Based on the scope of the activities to be performed, it is estimated that remediation construction will require three to four years to complete. A typical construction season will begin in the early spring and extend to a late fall, unless unseasonably cold and wet weather shortens the period during which effective construction can be performed. Construction experience from the South Globeville Residential Soil Remediation Project indicates that approximately 100 to 150 properties can be remediated in a single construction period with limited disruption of normal activities in the local community. Remediation in the VB/I70 Site will be more difficult than Globeville because the properties to be remediated are located throughout the site, which will make sequencing and material staging more problematic.

Property remediation activities will be coordinated with soil management activities at the disposal location to limit the need for stockpiling of soil in residential areas or at the disposal site. If the Globe Plant is the selected disposal site, the property

remediation activities will be performed such that the material management activities at the Globe Plant comply with ASARCO's existing obligations.

The USACE will sequence the construction from the list of properties identified by the EPA. USEPA may identify properties to be targeted for early remediation based on data generated by the Community Health Program.

5.2 Material Quantity Estimates

Based on existing Site data extrapolated to account for unsampled properties, it is estimated that a total of 853 properties will require remediation for action levels of 70 mg/kg arsenic and 400 mg/kg lead (USEPA, 20001b). For this number of properties, it is estimated that the remediation activities will produce approximately 176,000 loose cubic yards (cy) of material for disposal. This volume is based on an average property loose soil volume of 205 cy, as determined from the previous removals a Globeville and the time critical removal actions at VB/I70.

It is estimated that approximately 194,000 cy of loose replacement material will be required for property remediation. This estimate is based on the estimated volume of the material to be removed plus a 10 percent allowance for net shrinkage and loss. It is estimated that the replacement material volume will be compromised of approximately 191,500 cy of soil and 2,500 cy of gravel.

5.3 Construction Quality Assurance/Quality Control

Construction quality control and quality assurance testing and inspection procedures will be implemented to provide for proper construction and compliance with the construction pans and specifications. In this Remedial Design Work Plan and its supporting documents, quality control refers to the procedures, methods, and test to be utilized by the Construction Contraction to exhibit compliance with the plans and specifications. Quality Assurance refers to inspection, checks and tests to be performed by the USACE to evaluate and document achievement of, or deviation from, the substantive requirements and intent of the plan and specifications. Complete details of the

construction quality control and quality assurance programs are provided in the Construction Quality Assurance Plan, which is included as Appendix F.

5.4 Health and Safety

The remedial action activities will be required to comply with the requirements of 29 CFR 1910 and 1926. The Construction Contractor will prepare a construction Health and Safety Plan for the project which addresses health and safety practices for all project workers and the public. During all construction activities, the Construction Contractor will have a designated Health and Safety Coordinator. This individual will have authority over all personnel to enforce the project's health and safety requirements.

The USACE will review the project Health & Safety Plan prepared by the Construction Contractor.

5.5 Compliance with ARARs

The residential design has been prepared to comply with the Applicable or Relevant and Appropriate Requirements (ARARs) identified in Feasibility Study report (USEPA, 2001b). The residential remediation will comply with the ARARs set out in the ROD.

The ARARs from the Feasibility Study report are shown in Tables 5-1 through 5-3. In addition, the tables identify the appropriate section within this report that provides design that will meet the substantive requirements of the ARARs.

6 Removal Action Reporting

6.1 Monthly Progress Reports

Construction reporting will include weekly progress reports prepared by the USACE and the Contractor and submitted to the USEPA project manager. The weekly progress reports will be prepared beginning with the pre-remediation sampling phase and continue through construction completion.

Progress reports will summarize the progress of the work, cost, identify important changes of revisions to the project schedule or design, and present all analytical data and data validation reports generated during the reporting period. Further details of the weekly progress reporting requirements are include in the Construction Quality Assurance Plan, included as Appendix F.

6.2 Final Construction Reports

A final construction report will be prepared by the Contractor at the end of each Task Order and Contract. The construction report will summarize the construction activities performed during the period, including properties finished, quantities removed and replaced, construction progress, field design changes, quality assurance/quality control data, project quantities, and cost.

REFERENCES

ASARCO Incorporated 2000. Contract Documents, South Globeville Residential Soils Remediation Project Blocks 4300,4400 and 4500. January.

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Tabbed Page: Tables

TABLES

Table 2-1
Replacement Material Chemical Criteria

Media	Constituent	Maximum Concentration [1] (mg/Kg)
Replacement Soils	*Volatile Organic Compounds*	
	Benzene	0.6
	Carbon Tetrachloride	0.23
	1,1-Dichloroethane	546.8
	1,1-Dichloroethylene	0.05
	Ethylbenzene	1000
	Pentachlorophenol	0.51
	Tetrachloroethylene	20.2
	Toluene	667.85
	1,1,1-Trichloroethane	797.19
	Trichloroethylene	2.99
	Vinyl chloride	0.02
	Semi-Volatile Organic Compounds	
	Napthalene	289.1
	Phenol	1000
	Xylene (total)	1000
	Pesticides/PCBs	
	DDT	0.58
	Dieldrin	0.01
	PCBs	0.07
	Arochlor 1016	2.99
	Arochlor 1254	0.63
	Metals [2]	
	Arsenic	15
	Cadmium and compounds	73
	Chromium (VI)	53.94
	Copper and compounds	2570
	Lead	195
	Mercury (inorganic)	17.66
Replacement Gravel	*Metals* [2]	
	Arsenic	15
	Lead	195

Notes: [1] Values from Tier 2 Soil Clean-up Table Value Standards (CDPHE, 1997), except for arsenic and lead site-specific PRGs (USEPA, 2001b), and cadmium from Globeville clean-up (CDPHE, 2002).
[2] Analyses will be performed for total cadmium, chromium and copper.

TABLE 4-1

TYPICAL PROPERTY REMEDIATION SEQUENCE

Responsible Party	Activity
Supervising Contractor	Researches property ownership information and legal description from tax records. Develops a preliminary Site Remediation Map for each property.
Supervising Contractor	Contacts the property owner to introduce the program and determines if the owner is interested in participating. Obtains signed Access Agreement from property owner. Discusses garden and flowerbed sampling with owner. If the owner does not want to save any gardens or flowerbeds, works with owner to generate a final site Remediation Map, as described below.
Supervising Contractor	Performs garden and flowerbed sampling and analysis, if required. Prepares final Site Remediation Map based on owner input and garden and flowerbed sample results. Provides analytical results to USEPA in monthly report.
Supervising Contractor & Construction Contractor	Meets with property owner to review final Site Remediation Plan. Supervising Contractor and property owner sign the Final Site Remediation Map.
USEPA	Reviews Final Site Remediation Map. If acceptable, USEPA representative signs Final Site Remediation Map.
Supervising Contractor	Issues signed Final Site Remediation Map to Construction Contractor. Notifies property owner of planned construction date.
Construction Contractor and Supervising Contractor	Perform property remediation and post-remediation maintenance activities.
Supervising Contractor	Prepares as-built Site Remediation Map.
Supervising Contractor	Meets with property owner to review property remediation. If acceptable, Supervising Contractor and property owner sign as-built Site Remediation Maps.
USEPA	Reviews signed as-built. If acceptable, signs the as-built and issues letter to property owner certifying that property remediation has been completed.

TABLE 5-1

SUMMARY OF POTENTIAL CHEMCIAL-SPECIFIC ARARs FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN

Standard, Requirement or Criteria	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment	Design Component that meets requirements
FEDERAL						
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/170 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.	Fugitive Emissions Dust Control Plan (Appendix E)
STATE						
Colorado Air Pollution Prevention and Control Act	Yes	--	5 CCR 1001-14;	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS.	Construction activities associated with potential remedial actions at the site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)
	No	Yes	5 CCR 1001-10 Part C (I) Regulation 8	Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)

TABLE 5-2

SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs FROM THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN

Standard, Requirement or Criteria	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment	Design Component that meets requirements
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs						
Endangered Species Act	Yes	No	16 USC § 1531 et seq.; 50 CFR 200 and 402	Provides protection for threatened and endangered species and their habitats.	Due to the urban nature of the site, threatened or endangered species are highly unlikely to be present. However, the Act would be applicable if endangered species were identified and affected by the selected remedial alternative.	Not applicable – no threatened or endangered species have been identified.

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
Hazardous and Solid Waste: 1. Solid waste determination	Yes	--	6 CCR 1007-3 Part 260 6 CCR 1007-3 Sect. 260.30-31 6 CCR 1007-3 Sect. 261.2 6 CCR 1007-3 Sect. 261.4	A solid waste is any discarded material that is not excluded by a variance granted under 40 CFR 260.30 and 260.31. Discarded material includes abandoned, recycled, and waste-like materials.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).
2. Solid waste classification.	Yes	--	6 CCR 1007-2, Section 1	If a generator of wastes has determined that the wastes do not meet the criteria for hazardous wastes, they are classified as solid wastes.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).
3. Determination of hazardous waste.	Yes	--	6 CCR 1007-3 Sect. 262.11 6 CCR 1007-3 Part 261	Wastes generated during soil excavation activities must be characterized and evaluated according to the following method to determine whether the waste is hazardous. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 milligrams per liter. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 milligrams per liter.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets Requirements**
Air Emission Control 4. Particulate emissions during excavation and backfill.	Yes	--	5 CCR 1001-3, Regulation 1, Section III (D) 5 CCR 1001-5, Regulation 3 5 CCR 1001-2, Section II	Colorado air pollution regulations require owners or operators of sources that emit fugitive particulates to minimize emissions through use of all available practical methods to reduce, prevent, and control emissions. In addition, no off-site transport of particulate matter is allowed. A fugitive dust control measure will be written into the workplan in consultation with the state for the remedial activity.	Applicable to alternatives where soil is excavated, moved, stored, transported or redistributed.	Fugitive Emissions Dust Control Plan (Appendix E)
5. Emission of hazardous air pollutants.	No	Yes	5 CCR 1001-10, Regulation 8	Emission of certain hazardous air pollutants is controlled by NESHAPs. Excavation and backfill of soils could potentially cause emission of hazardous air pollutants. Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
6. Air emissions from diesel-powered vehicles associated with excavation and backfill operations.	Yes	--	5 CCR 1001-15, Regulation 12	Colorado Diesel-Powered Vehicle Emissions Standards for Visible Pollutants apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways, and state as follows: 1) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighting 7,500 pounds and less, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity. 2) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing more than 7,500 pounds, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 35% opacity, with the exception of subpart "C". 3) Any diesel-powered motor vehicle exceeding these requirements shall be exempt for a period of 10 minutes if the emissions are a direct result of a cold engine startup and provided the vehicle is in a stationary position. 4) These standards shall apply to motor vehicles intended, designed, and manufactured primarily for travel or use in transporting persons, property, auxiliary equipment, and/or cargo over roads, streets, and highways.	Applicable to alternatives that include transportation of soil.	Transportation and Disposal Plan (Appendix D)

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
7. Odor emissions.	Yes	--	5 CCR 1001-4, Regulation 2	Colorado odor emission regulations require that no person shall allow emission of odorous air contaminants that result in detectable odors that are measured in excess of the following limits: For residential and commercial areas – odors detected after the odorous air has been diluted with seven more volumes of odor-free air.	Applicable to alternatives that include construction activities in residential areas.	Section 4.4.5
8. Smoke and opacity.	No	Yes	5 CCR 1001-3, Regulation 1, Sect. II.A	Excavation and backfilling of soils must be conducted in a manner that will not allow or cause the emission into the atmosphere of any air pollutant that is in excess of 20% opacity.	Regulation specifically exempts fugitive emissions generated by excavation/backfilling activities. Relevant and appropriate to alternatives that include excavation and backfilling of soils.	Fugitive Emissions Dust Control Plan (Appendix E).
9. Ambient Air Standard for Total Suspended Particulate Matter.	Yes	--	5 CCR 1001-14	Air quality standards for particulates (as PM10) are 50 $\mu g/m^3$; annual geometric mean, 150 $\mu g/m^3$ 24 hour.	Applicable to alternatives that include actions that generate fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix E).
10. Ambient Air Standard for Lead.	Yes	--	5CCR 1001-10, Regulation 8	Monthly air concentration must be less than 1.5 $\mu g/m^3$.	Applicable to alternatives that include actions on contaminated soil that generate fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix E).

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
11. Noise abatement	Yes	--	C.R.S., Section 25-12-103	The Colorado Noise Abatement Statute provides that: a. "Applicable activities shall be conducted in a manner so any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Noise is defined to be a public nuisance if sound levels radiating from a property line at a distance of twenty-five feet or more exceed the sound levels established for the following time periods and zones: Zone — 7:00 a.m. to next 7:00 p.m. — 7:00 p.m. to next 7:00 a.m. Residential — 55 db(A) — 50 db(A) Commercial — 60 db(A) — 55 db(A) Light Industrial — 70 db(A) — 65 db(A) Industrial — 80 db(A) — 75 db(A) b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in Requirement a (above) may be increased by ten decibels for a period of not to exceed fifteen minutes in any one-hour period. c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five decibels less than those listed in Requirement a (above). d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project. e. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.	Applicable to alternatives that include construction activities.	Noise Control Requirements-Section 4.4.3

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

STATE ARARS						
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
12. Transportation of Hazardous Waste.	Yes	--	8 CCR 1507	Rules regarding Transportation of Hazardous Substances.	Applicable to alternatives that include transportation of contaminated soil.	Transportation and Disposal Plan (Appendix D)

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

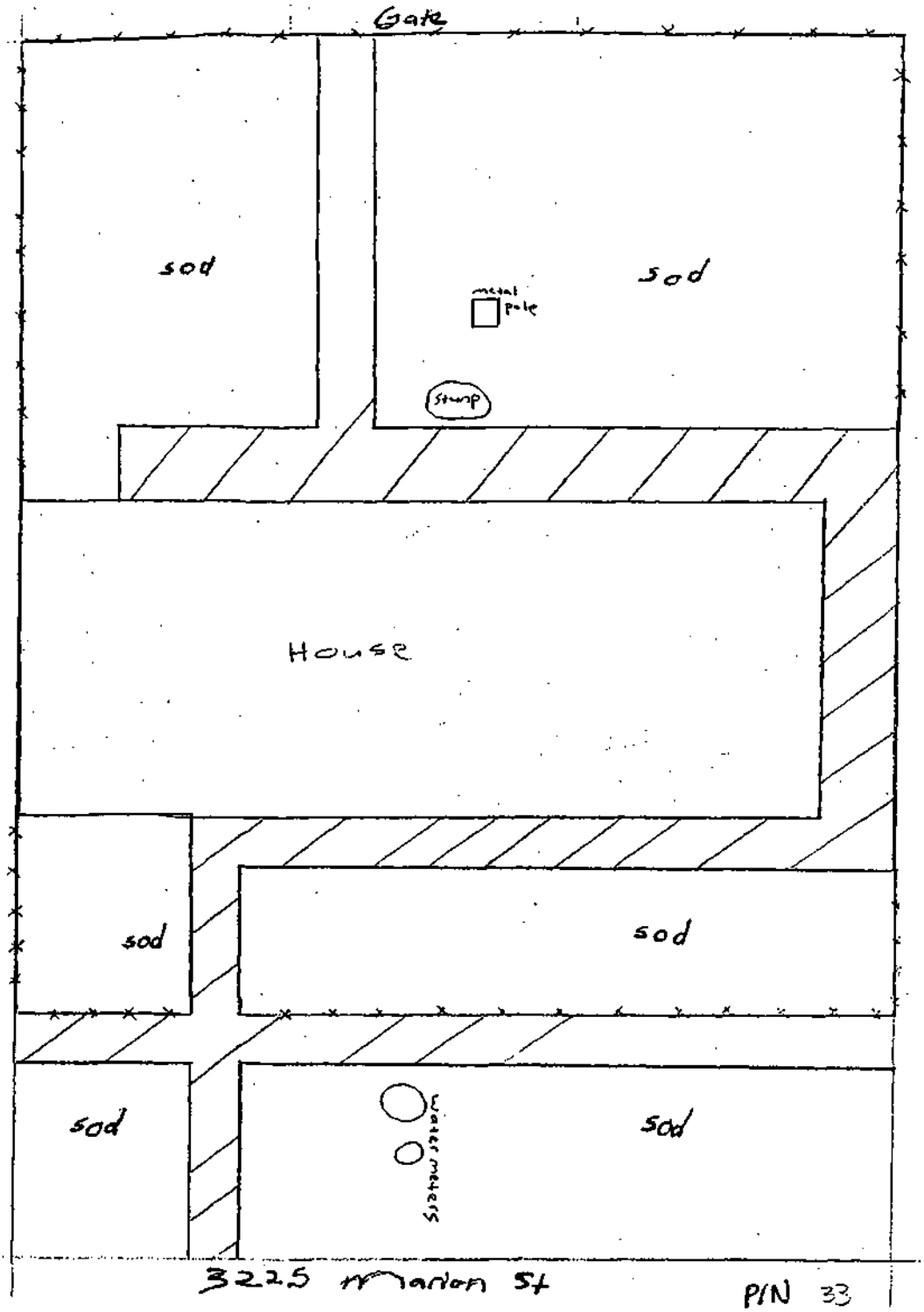
FEDERAL ARARs						
Standard, Requirement or Criteria	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
Criteria for Classification of Solid Waste and Disposal Facilities and Practices	Yes	--	40 CFR Part 257	Establishes criteria for use in determining solid wastes and disposal requirements.	Would be applicable if solid wastes are generated (such as excavated soil).	Disposal sampling characteristics (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F)
Criteria for Classification of Hazardous Waste and Disposal Facilities and Practices	Yes	--	40 CFR 264	Establishes criteria for use in determining hazardous wastes and disposal requirements. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 mg/l. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 mg/l.	Would be applicable if hazardous wastes are generated. It is noted that previous soil removed had higher concentrations of lead and arsenic and were not hazardous wastes. However, these regulations are potentially applicable.	Disposal sampling characteristics (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F)
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standards are: 150 micrograms per cubic meter for particulate matter for a 24 hour period; 50 micrograms per cubic meter for particulate matter- annual arithmetic mean; 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/I70 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to particulates and to lead are relevant and appropriate.	Fugitive Emissions Dust Control Plan (Appendix E)

TABLE 5-3
POTENTIAL ACTION-SPECIFIC ARARS FROM
THE FEASIBILITY STUDY REPORT AND HOW REQUIREMENTS ARE MET BY THE DESIGN (continued)

FEDERAL ARARs						
Standard, Requirement or Criteria	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**	**Design Component that meets requirements**
Hazardous Materials Transportation Regulations	Yes	--	49 CFR Parts 107, 171-177	Regulates transportation of hazardous materials.	Applicable only if the remedial action involves off-site transportation of hazardous materials. The regulations affecting packaging, labeling, marking, placarding, using proper containers, and reporting discharges of hazardous materials would be potential ARARs.	Excavated soil not expected to be hazardous based on previous removals – would be addressed in the Transportation and Disposal Plan (Appendix D), if applicable.

Tabbed Page: Figures

FIGURES



NOTE:
THIS DRAWING IS NOT TO SCALE.

U.S. EPA REGION VIII
VB/I-70 SUPERFUND SITE - OPERABLE UNIT 1
REMEDIAL DESIGN WORK PLAN
TYPICAL SITE REMEDIATION PLAN
PROJECT RESOURCES INC.

APPENDICES

Tabbed Page: Appendix A

APPENDIX A

PRELIMINARY LIST OF CANDIDATE PROPERTIES FOR REMEDIATION

Appendix A
Preliminary List of Candidate Properties for Remedial Action

This appendix provides a preliminary list of candidate properties for cleanup during the remedial action. The list was generated by comparing the arsenic and lead exposure point concentrations (EPCs) measured in yard soils to the anticipated remedial action levels of 70 mg/kg arsenic and 400 mg/kg lead, and identifying properties not target for removal actions (see below), for which the EPCs exceeded the action levels. A list of the properties that are candidates for remedial action is shown in Table A-1. The list was generated using all sampling data through March 2003. Property owner contact information is shown in Table A-2.

Several activities need to be completed before a final list of candidate properties for remedial action is identified. Most importantly, USEPA will define the action levels in a Record of Decision; expected to be issued in 2003. Also, in addition to the properties identified in Table A-1, USEPA has identified 141 properties with arsenic EPCs greater than or equal to 240 mg/kg and/or lead EPCs greater than 540 mg/kg to be addressed under a Non-Time-Critical Removal Action. The list of properties is presented in the design report (*Non-Time-Critical Action Removal Work Plan Operable Unit 1 Vasquez Boulevard/Interstate 70 Superfund Site Denver Colorado* USEPA, 2003. Prepared by MFG, Inc. and Tetra Tech EM Inc.) and are not included on Table A-1. In the event that some of these properties are not addressed under the removal action they will need to be added to the remedial action candidate list. Finally, there are approximately 1,000 residential properties within the Site, which have not yet been sampled (see Appendix C for a preliminary list). Properties which are identified by future sampling to have arsenic or lead EPCs above action levels will be added to the list of properties requiring remediation.

Table A-1

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
959	CLAYTON	3201 FILLMORE ST	93.3	158.5
960	CLAYTON	3209 FILLMORE ST	179.3	229.6
1401	CLAYTON	3212 SAINT PAUL ST	134.9	355.3
961	CLAYTON	3215 FILLMORE ST	103.2	218.3
1002	CLAYTON	3216 COLUMBINE ST	95.0	167.1
983	CLAYTON	3216 JOSEPHINE ST	95.4	208.9
920	CLAYTON	3220 FILLMORE ST	130.5	231.1
1037	CLAYTON	3220 YORK ST	121.5	365.8
962	CLAYTON	3221 FILLMORE ST	153.1	360.8
982	CLAYTON	3222 JOSEPHINE ST	93.6	151.0
1409	CLAYTON	3227 ADAMS ST	84.9	169.6
981	CLAYTON	3228 JOSEPHINE ST	79.0	244.6
999	CLAYTON	3230 COLUMBINE ST	106.7	154.7
975	CLAYTON	3240 YORK ST	4.6	443.3
970	CLAYTON	3250 FILLMORE ST	78.0	152.0
1032	CLAYTON	3258 YORK ST	79.6	307.4
1479	CLAYTON	3265 MADISON ST	100.3	171.1
1133	CLAYTON	3301 SAINT PAUL ST	94.3	151.7
1456	CLAYTON	3310 SAINT PAUL ST	215.3	287.0
1560	CLAYTON	3311 BRUCE RANDOLPH AVE	98.1	139.3
1134	CLAYTON	3311 SAINT PAUL ST	89.7	236.6
1080	CLAYTON	3314 JOSEPHINE ST	85.9	232.2
1049	CLAYTON	3315 CLAYTON ST	111.3	157.0
1137	CLAYTON	3329 SAINT PAUL ST	216.9	236.7
1138	CLAYTON	3333 SAINT PAUL ST	238.2	389.8
1450	CLAYTON	3337 STEELE ST	241.4	410.3
1070	CLAYTON	3339 ELIZABETH ST	157.7	1130.5
1028	CLAYTON	3341 JOSEPHINE ST	147.1	316.4
1434	CLAYTON	3344 STEELE ST	81.6	356.7
1029	CLAYTON	3347 JOSEPHINE ST	97.1	233.9
1125	CLAYTON	3350 MILWAUKEE ST	214.0	241.4
1073	CLAYTON	3353 ELIZABETH ST	69.4	438.8
1447	CLAYTON	3359 STEELE ST	98.7	268.5
1199	CLAYTON	3415 COLUMBINE ST	108.4	163.8
1600	CLAYTON	3415 STEELE ST	70.2	309.3
1167	CLAYTON	3420 FILLMORE ST	85.9	111.9
1200	CLAYTON	3421 COLUMBINE ST	126.0	231.6
1142	CLAYTON	3421 ELIZABETH ST	140.8	311.4
1547	CLAYTON	3421 HARRISON ST	158.4	84.4
1178	CLAYTON	3424 YORK ST	96.8	241.4
1558	CLAYTON	3425 COOK ST	79.2	186.2
1598	CLAYTON	3427 STEELE ST	209.2	193.9
1549	CLAYTON	3429 HARRISON ST	150.6	183.9
1116	CLAYTON	3429 SAINT PAUL ST	135.7	188.6
1192	CLAYTON	3432 JOSEPHINE ST	313.0	456.0
1606	CLAYTON	3434 SAINT PAUL ST	172.1	281.5
1597	CLAYTON	3435 STEELE ST	87.0	472.1
1552	CLAYTON	3440 HARRISON ST	150.9	101.8
1191	CLAYTON	3440 JOSEPHINE ST	182.1	238.7
1111	CLAYTON	3446 MILWAUKEE ST	208.2	146.8
1185	CLAYTON	3449 JOSEPHINE ST	114.2	199.2
1542	CLAYTON	3450 JACKSON ST	137.6	348.8

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
1612	CLAYTON	3450 STEELE ST	160.0	202.1
1188	CLAYTON	3452 JOSEPHINE ST	240.0	505.9
1187	CLAYTON	3455 JOSEPHINE ST	85.7	166.7
1587	CLAYTON	3456 MADISON ST	114.9	219.3
1593	CLAYTON	3457 STEELE ST	178.9	140.2
1625	CLAYTON	3458 ADAMS ST	149.6	188.2
1611	CLAYTON	3458 STEELE ST	70.5	116.1
1665	CLAYTON	3501 GARFIELD ST	157.1	308.7
1713	CLAYTON	3501 JACKSON ST	80.5	118.6
1294	CLAYTON	3501 SAINT PAUL ST	76.5	280.5
1691	CLAYTON	3510 HARRISON ST	83.7	172.8
1650	CLAYTON	3510 SAINT PAUL ST	117.5	236.6
2795	CLAYTON	3515 MONROE ST	121.3	114.5
1651	CLAYTON	3516 SAINT PAUL ST	219.2	300.3
1241	CLAYTON	3521 MILWAUKEE ST	164.2	194.8
1303	CLAYTON	3532 FILLMORE ST	176.2	429.5
1707	CLAYTON	3532 GARFIELD ST	189.5	213.6
1699	CLAYTON	3533 HARRISON ST	135.5	119.0
1649	CLAYTON	3535 STEELE ST	99.6	304.0
2797	CLAYTON	3536 HARRISON ST	77.8	134.4
1299	CLAYTON	3537 SAINT PAUL ST	47.3	520.7
1211	CLAYTON	3540 COLUMBINE ST	70.7	156.3
1694	CLAYTON	3540 JACKSON ST	89.6	207.5
2791	CLAYTON	3540 SAINT PAUL ST	76.4	194.5
1648	CLAYTON	3541 STEELE ST	76.0	212.0
1301	CLAYTON	3547 SAINT PAUL ST	186.6	329.2
1263	CLAYTON	3548 ELIZABETH ST	106.2	164.3
1591	CLAYTON	3550 SAINT PAUL ST	205.7	148.7
1673	CLAYTON	3559 GARFIELD ST	79.2	108.3
1686	CLAYTON	3600 HARRISON ST	214.9	353.6
1801	CLAYTON	3600 SAINT PAUL ST	70.1	374.0
1284	CLAYTON	3601 SAINT PAUL ST	225.8	355.9
1800	CLAYTON	3601 STEELE ST	87.9	161.5
1513	CLAYTON	3604 BRUCE RANDOLPH AVE	136.6	210.5
1523	CLAYTON	3609 BRUCE RANDOLPH AVE	106.1	213.1
2819	CLAYTON	3610 SAINT PAUL ST	83.0	473.7
2761	CLAYTON	3611 FILLMORE ST	118.3	157.5
1719	CLAYTON	3615 GARFIELD ST	223.8	218.1
1749	CLAYTON	3620 HARRISON ST	98.8	122.5
1802	CLAYTON	3620 SAINT PAUL ST	258.5	468.2
2768	CLAYTON	3621 JOSEPHINE ST	214.9	202.4
1798	CLAYTON	3621 STEELE ST	101.5	241.6
2754	CLAYTON	3625 SAINT PAUL ST	102.7	285.5
2807	CLAYTON	3627 JACKSON ST	74.3	178.9
1345	CLAYTON	3629 JOSEPHINE ST	145.5	153.5
1316	CLAYTON	3632 CLAYTON ST	80.5	307.4
1743	CLAYTON	3635 HARRISON ST	113.1	146.7
1748	CLAYTON	3636 HARRISON ST	76.6	248.3
1892	CLAYTON	3636 STEELE ST	184.8	130.3
1727	CLAYTON	3638 GARFIELD ST	143.0	158.6
3880	CLAYTON	3639 FILLMORE ST	105.9	228.6
1722	CLAYTON	3641 GARFIELD ST	117.1	210.7
1757	CLAYTON	3650 COOK ST	179.7	129.0

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
1724	CLAYTON	3653 GARFIELD ST	112.8	122.9
2828	CLAYTON	3700 ADAMS ST	152.7	135.9
1365	CLAYTON	3700 MILWAUKEE ST	74.6	162.1
1837	CLAYTON	3701 COOK ST	163.0	157.1
1376	CLAYTON	3701 MILWAUKEE ST	81.1	163.3
1814	CLAYTON	3705 GARFIELD ST	70.6	132.5
1830	CLAYTON	3706 COOK ST	93.1	126.9
2827	CLAYTON	3710 ADAMS ST	235.1	153.4
1829	CLAYTON	3710 COOK ST	191.9	114.1
2822	CLAYTON	3720 MADISON ST	82.0	223.6
1336	CLAYTON	3724 YORK ST	260.2	417.9
2776	CLAYTON	3730 YORK ST	99.4	637.0
1789	CLAYTON	3745 STEELE ST	98.0	109.4
2824	CLAYTON	3750 COOK ST	73.2	77.1
1795	CLAYTON	3758 SAINT PAUL ST	132.5	152.6
2832	CLAYTON	3808 STEELE ST	60.7	430.2
2837	CLAYTON	3835 ADAMS ST	164.8	132.4
1924	CLAYTON	3838 MADISON ST	89.5	261.3
3881	CLAYTON	3838 STEELE ST	126.9	208.8
2778	CLAYTON	3840 E 35TH AVE	89.6	99.5
2856	CLAYTON	3855 COOK ST	82.7	151.0
1925	CLAYTON	3880 MADISON ST	79.7	132.8
1936	CLAYTON	3928 STEELE ST	80.2	170.2
1931	CLAYTON	3940 JACKSON ST	73.3	207.8
2893	CLAYTON	3971 HARRISON ST	165.4	154.1
2879	CLAYTON	3990 JACKSON ST	95.1	136.0
29	COLE	1227 MARTIN LUTHER KING BLVD	5.5	452.3
2607	COLE	1705 BRUCE RANDOLPH AVE	11.9	458.0
788	COLE	1903 BRUCE RANDOLPH AVE	14.3	416.4
786	COLE	1911 BRUCE RANDOLPH AVE	14.9	400.8
636	COLE	3200 RACE ST	113.3	215.0
579	COLE	3201 GAYLORD ST	81.2	310.6
620	COLE	3201 RACE ST	177.4	369.7
598	COLE	3201 YORK ST	232.3	516.7
580	COLE	3209 GAYLORD ST	232.5	669.5
98	COLE	3209 HIGH ST	91.8	588.5
651	COLE	3216 VINE ST	114.3	191.3
33	COLE	3225 MARION ST	25.6	514.6
593	COLE	3226 GAYLORD ST	72.3	241.9
34	COLE	3227 MARION ST	141.3	410.9
592	COLE	3230 GAYLORD ST	363.7	408.7
124	COLE	3233 GILPIN ST	19.8	460.8
35	COLE	3233 MARION ST	5.5	417.3
646	COLE	3244 VINE ST	126.8	207.6
586	COLE	3245 GAYLORD ST	156.2	231.8
624	COLE	3248 HIGH ST	21.7	403.3
589	COLE	3250 GAYLORD ST	144.5	312.3
645	COLE	3250 VINE ST	77.5	205.5
721	COLE	3303 GAYLORD ST	93.9	236.1
157	COLE	3314 LAFAYETTE ST	5.5	469.7
723	COLE	3315 GAYLORD ST	92.0	184.4
683	COLE	3315 RACE ST	72.4	258.8
156	COLE	3316 LAFAYETTE ST	24.0	468.1

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
707	COLE	3317 YORK ST	79.6	407.8
132	COLE	3318 FRANKLIN ST	12.9	408.1
688	COLE	3318 HIGH ST	79.2	164.8
708	COLE	3319 YORK ST	87.2	245.4
724	COLE	3321 GAYLORD ST	158.9	268.2
177	COLE	3322 GILPIN ST	84.8	404.3
663	COLE	3328 RACE ST	110.6	234.6
153	COLE	3332 LAFAYETTE ST	170.2	465.8
662	COLE	3332 RACE ST	80.6	225.1
164	COLE	3333 HIGH ST	12.1	462.8
143	COLE	3335 GILPIN ST	118.0	395.0
165	COLE	3337 HIGH ST	126.3	453.4
184	COLE	3337 WILLIAMS	18.0	456.7
661	COLE	3338 RACE ST	224.1	347.6
715	COLE	3344 VINE ST	177.7	233.8
216	COLE	3344 WILLIAMS ST	186.0	340.9
171	COLE	3346 GILPIN ST	150.5	563.7
167	COLE	3349 HIGH ST	42.8	447.9
187	COLE	3350 GILPIN ST	293.2	510.7
673	COLE	3351 VINE ST	27.9	420.6
656	COLE	3357 GAYLORD ST	88.0	271.5
728	COLE	3401 VINE ST	89.6	329.6
738	COLE	3404 RACE ST	14.5	457.4
745	COLE	3408 VINE ST	92.5	203.3
729	COLE	3411 VINE ST	223.9	243.6
311	COLE	3414 LAFAYETTE ST	22.5	481.9
207	COLE	3419 HIGH ST	94.2	209.2
727	COLE	3420 RACE ST	71.8	203.7
270	COLE	3421 FRANKLIN ST	17.0	460.2
764	COLE	3422 GAYLORD ST	104.9	149.6
228	COLE	3424 FRANKLIN ST	59.1	403.3
763	COLE	3424 GAYLORD ST	78.5	286.5
287	COLE	3424 MARION ST	31.0	492.1
295	COLE	3425 LAFAYETTE ST	100.4	422.4
799	COLE	3426 RACE ST	176.6	431.1
252	COLE	3427 HUMBOLDT ST	5.5	402.7
732	COLE	3427 VINE ST	214.1	316.0
733	COLE	3431 VINE ST	198.5	344.2
253	COLE	3433 HUMBOLDT ST	96.6	428.9
264	COLE	3434 HUMBOLDT ST	114.0	476.6
45	COLE	3435 MARION ST	11.5	486.1
754	COLE	3437 GAYLORD ST	111.2	274.2
254	COLE	3443 HUMBOLDT ST	5.5	430.1
244	COLE	3444 GILPIN ST	35.9	445.5
255	COLE	3447 HUMBOLDT ST	12.3	441.1
211	COLE	3449 HIGH ST	131.9	268.4
759	COLE	3450 GAYLORD ST	181.4	285.3
300	COLE	3451 LAFAYETTE ST	15.7	401.4
737	COLE	3455 VINE ST	184.0	195.3
853	COLE	3500 GAYLORD ST	165.4	380.7
321	COLE	3505 HUMBOLDT ST	22.8	509.7
369	COLE	3507 FRANKLIN ST	21.2	438.5
367	COLE	3508 HUMBOLDT ST	53.7	409.9

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
2714	COLE	3508 RACE ST	91.2	240.9
322	COLE	3511 HUMBOLDT ST	163.9	574.6
339	COLE	3511 LAFAYETTE ST	26.2	512.6
2660	COLE	3515 LAFAYETTE ST	154.4	598.4
397	COLE	3516 GILPIN ST	13.2	467.6
334	COLE	3518 MARION ST	19.3	417.0
323	COLE	3519 HUMBOLDT ST	159.9	455.5
364	COLE	3520 HUMBOLDT ST	176.7	476.6
363	COLE	3524 HUMBOLDT ST	93.0	436.5
803	COLE	3524 VINE ST	113.1	123.6
383	COLE	3524 WILLIAMS ST	176.3	430.0
333	COLE	3526 MARION ST	17.5	445.8
2675	COLE	3527 WILLIAMS ST	19.8	408.5
2722	COLE	3527 YORK ST	113.6	373.1
2665	COLE	3528 HUMBOLDT ST	76.6	327.6
382	COLE	3528 WILLIAMS ST	26.9	515.1
848	COLE	3530 GAYLORD ST	102.0	184.4
2661	COLE	3531 LAFAYETTE ST	149.2	623.6
2710	COLE	3532 VINE ST	103.5	214.4
2654	COLE	3533 MARION ST	25.6	440.3
2721	COLE	3538 GAYLORD ST	164.5	242.5
326	COLE	3539 HUMBOLDT ST	162.6	454.8
2713	COLE	3540 RACE ST	75.8	138.3
847	COLE	3544 GAYLORD ST	185.6	256.4
317	COLE	3545 FRANKLIN ST	18.9	401.7
360	COLE	3546 HUMBOLDT ST	206.7	384.0
2670	COLE	3548 GILPIN ST	31.1	517.6
330	COLE	3548 MARION ST	22.9	435.5
2664	COLE	3550 HUMBOLDT ST	22.6	401.6
344	COLE	3553 LAFAYETTE ST	38.1	451.7
2658	COLE	3554 MARION ST	19.2	447.2
812	COLE	3556 RACE ST	211.6	235.9
837	COLE	3601 YORK ST	199.0	251.7
885	COLE	3603 VINE ST	165.5	249.7
420	COLE	3605 HIGH ST	219.2	492.3
472	COLE	3609 LAFAYETTE ST	18.8	403.2
2728	COLE	3610 HIGH ST	171.9	419.6
838	COLE	3611 YORK ST	25.1	475.4
868	COLE	3612 HIGH ST	91.1	360.3
2686	COLE	3613 LAFAYETTE ST	148.2	531.7
421	COLE	3615 HIGH ST	79.5	321.4
473	COLE	3619 LAFAYETTE ST	60.5	416.7
2730	COLE	3619 VINE ST	81.4	461.0
2676	COLE	3624 GILPIN ST	74.7	247.7
441	COLE	3626 HUMBOLDT ST	49.7	538.0
840	COLE	3627 YORK ST	133.9	250.0
450	COLE	3629 FRANKLIN ST	86.6	522.6
881	COLE	3630 RACE ST	168.3	398.6
415	COLE	3632 WILLIAMS ST	150.3	487.1
379	COLE	3634 WILLIAMS ST	104.0	442.6
482	COLE	3637 HUMBOLDT ST	28.5	477.8
474	COLE	3639 LAFAYETTE ST	26.1	437.6
438	COLE	3640 HUMBOLDT ST	212.4	641.0

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
880	COLE	3640 RACE ST	71.8	144.7
437	COLE	3642 HUMBOLDT ST	26.1	401.7
843	COLE	3647 YORK ST	114.9	260.4
879	COLE	3650 RACE ST	142.9	152.0
2677	COLE	3658 WILLIAMS ST	51.0	404.9
875	COLE	3690 RACE ST	124.5	251.8
501	COLE	3712 LAFAYETTE ST	184.4	375.7
2737	COLE	3715 RACE ST	17.1	407.8
912	COLE	3716 HIGH ST	17.7	427.3
542	COLE	3718 HUMBOLDT ST	5.5	436.0
499	COLE	3722 LAFAYETTE ST	21.1	449.7
895	COLE	3722 RACE ST	172.2	1004.4
551	COLE	3725 FRANKLIN ST	12.1	436.5
2693	COLE	3726 MARION ST	25.1	449.9
2698	COLE	3727 HIGH ST	99.3	256.3
519	COLE	3727 LAFAYETTE ST	34.8	474.2
893	COLE	3728 VINE ST	109.8	192.6
4	COLE	3729 MARION ST	22.1	414.6
552	COLE	3733 FRANKLIN ST	11.8	408.9
2685	COLE	3734 MARION ST	26.7	464.6
493	COLE	3735 FRANKLIN ST	15.8	409.2
2724	COLE	3742 HIGH ST	14.8	445.8
510	COLE	3742 MARION ST	24.2	418.5
2691	COLE	3744 LAFAYETTE ST	103.1	335.6
2690	COLE	3748 LAFAYETTE ST	171.1	384.9
902	COLE	3751 VINE ST	85.7	178.3
506	COLE	3762 MARION ST	18.3	414.4
3389	COLE	3770 FRANKLIN ST	19.1	428.9
3411	COLE	3770 GILPIN ST	21.6	452.2
3387	COLE	3778 FRANKLIN ST	5.5	491.8
3385	COLE	3778 GILPIN ST	16.5	465.5
2258	COLE	3781 GILPIN ST	133.5	578.3
2255	COLE	3785 WILLIAMS ST	17.6	538.5
3432	COLE	3805 GILPIN ST	87.7	390.1
3429	COLE	3830 FRANKLIN ST	178.9	697.7
3422	COLE	3830 WILLIAMS ST	14.9	447.1
3437	COLE	3839 GILPIN ST	21.7	444.2
2303	COLE	3840 FRANKLIN ST	24.5	402.1
2305	COLE	3843 GILPIN ST	22.1	404.8
3419	COLE	3843 WILLIAMS ST	137.0	469.5
3413	COLE	3846 GILPIN ST	42.5	507.6
3448	COLE	3919 HUMBOLDT ST	20.2	531.4
2321	ELYRIA	4351 RACE ST	206.5	643.9
2335	ELYRIA	4644 HIGH ST	17.4	438.6
2346	ELYRIA	4658 WILLIAMS ST	144.6	559.4
2363	ELYRIA	4660 BALDWIN CT	29.7	500.6
2324	ELYRIA	4677 GAYLORD ST	19.9	472.7
2345	ELYRIA	4684 BRIGHTON BLVD	90.8	454.5
2325	ELYRIA	4687 GAYLORD ST	30.9	473.3
2333	ELYRIA	4690 HIGH ST	100.2	422.1
2353	ELYRIA	4695 HIGH ST	17.0	430.0
2344	ELYRIA	4695 WILLIAMS ST	22.5	422.3
2392	ELYRIA	4704 GAYLORD ST	18.6	408.3

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
2403	ELYRIA	4706 CLAUDE CT	5.5	421.3
2386	ELYRIA	4715 WILLIAMS ST	110.1	279.4
2391	ELYRIA	4752 HIGH ST	16.2	408.7
3896	ELYRIA	4755 VINE ST	121.2	365.6
2394	ELYRIA	4758 VINE ST	19.6	409.6
2382	ELYRIA	4766 WILLIAMS ST	30.6	437.8
2367	ELYRIA	4775 WILLIAMS ST	24.4	408.6
2387	ELYRIA	4780 RACE ST	18.7	459.1
3909	ELYRIA	4783 HIGH ST	131.6	409.1
11	FIVE POINTS	3517 DELGANY ST	19.4	501.4
2642	FIVE POINTS	3527 DELGANY ST	155.7	369.2
2643	FIVE POINTS	3733 WYNKOOP ST	133.4	540.4
2644	FIVE POINTS	3739 WYNKOOP ST	123.0	498.0
2645	FIVE POINTS	3741 WYNKOOP ST	25.4	501.2
23	FIVE POINTS	3742 BRIGHTON BLVD	25.4	474.8
2648	FIVE POINTS	3742 DELGANY ST	335.3	516.6
22	FIVE POINTS	3746 BRIGHTON BLVD	75.6	565.5
17	FIVE POINTS	3746 DELGANY ST	45.3	487.9
2647	FIVE POINTS	3750 DELGANY ST	19.1	403.4
2409	GLOBEVILLE	4012 FOX ST	24.1	425.7
3617	GLOBEVILLE	4211 FOX ST	13.1	527.0
3621	GLOBEVILLE	4422 DELAWARE ST	258.7	517.6
2447	GLOBEVILLE	4463 CHEROKEE ST	86.6	310.9
2999	SWANSEA	3120 E 47TH AVE	189.8	142.4
4041	SWANSEA	3750 YORK ST	333.0	513.3
1994	SWANSEA	4021 MILWAUKEE ST	236.4	420.3
2948	SWANSEA	4027 FILLMORE ST	60.0	502.3
2923	SWANSEA	4033 ADAMS ST	148.9	133.0
1996	SWANSEA	4040 CLAYTON ST	198.5	269.7
3883	SWANSEA	4041 STEELE ST	115.0	271.8
2943	SWANSEA	4050 FILLMORE ST	186.7	226.8
2981	SWANSEA	4109 MILWAUKEE ST	146.7	162.1
2978	SWANSEA	4110 FILLMORE ST	99.3	183.2
2002	SWANSEA	4110 SAINT PAUL ST	116.2	228.9
1999	SWANSEA	4111 SAINT PAUL ST	128.7	215.8
2962	SWANSEA	4115 STEELE ST	166.1	377.1
2979	SWANSEA	4120 FILLMORE ST	132.3	399.4
2025	SWANSEA	4141 MILWAUKEE ST	85.1	144.4
2964	SWANSEA	4145 STEELE ST	96.4	313.0
2930	SWANSEA	4150 ADAMS ST	234.5	204.0
1981	SWANSEA	4171 ADAMS ST	121.8	188.3
2988	SWANSEA	4251 COLUMBINE ST	32.3	445.7
2235	SWANSEA	4300 STEELE ST	175.4	388.5
2058	SWANSEA	4305 COLUMBINE ST	30.6	537.9
2234	SWANSEA	4309 ADAMS ST	119.1	381.8
2995	SWANSEA	4312 YORK ST	23.0	434.2
2056	SWANSEA	4314 JOSEPHINE ST	237.5	579.0
3015	SWANSEA	4325 CLAYTON ST	102.4	233.0
3046	SWANSEA	4328 CLAYTON ST	97.0	223.3
3884	SWANSEA	4334 SAINT PAUL ST	105.7	208.2
3043	SWANSEA	4335 MILWAUKEE ST	82.7	226.9
3885	SWANSEA	4336 STEELE ST	78.4	184.5
2067	SWANSEA	4336 THOMPSON CT	97.2	350.3

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
3018	SWANSEA	4343 CLAYTON ST	146.8	312.6
3028	SWANSEA	4344 SAINT PAUL ST	102.3	144.7
2232	SWANSEA	4344 STEELE ST	148.1	130.3
2069	SWANSEA	4347 CLAYTON ST	177.7	333.5
2057	SWANSEA	4350 JOSEPHINE ST	166.9	171.1
2101	SWANSEA	4350 ST. PAUL ST	74.0	153.3
3038	SWANSEA	4355 SAINT PAUL ST	94.1	136.5
3459	SWANSEA	4359 CLAUDE CT	75.2	423.5
2054	SWANSEA	4362 JOSEPHINE ST	235.5	250.8
3075	SWANSEA	4363 STEELE ST	91.4	196.6
3016	SWANSEA	4375 CLAYTON ST	115.2	329.7
2994	SWANSEA	4395 COLUMBINE ST	13.8	520.0
3087	SWANSEA	4400 CLAYTON ST	72.3	150.3
3096	SWANSEA	4424 FILLMORE ST	75.8	166.2
2138	SWANSEA	4424 JOSEPHINE ST	188.9	388.0
3051	SWANSEA	4424 MILWAUKEE ST	113.0	275.9
3095	SWANSEA	4430 FILLMORE ST	149.7	314.3
3059	SWANSEA	4430 SAINT PAUL ST	119.7	182.8
3099	SWANSEA	4433 MILWAUKEE ST	171.3	380.6
3078	SWANSEA	4435 THOMPSON CT	120.3	305.0
3142	SWANSEA	4436 JOSEPHINE ST	24.2	421.1
3054	SWANSEA	4441 SAINT PAUL ST	75.7	252.3
2112	SWANSEA	4442 MILWAUKEE ST	168.3	345.7
3057	SWANSEA	4442 SAINT PAUL ST	156.8	138.5
2110	SWANSEA	4445 MILWAUKEE ST	98.8	330.1
3093	SWANSEA	4446 FILLMORE ST	5.5	440.3
3886	SWANSEA	4451 SAINT PAUL ST	80.5	183.5
2123	SWANSEA	4460 ELIZABETH ST	234.8	274.1
3153	SWANSEA	4507 CLAYTON ST	97.9	453.8
3179	SWANSEA	4518 MILWAUKEE ST	119.1	269.3
3132	SWANSEA	4539 COLUMBINE ST	188.2	678.8
3145	SWANSEA	4543 MILWAUKEE ST	135.6	266.3
3167	SWANSEA	4615 FILLMORE ST	130.9	178.2
3475	SWANSEA	4620 CLAUDE CT	30.7	527.4
3300	SWANSEA	4620 FILLMORE ST	203.1	308.8
2173	SWANSEA	4623 THOMPSON CT	163.0	314.6
3483	SWANSEA	4626 RACE ST	18.8	475.2
3162	SWANSEA	4650 CLAYTON ST	72.3	188.9
3201	SWANSEA	4651 CLAYTON ST	95.9	146.1
3490	SWANSEA	4651 WILLIAMS ST	23.6	491.8
3501	SWANSEA	4653 HIGH ST	326.0	480.9
3469	SWANSEA	4660 RACE ST	19.2	435.6
3466	SWANSEA	4665 VINE ST	50.7	426.9
3478	SWANSEA	4668 HIGH ST	21.3	466.3
3481	SWANSEA	4669 RACE ST	83.9	248.1
3173	SWANSEA	4670 MILWAUKEE ST	79.1	136.0
3468	SWANSEA	4679 VINE ST	11.1	477.4
2157	SWANSEA	4680 CLAYTON ST	102.5	557.7
3172	SWANSEA	4680 MILWAUKEE ST	160.1	314.0
3225	SWANSEA	4682 JOSEPHINE ST	11.8	443.7
2162	SWANSEA	4685 FILLMORE ST	99.0	233.8
3279	SWANSEA	4695 MILWAUKEE ST	120.5	191.9
3352	SWANSEA	4700 CLAYTON ST	120.4	371.8
3543	SWANSEA	4700 VINE ST	56.5	435.1

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
3338	SWANSEA	4701 MILWAUKEE ST	130.7	157.4
3533	SWANSEA	4708 WILLIAMS ST	28.3	447.7
3270	SWANSEA	4710 ELIZABETH ST	81.4	505.2
2195	SWANSEA	4710 THOMPSON CT	134.6	164.3
3556	SWANSEA	4719 VINE ST	17.8	409.7
3578	SWANSEA	4720 GAYLORD ST	129.0	381.1
3532	SWANSEA	4720 WILLIAMS ST	174.5	256.0
3894	SWANSEA	4721 THOMPSON CT	124.4	468.4
3553	SWANSEA	4722 RACE ST	21.2	427.9
3557	SWANSEA	4723 VINE ST	5.5	411.7
3353	SWANSEA	4725 CLAYTON ST	93.0	213.9
3319	SWANSEA	4725 SAINT PAUL CT	138.9	227.3
3569	SWANSEA	4726 HIGH ST	68.3	474.4
3513	SWANSEA	4727 BRIGHTON BLVD	16.5	445.0
3591	SWANSEA	4729 GAYLORD ST	217.9	426.9
2197	SWANSEA	4730 ELIZABETH ST	90.3	196.2
3552	SWANSEA	4730 RACE ST	44.5	414.9
2194	SWANSEA	4730 THOMPSON CT	79.5	204.7
3570	SWANSEA	4732 GAYLORD ST	73.5	387.3
3585	SWANSEA	4732 VINE ST	15.5	461.0
3551	SWANSEA	4736 RACE ST	221.2	378.1
2225	SWANSEA	4740 CLAYTON ST	113.0	158.7
3262	SWANSEA	4740 THOMPSON CT	232.1	123.5
3271	SWANSEA	4741 THOMPSON CT	170.4	115.5
3529	SWANSEA	4750 WILLIAMS ST	98.8	348.4
3238	SWANSEA	4751 ELIZABETH ST	120.7	147.8
3508	SWANSEA	4751 WILLIAMS ST	15.3	449.8
3509	SWANSEA	4753 WILLIAMS ST	24.1	532.2
3895	SWANSEA	4755 MILWAUKEE ST	102.7	144.8
2223	SWANSEA	4757 CLAYTON ST	85.3	148.7
2226	SWANSEA	4760 CLAYTON ST	174.1	360.0
2200	SWANSEA	4761 THOMPSON CT	89.9	456.7
3566	SWANSEA	4762 HIGH ST	19.8	414.2
3519	SWANSEA	4763 RACE ST	15.7	538.2
3575	SWANSEA	4765 CLAUDE CT	116.7	234.9
3594	SWANSEA	4765 GAYLORD ST	18.3	410.4
3510	SWANSEA	4765 WILLIAMS ST	16.6	444.6
3535	SWANSEA	4767 HIGH ST	28.0	415.0
3276	SWANSEA	4770 COLUMBINE ST	149.0	308.5
3310	SWANSEA	4770 SAINT PAUL ST	236.2	174.1
3302	SWANSEA	4775 FILLMORE ST	138.5	423.7
3536	SWANSEA	4775 HIGH ST	254.5	411.1
2208	SWANSEA	4776 FILLMORE ST	114.8	173.3
3521	SWANSEA	4777 RACE ST	15.5	404.6
2227	SWANSEA	4778 CLAYTON ST	90.3	281.3
3349	SWANSEA	4780 CLAYTON ST	70.0	298.0
3275	SWANSEA	4780 COLUMBINE ST	156.2	572.8
3275	SWANSEA	4780 COLUMBINE ST	156.2	572.8
3511	SWANSEA	4781 WILLIAMS ST	24.9	501.4
3581	SWANSEA	4785 CLAUDE CT	248.0	416.4
3253	SWANSEA	4785 COLUMBINE ST	140.2	178.5
3253	SWANSEA	4785 COLUMBINE ST	140.2	178.5
2214	SWANSEA	4785 FILLMORE ST	207.8	174.1
3577	SWANSEA	4793 CLAUDE CT	30.1	461.3

Table A-1 (Continued)

List of Candidate Properties for Remedial Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
3706	SWANSEA	4815 FILLMORE ST	140.5	111.8
3739	SWANSEA	4815 SAINT PAUL ST	237.0	341.7
3738	SWANSEA	4825 SAINT PAUL ST	82.9	159.8
3635	SWANSEA	4831 ADAMS ST	79.0	230.7
2490	SWANSEA	4840 CLAYTON ST	101.7	358.6
3730	SWANSEA	4857 STEELE ST	67.1	495.6
3849	SWANSEA	4905 CLAYTON ST	137.3	105.7
3864	SWANSEA	4905 MILWAUKEE ST	136.3	254.8
3720	SWANSEA	4906 SAINT PAUL ST	79.8	250.8
3853	SWANSEA	4907 FILLMORE ST	184.3	242.3
2593	SWANSEA	4908 MILWAUKEE ST	80.6	169.5
2588	SWANSEA	4912 FILLMORE ST	129.2	213.9
3873	SWANSEA	4912 MILWAUKEE ST	150.3	127.4
3719	SWANSEA	4914 SAINT PAUL ST	139.6	281.1
3867	SWANSEA	4921 MILWAUKEE ST	92.3	282.3
3722	SWANSEA	4929 STEELE ST	172.8	150.0
3870	SWANSEA	4930 MILWAUKEE ST	116.6	201.1
3658	SWANSEA	4955 ADAMS ST	144.1	169.6
2560	SWANSEA	4956 FILLMORE ST	123.9	481.0
2576	SWANSEA	4957 CLAYTON ST	119.2	447.3
3913	SWANSEA	4959 ADAMS ST	174.6	107.8
2559	SWANSEA	4960 FILLMORE ST	126.0	276.6
3815	SWANSEA	4962 SAINT PAUL ST	159.3	250.0
3829	SWANSEA	4963 SAINT PAUL ST	71.2	176.1
3653	SWANSEA	4965 ADAMS ST	145.1	155.8
2556	SWANSEA	4965 STEELE ST	89.6	103.5
2556	SWANSEA	4965 STEELE ST	89.6	103.5
2565	SWANSEA	4970 FILLMORE ST	187.1	205.4
3651	SWANSEA	4970 STEELE ST	140.7	244.1
2564	SWANSEA	4972 FILLMORE ST	207.1	170.9
3655	SWANSEA	4979 ADAMS ST	90.0	143.2
3649	SWANSEA	4986 STEELE ST	81.4	107.8
3644	SWANSEA	4990 ADAMS ST	97.0	220.6
3914	SWANSEA	4992 STEELE ST	227.0	158.7
3915	SWANSEA	5010 STEELE ST	124.0	141.5
3687	SWANSEA	5020 STEELE ST	124.9	141.2
3626	SWANSEA	5025 ADAMS ST	137.7	189.4
3626	SWANSEA	5025 ADAMS ST	137.7	189.4
3808	SWANSEA	5031 STEELE ST	87.6	397.0
3630	SWANSEA	5040 ADAMS ST	147.6	179.4
3684	SWANSEA	5044 STEELE ST	157.7	605.7
2461	SWANSEA	5050 ADAMS ST	185.7	205.6
2460	SWANSEA	5058 ADAMS ST	199.6	210.1
2543	SWANSEA	5060 MILWAUKEE ST	98.2	143.6
3801	SWANSEA	5060 SAINT PAUL ST	116.4	192.4
2536	SWANSEA	5065 MILWAUKEE ST	77.0	244.9
3690	SWANSEA	5070 STEELE ST	148.7	116.1
3780	SWANSEA	5075 MILWAUKEE ST	237.6	242.7
3780	SWANSEA	5075 MILWAUKEE ST	237.6	242.7
3792	SWANSEA	5075 SAINT PAUL ST	103.9	222.3
3689	SWANSEA	5088 STEELE ST	111.3	115.5
3798	SWANSEA	5096 SAINT PAUL ST	174.9	92.7

Table A-2

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
4	COLE	3729 MARION ST	JOSE LUIS GARCIA		3736 MARION ST	DENVER	CO	80205	303-298-8847	22.1	414.6
11	FIVE POINTS	3517 DELGANY ST	SALLY A GONZALES		3742 DELGANY ST	DENVER	CO	80216	303-371-8901	19.4	501.4
17	FIVE POINTS	3746 DELGANY ST	GERARDO & MARIA E HINOJOS		3746 DELGANY ST	DENVER	CO	80216	303-293-0186	45.3	487.9
22	FIVE POINTS	3746 BRIGHTON BLVD	ETHEL M & DAVID J POPISH		3746 BRIGHTON BLVD	DENVER	CO	80216		75.6	565.5
23	FIVE POINTS	3742 BRIGHTON BLVD	WALLACE BLACK-ELK		910 16TH ST STE 408	DENVER	CO	80202	303-292-3618.	25.4	474.8
29	COLE	1227 MARTIN LUTHER KING BLVD	DEBORAH HAYWOOD		1227 MARTIN LUTHER KING BLVD	DENVER	CO	80205	303-414-5698	5.5	452.3
33	COLE	3225 MARION ST	ABDUL SHAREEF		2727 HUMBOLDT ST	DENVER	CO	80205	303-298-1672	25.6	514.6
34	COLE	3227 MARION ST	MARIA ESTHER SALAS		3227 MARION ST	DENVER	CO	80205	303-675-0501	141.3	410.9
35	COLE	3233 MARION ST	CRIPPEN STUART TYLER	SARA PAZ CRIPPEN	3233 MARION ST	DENVER	CO	80205	303-293-9899	5.5	417.3
45	COLE	3435 MARION ST	ANTHONY MORTON		3435 MARION ST	DENVER	CO	80205	303-295-3619	11.5	486.1
98	COLE	3209 HIGH ST	ALEJANDRO PEDROZA		3209 HIGH ST	DENVER	CO	80205	303-296-1056	91.8	588.5
124	COLE	3233 GILPIN ST	MICHAEL J & TERRY S WILLIS		3233 GILPIN ST	DENVER	CO	80205	303-985-0940	19.8	460.8
132	COLE	3318 FRANKLIN ST	MAX JOSEPH LUCERO		3318 FRANKLIN ST	DENVER	CO	80205	303-296-8101	12.9	408.1
143	COLE	3335 GILPIN ST	RENEE BRYANT		3335 GILPIN ST	DENVER	CO	80205	303-388-8699	118.0	395.0
153	COLE	3332 LAFAYETTE ST	PETRA MONTOYA		3332 LAFAYETTE ST	DENVER	CO	80205	303-293-8037	170.2	465.8
156	COLE	3316 LAFAYETTE ST	ALEJANDRO PEDROZA		3316 LAFAYETTE ST	DENVER	CO	80205	303-292-1056	24.0	468.1
157	COLE	3314 LAFAYETTE ST	HENRY JONES	NORA MCCLAIN	3314 LAFAYETTE ST	DENVER	CO	80205		5.5	469.7
164	COLE	3333 HIGH ST	OSCAR R COLMENERO	ERLINDA COLMENERO	3333 HIGH ST	DENVER	CO	80205	303-308-1995	12.1	462.8
165	COLE	3337 HIGH ST	JESSE & MAE ODDIS		3337 HIGH ST	DENVER	CO	80205	303-295-6801	126.3	453.4
167	COLE	3349 HIGH ST	MIRIAM & DANIELA CASTELAN	HUGO RIZO CASTELAN	3349 HIGH ST	DENVER	CO	80205	303-294-0521	42.8	447.9
171	COLE	3346 GILPIN ST	JOE & LUCILLE HUNT		3346 GILPIN ST	DENVER	CO	80205	303-295-6777	150.5	563.7
177	COLE	3322 GILPIN ST	JERRY O & DOROTHY M WHITE		10620 W 76TH DR	ARVADA	CO	80005	303-440-4189	84.8	404.3
184	COLE	3337 WILLIAMS	ROSA GARCIA PALACIOS		3512 HIGH ST	DENVER	CO	80205		18.0	456.7
187	COLE	3350 GILPIN ST	CADREC, ATTN: J T PETERSON		3350 GILPIN ST	DENVER	CO	80205	303-295-2521	293.2	510.7
207	COLE	3419 HIGH ST	JOSE F DEVORA-ROMAN		3419 HIGH ST	DENVER	CO	80205	303-292-2923	94.2	209.2
211	COLE	3449 HIGH ST	AMALIO & ESPERANZA PAYAN		3749 WILLIAMS ST	DENVER	CO	80205	303-293-0250	131.9	268.4
216	COLE	3344 WILLIAMS ST	MARY K HEIDENREICH		3340 WILLIAMS ST	DENVER	CO	80205	303-429-7445	186.0	340.9
228	COLE	3424 FRANKLIN ST	DAROL C WILLIAMS		3424 FRANKLIN ST	DENVER	CO	80205	303-296-3496	59.1	403.3
244	COLE	3444 GILPIN ST	LUPE M GARCIA		3444 GILPIN ST	DENVER	CO	80205	303-293-3616	35.9	445.5
252	COLE	3427 HUMBOLDT ST	ERLINDA L GARCIA		2115 W 31ST AVE	DENVER	CO	80211	303-455-7745	5.5	402.7
253	COLE	3433 HUMBOLDT ST	MANUEL E RAMIREZ		3435 HUMBOLDT ST	DENVER	CO	80205	303-292-6206	96.6	428.9
254	COLE	3443 HUMBOLDT ST	BRENT L ALMQUIST		1820 E MUIRWOOD DR	PHOENIX	AZ	85048	602-984-3448	5.5	430.1
255	COLE	3447 HUMBOLDT ST	ALBERTA J VALDEZ	ANGELINA J GORDY	4958 ADAMS ST	DENVER	CO	80216	303-296-4009	12.3	441.1
264	COLE	3434 HUMBOLDT ST	BETTY MAESTAS		3434 HUMBOLDT ST	DENVER	CO	80205	303-295-6825	114.0	476.6
270	COLE	3421 FRANKLIN ST	MAX & LUCENA GUTIERREZ		3421 FRANKLIN ST	DENVER	CO	80205		17.0	460.2
287	COLE	3424 MARION ST	JAMES W SR & LISA ROY ROY		3424 MARION ST	DENVER	CO	80205	303-296-5041	31.0	492.1
287	COLE	3424 MARION ST	JAMES & KATHY POWERS		3424 MARION ST	DENVER	CO	80205		31.0	492.1
295	COLE	3425 LAFAYETTE ST	REYNALDO SANCHEZ		3425 LAFAYETTE ST	DENVER	CO	80205	303-296-8134	100.4	422.4
300	COLE	3451 LAFAYETTE ST	STEVE R WALKER		3451 LAFAYETTE ST	DENVER	CO	80205	303-291-1948	15.7	401.4
311	COLE	3414 LAFAYETTE ST	DIANE ELAINE ROMERO		3414 LAFAYETTE ST	DENVER	CO	80205	303-605-2175	22.5	481.9
317	COLE	3545 FRANKLIN ST	JOSE VALLES		3545 FRANKLIN ST	DENVER	CO	80205	303-296-7408	18.9	401.7
321	COLE	3505 HUMBOLDT ST	JESSE G HOLLINGSWORTH	SUSAN K HOLLINGSWORTH	3505 HUMBOLDT ST	DENVER	CO	80205	303-295-2968	22.8	509.7
322	COLE	3511 HUMBOLDT ST	JOHN C & ANGELA T DERR		3511 HUMBOLDT ST	DENVER	CO	80205	303-=295-7503	163.9	574.6
323	COLE	3519 HUMBOLDT ST	BENITO ESPINO VALDEZ	ELVIRA RIVERA DE ESPINO VALDEZ	3519 HUMBOLDT ST	DENVER	CO	80205	303-293-3517	159.9	455.5
326	COLE	3539 HUMBOLDT ST	JENNIFER L JENKINS	HOMER BONGARD	3539 HUMBOLDT ST	DENVER	CO	80205	303-831-7007	162.6	454.8
330	COLE	3548 MARION ST	VENTURA LARA		3548 MARION ST	DENVER	CO	80205	303-433-4535	22.9	435.5
333	COLE	3526 MARION ST	DONALD L & JANELLE A OBRIEN		1270 W CEDAR AVE # C	DENVER	CO	80223	303-722-4007	17.5	445.8
334	COLE	3518 MARION ST	LINDA MARIE GONZALEZ		3518 MARION ST	DENVER	CO	80205	303-298-9228	19.3	417.0
339	COLE	3511 LAFAYETTE ST	HIPOLITO M SANCHEZ	EPIFANIA T SANCHEZ	3511 LAFAYETTE ST	DENVER	CO	80205		26.2	512.6
339	COLE	3511 LAFAYETTE ST	EPIFANIA SANCHEZ		3511 LAFAYETTE ST	DENVER	CO	80205		26.2	512.6
344	COLE	3553 LAFAYETTE ST	GUILLERMO & ALFREDO GONZALEZ	JUANA F GONZALEZ	3553 LAFAYETTE ST	DENVER	CO	80205	303-295-2545	38.1	451.7
360	COLE	3546 HUMBOLDT ST	GENE EMRISEK		3546 HUMBOLDT ST	DENVER	CO	80205	303-292-5110	206.7	384.0
363	COLE	3524 HUMBOLDT ST	ANGIE TRUJILLO		3524 HUMBOLDT ST	DENVER	CO	80205		93.0	436.5
364	COLE	3520 HUMBOLDT ST	NICOLAS FLORES	MARIA MARTHA LOPEZ	3520 HUMBOLDT ST	DENVER	CO	80205	303-295-2712	176.7	476.6
367	COLE	3508 HUMBOLDT ST	LEONA V TALMADGE		3508 HUMBOLDT ST	DENVER	CO	80205	303-296-1707	53.7	409.9
369	COLE	3507 FRANKLIN ST	DAVID J & CECEILIA R TALMADGE		3507 FRANKLIN ST	DENVER	CO	80205	303-297-9493	21.2	438.5
379	COLE	3634 WILLIAMS ST	ARMANDO DE SANTIAGO		3634 WILLIAMS ST	DENVER	CO	80205	303-382-1029	104.0	442.6
382	COLE	3528 WILLIAMS ST	JOSE S RODRIGUEZ	PATRICIA A ORTEGA	3528 WILLIAMS ST	DENVER	CO	80205	303-297-9664	26.9	515.1

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
383	COLE	3524 WILLIAMS ST	MARK A FARLEY		3524 WILLIAMS ST	DENVER	CO	80205	303-675-0972	176.3	430.0
397	COLE	3516 GILPIN ST	JOSE PABLO HERRERA		3516 GILPIN ST	DENVER	CO	80205		13.2	467.6
415	COLE	3632 WILLIAMS ST	MARCELINO & JOSEFINA ESCALANTE		3134 KALAMATH ST	DENVER	CO	80211		150.3	487.1
415	COLE	3632 WILLIAMS ST	RAFAEL GURROLA		3632 WILLIAMS ST	DENVER	CO	80205	303-293-8796	150.3	487.1
420	COLE	3605 HIGH ST	EVA APPELHANS		3605 HIGH ST	DENVER	CO	80205	303-295-6517	219.2	492.3
421	COLE	3615 HIGH ST	JUAN ALBERTO CASTORENA		3615 HIGH ST	DENVER	CO	80205	303-298-8784	79.5	321.4
437	COLE	3642 HUMBOLDT ST	LYDIA M TRUJILLO		3642 HUMBOLDT ST	DENVER	CO	80205	303-292-2632	26.1	401.7
438	COLE	3640 HUMBOLDT ST	JESUS M MARTINEZ		3640 HUMBOLDT ST	DENVER	CO	80205		212.4	641.0
441	COLE	3626 HUMBOLDT ST	GRACE BACA		3626 HUMBOLDT ST	DENVER	CO	80205	303-291-0124	49.7	538.0
450	COLE	3629 FRANKLIN ST	BAUDELIO CASILLAS CASILLAS		3720 ADAMS ST	DENVER	CO	80205	303-322-6008	86.6	522.6
472	COLE	3609 LAFAYETTE ST	VICTOR GONZALES		3609 LAFAYETTE ST	DENVER	CO	80205	303-296-2934	18.8	403.2
473	COLE	3619 LAFAYETTE ST	VICTOR MANUEL HERNADEZ	TERESA HERNANDEZ	3619 LAFAYETTE ST	DENVER	CO	80205	303-298-1432	60.5	416.7
474	COLE	3639 LAFAYETTE ST	CONSUELO CHAVEZ		3639 LAFAYETTE ST	DENVER	CO	80205	303-297-3165	26.1	437.6
482	COLE	3637 HUMBOLDT ST	HECTOR & BELEN PASILLAS		3637 HUMBOLDT ST	DENVER	CO	80205	303-296-9961	28.5	477.8
493	COLE	3735 FRANKLIN ST	NAZARIO & RAQUEL MUNIZ		3735 FRANKLIN ST	DENVER	CO	80205	303-296-0133	15.8	409.2
499	COLE	3722 LAFAYETTE ST	MARIA L & TONY GARCIA		3722 LAFAYETTE ST	DENVER	CO	80205	303-296-4360	21.1	449.7
50[illegible]	COLE	3712 LAFAYETTE ST	JAIME & TERESA LOMELI		3712 LAFAYETTE ST	DENVER	CO	80205		184.4	375.7
50[illegible]	COLE	3762 MARION ST	WALDO GARCIA		3734 MARION ST	DENVER	CO	80205	303-316-7198	18.3	414.4
51[illegible]	COLE	3742 MARION ST	EDDY J & ANNA CORDOVA		3742 MARION ST	DENVER	CO	80205	303-296-6317	24.2	418.5
51[illegible]	COLE	3727 LAFAYETTE ST	MARTHA CERVANTES	HUVENSE MORALES	3727 LAFAYETTE ST	DENVER	CO	80205	303-308-0850	34.8	474.2
52[illegible]	COLE	3734 FRANKLIN ST	EULALIA & DELMER F VIGIL		3734 FRANKLIN ST	DENVER	CO	80205		5.5	412.1
54[illegible]	COLE	3718 HUMBOLDT ST	ALEX JOE VIALPANDO		3718 HUMBOLDT ST	DENVER	CO	80205	303-293-2445	5.5	436.0
55[illegible]	COLE	3725 FRANKLIN ST	MARY DELAROSA		3725 FRANKLIN ST	DENVER	CO	80205	303-295-3863	12.1	436.5
552	COLE	3733 FRANKLIN ST	BRIAN KEITH NELSON		2623 RIVER DR	DENVER	CO	80211	303-480-0457	11.8	408.9
57[illegible]	COLE	3201 GAYLORD ST	JAMES C MCCOY		3340 MARTIN LUTHER KING BLVD	DENVER	CO	80205	303-355-5869	81.2	310.6
58[illegible]	COLE	3209 GAYLORD ST	LELA MAE BUGGS	DOROTHY R WINN	3209 GAYLORD ST	DENVER	CO	80205	303-337-7633	232.5	669.5
58[illegible]	COLE	3245 GAYLORD ST	MINOR P & ROSE MARIE JOHNSON		13349 E IOWA AVE	AURORA	CO	80012	303-751-4286	156.2	231.8
58[illegible]	COLE	3250 GAYLORD ST	KRAIG W & AUTHERINE L BURLESON		3250 GAYLORD ST	DENVER	CO	80205	303-296-9284	144.5	312.3
592	COLE	3230 GAYLORD ST	CHRIS MEZA		3230 GAYLORD ST	DENVER	CO	80205	303-321-7566	363.7	408.7
593	COLE	3226 GAYLORD ST	ANDRE J & ARLEVIA JOHNSON		3226 GAYLORD ST	DENVER	CO	80205	303-296-2803	72.3	241.9
598	COLE	3201 YORK ST	EDWARD R & BARBARA J BATTLE		3201 YORK ST	DENVER	CO	80205	303-296-0253	232.3	516.7
620	COLE	3201 RACE ST	JORGE MALAGON		3201 RACE ST	DENVER	CO	80205	303-299-9326	177.4	369.7
624	COLE	3248 HIGH ST	JOSE S ESPINOZA		3248 HIGH ST	DENVER	CO	80205	303-675-0805	21.7	403.3
636	COLE	3200 RACE ST	HELEN L HUDSON		3200 RACE ST	DENVER	CO	80205	303-295-6565	113.3	215.0
645	COLE	3250 VINE ST	DEWAYNE JOHNSON	ALINE BUSKEY	3250 VINE ST	DENVER	CO	80205	303-296-6172	77.5	205.5
646	COLE	3244 VINE ST	IMO E TURNER		3244 VINE ST	DENVER	CO	80205	303-297-1267	126.8	207.6
651	COLE	3216 VINE ST	CLARK CARTER		3216 VINE ST	DENVER	CO	80205		114.3	191.3
656	COLE	3357 GAYLORD ST	ROBERT L & LESSIE R FRAZIER		3357 GAYLORD ST	DENVER	CO	80205	303-295-6598	88.0	271.5
661	COLE	3338 RACE ST	JOSEPH GERALD LITTLE	RHONDA LYNN LITTLE	3338 RACE ST	DENVER	CO	80205	303-297-8969	224.1	347.6
662	COLE	3332 RACE ST	DELORES DUDLEY		3332 RACE ST	DENVER	CO	80205		80.6	225.1
663	COLE	3328 RACE ST	THELMA L CRAWLEY		3328 RACE ST	DENVER	CO	80205	303-297-2461	110.6	234.6
673	COLE	3351 VINE ST	JACQUELINE C NELMS		3351 VINE ST	DENVER	CO	80205	303-293-8120	27.9	420.6
683	COLE	3315 RACE ST	WOODROW & JESSIE K WILLIAMS		3315 RACE ST	DENVER	CO	80205	303-295-6802	72.4	258.8
688	COLE	3318 HIGH ST	LOVE PROPERTIES	GEORGE LOVE	PO BOX 7041	DENVER	CO	80207	303-322-0161	79.2	164.8
707	COLE	3317 YORK ST	ROBERT E & CAMILLE T DAWSON		3317 YORK ST	DENVER	CO	80205	303-298-9802	79.6	407.8
708	COLE	3319 YORK ST	B SOLOMON & DANIELLE MUWANGA		3319 YORK ST	DENVER	CO	80205	303-713-1500X248	87.2	245.4
715	COLE	3344 VINE ST	JACQUELINE C NELMS		3344 VINE ST	DENVER	CO	80205	303-293-8120	177.7	233.8
721	COLE	3303 GAYLORD ST	ALFONSO BROWN		3303 GAYLORD ST	DENVER	CO	80205	303-295-6519	93.9	236.1
723	COLE	3315 GAYLORD ST	RODNEY A LONG		2823 VINE ST	DENVER	CO	80205	303-297-8491	92.0	184.4
724	COLE	3321 GAYLORD ST	MARTHA & PERRY R HENDERSON		3321 GAYLORD ST	DENVER	CO	80205	303-295-6584	158.9	268.2
727	COLE	3420 RACE ST	WILFORD O JR & NORA L THOMAS		2729 WELTON ST	DENVER	CO	80205	303-296-8001	71.8	203.7
728	COLE	3401 VINE ST	PABLO FLORES PIZARRO	JUANAELENA VILLARREAL DEFLORES	3401 VINE ST	DENVER	CO	80205	303-294-9309	89.6	329.6
729	COLE	3411 VINE ST	JEANNE K DEBELL		3411 VINE ST	DENVER	CO	80205	303-295-3988	223.9	243.6
732	COLE	3427 VINE ST	MABELLINE FOSTER BARNETT		3427 VINE ST	DENVER	CO	80205	303-297-8364	214.1	316.0
733	COLE	3431 VINE ST	JAMES SNEAD GIBSON	JESSIE LEE GIBSON	3431 VINE ST	DENVER	CO	80205	303-296-8085	198.5	344.2
737	COLE	3455 VINE ST	HENRIETTA REID		3455 VINE ST	DENVER	CO	80205	303-295-3439	184.0	195.3
738	COLE	3404 RACE ST	ELFRIEDA RIEDEL		3404 RACE ST	DENVER	CO	80205	303-296-8074	14.5	457.4
745	COLE	3408 VINE ST	TAMMI L ARNETT		3408 VINE ST	DENVER	CO	80205	303-292-9014	92.5	203.3
754	COLE	3437 GAYLORD ST	ROBERT L & LUCILLE L JOHNSON		3437 GAYLORD ST	DENVER	CO	80205	303-295-6608	111.2	274.2
759	COLE	3450 GAYLORD ST	DAISY M WILLIAMS		3450 GAYLORD ST	DENVER	CO	80205	303-308-9539	181.4	285.3

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
763	COLE	3424 GAYLORD ST	H LEON COLE	RENETER C HAYNES	3424 GAYLORD ST	DENVER	CO	80205	303-295-6531	78.5	286.5
764	COLE	3422 GAYLORD ST	JOHN W & ROSE SIMS		3422 GAYLORD ST	DENVER	CO	80205	303-296-3869	104.9	149.6
765	COLE	1911 BRUCE RANDOLPH AVE	LORENZA R & GLADYS M WELLS		1911 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-295-6566	14.9	400.8
766	COLE	1903 BRUCE RANDOLPH AVE	ROSA ZULONG		1903 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-295-3692	14.3	416.4
799	COLE	3426 RACE ST	ANTONIO LEON	ROSA MARIA GARCIA DELEON	3426 RACE ST	DENVER	CO	80205	303-296-3946	176.6	431.1
803	COLE	3524 VINE ST	JOSE MARCELO & SOFIA MENDEZ		3524 VINE ST	DENVER	CO	80205	303-298-1038	113.1	123.6
813	COLE	3556 RACE ST	FREDDIE LEON JONES		3556 RACE ST	DENVER	CO	80205	303-291-0622	211.6	235.9
831	COLE	3601 YORK ST	DOMINGO & ERNESTINE ROMERO		3601 YORK ST	DENVER	CO	80205	303-293-6776	199.0	251.7
833	COLE	3611 YORK ST	GEORGE E & ESTELLA R ANGEL		3611 YORK ST	DENVER	CO	80205	303-292-4991	25.1	475.4
841	COLE	3627 YORK ST	ALONZO JR PHILLIPS		PO BOX 2981	DENVER	CO	80201		133.9	250.0
842	COLE	3627 YORK ST	PEDRO AVILA		3627 YORK ST	DENVER	CO	80205	720-231-1799	133.9	250.0
843	COLE	3647 YORK ST	GRACE L SANDERS		3647 YORK ST	DENVER	CO	80205		114.9	260.4
847	COLE	3544 GAYLORD ST	GUADALUPE & EMA C VILLALPANDO		3544 GAYLORD ST	DENVER	CO	80205	303-299-9269	185.6	256.4
848	COLE	3530 GAYLORD ST	MILDRIDGE M JR LONG	LINDA PARKER-LONG	3530 GAYLORD ST	DENVER	CO	80205	303-293-9847	102.0	184.4
853	COLE	3500 GAYLORD ST	VERA M JENKINS		3500 GAYLORD ST	DENVER	CO	80205	303-295-6372	165.4	380.7
868	COLE	3612 HIGH ST	DOROTHY M SMITH		3612 HIGH ST	DENVER	CO	80205	303-294-9703	91.1	360.3
875	COLE	3690 RACE ST	JIMMY ALONZO JR GATES	DOLLY SEVELLA GATES	3690 RACE ST	DENVER	CO	80205	303-297-2408	124.5	251.8
879	COLE	3650 RACE ST	JOSE N FLORES		3650 RACE ST	DENVER	CO	80205	303-297-1377	142.9	152.0
880	COLE	3640 RACE ST	MARTHA & CRISTINO MENA		3640 RACE ST	DENVER	CO	80205	303-295-7078	71.8	144.7
881	COLE	3630 RACE ST	JOSE GUADALUPE ORTIZ	JESUS CABRERA	3630 RACE ST	DENVER	CO	80205	303-297-9706	168.3	398.6
885	COLE	3603 VINE ST	ROBERT P JONES		3603 VINE ST	DENVER	CO	80205	303-296-2005	165.5	249.7
893	COLE	3728 VINE ST	DANIEL JOSE & MARTHA OLGUIN		3728 VINE ST	DENVER	CO	80205	303-296-6331	109.8	192.6
895	COLE	3722 RACE ST	WINNIFRED BAXTER		3722 RACE ST	DENVER	CO	80205	303-297-8966	172.2	1004.4
902	COLE	3751 VINE ST	LEDORA PATTERSON		3751 VINE ST	DENVER	CO	80205	303-295-7710	85.7	178.3
912	COLE	3716 HIGH ST	FIRMO & FRANCES SANCHEZ		3716 HIGH ST	DENVER	CO	80205	303-296-6601	17.7	427.3
920	CLAYTON	3220 FILLMORE ST	EDGAR E GARMANY		3220 FILLMORE ST	DENVER	CO	80205	303-388-2826	130.5	231.1
959	CLAYTON	3201 FILLMORE ST	JOHN W & MARY S CHAPMAN		3201 FILLMORE ST	DENVER	CO	80205	303-320-1520	93.3	158.5
960	CLAYTON	3209 FILLMORE ST	TRESSIE L LANDAU		50 S STEELE ST STE 222	DENVER	CO	80209	303-321-2998	179.3	229.6
960	CLAYTON	3209 FILLMORE ST	ROBIN HAGGERTY		50 S STEELE ST #222	DENVER	CO	80209		179.3	229.6
961	CLAYTON	3215 FILLMORE ST	JUNIOUS S MCCONNELL		3215 FILLMORE ST	DENVER	CO	80205	303-355-4542	103.2	218.3
962	CLAYTON	3221 FILLMORE ST	DIMPS R & OLGA K HUMPHREY		3221 FILLMORE ST	DENVER	CO	80205	303-388-1718	153.1	360.8
970	CLAYTON	3250 FILLMORE ST	VIVIAN W BROCKMAN		63 SCOTT DR S	BROOMFIELD	CO	80020	303-469-5653	78.0	152.0
975	CLAYTON	3240 YORK ST	DAMON R MCANULTY		3240 YORK ST	DENVER	CO	80205		4.6	443.3
981	CLAYTON	3228 JOSEPHINE ST	JOAN HOOKER		3228 JOSEPHINE ST	DENVER	CO	80205	303-322-0920	79.0	244.6
982	CLAYTON	3222 JOSEPHINE ST	CHARLES D & JANICE E HOBELMAN		7281 URBAN DR	ARVADA	CO	80005	303-422-2004	93.6	151.0
983	CLAYTON	3216 JOSEPHINE ST	LUSH B & ELIZA C LOFTON		3216 JOSEPHINE ST	DENVER	CO	80205	303-333-2500	95.4	208.9
999	CLAYTON	3230 COLUMBINE ST	GARY A HALE		3230 COLUMBINE ST	DENVER	CO	80205	303-550-8352	106.7	154.7
1002	CLAYTON	3216 COLUMBINE ST	VICTOR VALENZUELA		3216 COLUMBINE ST	DENVER	CO	80205		95.0	167.1
1028	CLAYTON	3341 JOSEPHINE ST	BUBBER LEE STERLING	EVELYN JEAN STERLING	3341 JOSEPHINE ST	DENVER	CO	80205	303-295-6438	147.1	316.4
1029	CLAYTON	3347 JOSEPHINE ST	ANDREA MAE WATKINS		3347 JOSEPHINE ST	DENVER	CO	80205	303-296-3908	97.1	233.9
1032	CLAYTON	3258 YORK ST	ROSIE & JAMES KENNY		3258 YORK ST	DENVER	CO	80205	303-675-0941	79.6	307.4
1037	CLAYTON	3220 YORK ST	KEITH SHEPARD		3220 YORK ST	DENVER	CO	80205	303-296-6320	121.5	365.8
1049	CLAYTON	3315 CLAYTON ST	ROSENDO C CASTILLO	MINERVA R CASTILLO	3315 CLAYTON ST	DENVER	CO	80205	303-355-0801	111.3	157.0
1070	CLAYTON	3339 ELIZABETH ST	DORIS M DUMAS		3339 ELIZABETH ST	DENVER	CO	80205	303-333-690	157.7	1130.5
1073	CLAYTON	3353 ELIZABETH ST	M PAULETTE ARCHULETA LIV TRUST		3353 ELIZABETH ST	DENVER	CO	80205	720-944-1324	69.4	438.8
1080	CLAYTON	3314 JOSEPHINE ST	CORINNE& WILLIAM ROGER JACKSON		3314 JOSEPHINE ST	DENVER	CO	80205	303-388-2159	85.9	232.2
1111	CLAYTON	3446 MILWAUKEE ST	LLOYD E & GYNELLE D SMITH		3446 MILWAUKEE ST	DENVER	CO	80205	303-377-5386	208.2	146.8
1116	CLAYTON	3429 SAINT PAUL ST	ELOISE CUSLEY		3429 SAINT PAUL ST	DENVER	CO	80205	303-355-8533	135.7	188.6
1125	CLAYTON	3350 MILWAUKEE ST	DONNA M BABB		3350 MILWAUKEE ST	DENVER	CO	80205	303-399-0213	214.0	241.4
1133	CLAYTON	3301 SAINT PAUL ST	FRANK P COLANDREA		3301 SAINT PAUL ST	DENVER	CO	80205	303-322-6423	94.3	151.7
1134	CLAYTON	3311 SAINT PAUL ST	ELIZABETH ANN SWANSON		3311 SAINT PAUL ST	DENVER	CO	80205	720-231-4908	89.7	236.6
1137	CLAYTON	3329 SAINT PAUL ST	DANIEL LEE MARION	PRISCILLA JOYCE MARION	3329 SAINT PAUL ST	DENVER	CO	80205	303-333-5794	216.9	236.7
1138	CLAYTON	3333 SAINT PAUL ST	DONALD G POMROY	ALLAN C SHWIEKOFFER	3333 SAINT PAUL ST	DENVER	CO	80205	303-388-8560	238.2	389.8
1142	CLAYTON	3421 ELIZABETH ST	RUBEN & JEWEL KNIGHT		3421 ELIZABETH ST	DENVER	CO	80205	303-355-3048	140.8	311.4
1167	CLAYTON	3420 FILLMORE ST	ANNIE M BRIDGES		3420 FILLMORE ST	DENVER	CO	80205	303-333-8709	85.9	111.9
1172	CLAYTON	3424 YORK ST	TIM MILTON		3424 YORK ST	DENVER	CO	80205	303-298-8870	96.8	241.4
1185	CLAYTON	3449 JOSEPHINE ST	JOHN B BRAME		3449 JOSEPHINE ST	DENVER	CO	80205		114.2	199.2
1187	CLAYTON	3455 JOSEPHINE ST	RUBY L TURNER		3455 JOSEPHINE ST	DENVER	CO	80205	303-295-6428	85.7	166.7
1188	CLAYTON	3452 JOSEPHINE ST	EDNA HARRIS		3452 JOSEPHINE ST	DENVER	CO	80205	303-399-6293	240.0	505.9
1191	CLAYTON	3440 JOSEPHINE ST	DARRYL S & RUTH L JOHNSON		3440 JOSEPHINE ST	DENVER	CO	80205	303-399-7846	182.1	238.7

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
1192	CLAYTON	3432 JOSEPHINE ST	CHRISTA & ARNOLD KILK		3432 JOSEPHINE ST	DENVER	CO	80205	303-321-7852	313.0	456.0
1199	CLAYTON	3415 COLUMBINE ST	SANTOS SIMENTAL		3415 COLUMBINE ST	DENVER	CO	80205	303-298-0743	108.4	163.8
1200	CLAYTON	3421 COLUMBINE ST	SHIRLEY A TAYLOR		3421 COLUMBINE ST	DENVER	CO	80205	303-355-5012	126.0	231.6
1211	CLAYTON	3540 COLUMBINE ST	DEBORAH R LACQUEMENT		3540 COLUMBINE ST	DENVER	CO	80205	303-393-8523	70.7	156.3
1241	CLAYTON	3521 MILWAUKEE ST	TED & SUE MIGAKI LIV TRUST		3521 MILWAUKEE ST	DENVER	CO	80205	303-377-6746	164.2	194.8
1263	CLAYTON	3548 ELIZABETH ST	MARCELLUS L & HAZEL V JOINER		3548 ELIZABETH ST	DENVER	CO	80205	303-333-2246	106.2	164.3
1284	CLAYTON	3601 SAINT PAUL ST	CARRIE E & ROY L HAMMOND		3601 SAINT PAUL ST	DENVER	CO	80205	303-329-9331	225.8	355.9
1294	CLAYTON	3501 SAINT PAUL ST	VEO DETTA & ANDERSON NELSON		3501 SAINT PAUL ST	DENVER	CO	80205	303-322-6814	76.5	280.5
1299	CLAYTON	3537 SAINT PAUL ST	CLARION D TAYLOR		93 S WASHINGTON ST	DENVER	CO	80209	303-733-9017	47.3	520.7
1301	CLAYTON	3547 SAINT PAUL ST	RAFAEL FLORES	BAUDELIO ALVAREZ	3547 SAINT PAUL ST	DENVER	CO	80205	303-322-7819	186.6	329.2
1303	CLAYTON	3532 FILLMORE ST	ETHEL M BREAZELL	CERO FLOYD SR SMITH	3532 FILLMORE ST	DENVER	CO	80205	505-526-5154	176.2	429.5
1316	CLAYTON	3632 CLAYTON ST	PASCUAL & EMILIA LOMELI		3632 CLAYTON ST	DENVER	CO	80205	303-292-4410	80.5	307.4
1336	CLAYTON	3724 YORK ST	VICTORIA H ORTIZ		3724 YORK ST	DENVER	CO	80205	303-298-9640	260.2	417.9
1345	CLAYTON	3629 JOSEPHINE ST	EDNA J WHITE		3629 JOSEPHINE ST	DENVER	CO	80205	303-298-3765	145.5	153.5
1365	CLAYTON	3700 MILWAUKEE ST	VAPI DELL JONES		3700 MILWAUKEE ST	DENVER	CO	80205	303-377-8510	74.6	162.1
1376	CLAYTON	3701 MILWAUKEE ST	THOMAS A & DEBORAH M WHALEN		3701 MILWAUKEE ST	DENVER	CO	80205	303-377-4346	81.1	163.3
1401	CLAYTON	3212 SAINT PAUL ST	BENJAMIN RAMIREZ		2612 ALBION ST	DENVER	CO	80207	303-321-3156	134.9	355.3
1409	CLAYTON	3227 ADAMS ST	MACEDONIA BAPTIST CHURCH		3240 ADAMS ST	DENVER	CO	80205	303-377-8821	84.9	169.6
1434	CLAYTON	3344 STEELE ST	ALONZO S & RUBY LEE HORTON		3344 STEELE ST	DENVER	CO	80205	303-333-0221	81.6	356.7
1447	CLAYTON	3359 STEELE ST	FLORENTINO & MARIA C CASILLAS		3359 STEELE ST	DENVER	CO	80205	303-399-9381	98.7	268.5
1450	CLAYTON	3337 STEELE ST	TIMOTHY V SLAUGHTER		3337 STEELE ST	DENVER	CO	80205	303-355-9424	241.4	410.3
1456	CLAYTON	3310 SAINT PAUL ST	ROBERT A MILLER	REBECCA BEATRICE MILLER	3310 SAINT PAUL ST	DENVER	CO	80205	303-322-3318	215.3	287.0
1479	CLAYTON	3265 MADISON ST	IGNACIO RODRIGUEZ		3265 MADISON ST	DENVER	CO	80205	303-399-3435	100.3	171.1
1513	CLAYTON	3604 BRUCE RANDOLPH AVE	JESSIE & REOLA WHITE		3604 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-377-5887	136.6	210.5
1523	CLAYTON	3609 BRUCE RANDOLPH AVE	MARJORIE A WINFREY		3609 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-377-8297	106.1	213.1
1542	CLAYTON	3450 JACKSON ST	KEITH A WINFREY		3450 JACKSON ST	DENVER	CO	80205	303-320-1220	137.6	348.8
1547	CLAYTON	3421 HARRISON ST	SERGIO AND PATRICIA LOPEZ		3421 HARRISON ST	DENVER	CO	80205	303-355-9278	158.4	84.4
1549	CLAYTON	3429 HARRISON ST	ISIAH MCDONALD		3429 HARRISON ST	DENVER	CO	80205	303-377-0899	150.6	183.9
1552	CLAYTON	3440 HARRISON ST	WILLIAM E JR HIKE		3440 HARRISON ST	DENVER	CO	80205		150.9	101.8
1558	CLAYTON	3425 COOK ST	MANUEL SANCHEZ		3425 COOK ST	DENVER	CO	80205	303-355-0985	79.2	186.2
1560	CLAYTON	3311 BRUCE RANDOLPH AVE	WILLIE H MCCALLUM		3311 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-355-6521	98.1	139.3
1587	CLAYTON	3456 MADISON ST	EDNA F ECHEOZO	THERESA L GADISON	3456 MADISON ST	DENVER	CO	80205	303-399-8247	114.9	219.3
159	CLAYTON	3550 SAINT PAUL ST	ALEX B & ALLENE MITCHELL		3550 SAINT PAUL ST	DENVER	CO	80205	303-333-6978	205.7	146.7
159	CLAYTON	3457 STEELE ST	EDNA W VON DICKERSOHN		3457 STEELE ST	DENVER	CO	80205	303-377-5359	178.9	140.2
159	CLAYTON	3435 STEELE ST	CHERRY D HATCHETT	PHILLIP G SUNBERG	3435 STEELE ST	DENVER	CO	80205	303-388-7629	87.0	472.1
159	CLAYTON	3427 STEELE ST	ERNESTINE GORDON		3427 STEELE ST	DENVER	CO	80205	303-355-6411	209.2	193.9
160	CLAYTON	3415 STEELE ST	RAYMOND R & ELEANOR R ROMERO		3415 STEELE ST	DENVER	CO	80205	303-388-9011	70.2	309.3
160	CLAYTON	3434 SAINT PAUL ST	ELSIE MAE OATS	DORIAN JAY PHILLIPS	3434 SAINT PAUL ST	DENVER	CO	80205	303-399-9682	172.1	281.5
161	CLAYTON	3458 STEELE ST	DOROTHY LEA MCNEIL		3458 STEELE ST	DENVER	CO	80205	303-322-1781	70.5	116.1
161	CLAYTON	3450 STEELE ST	EVERRETT E & G JUNE NELSON		PO BOX 787	ARVADA	CO	80001	303-422-7577	160.0	202.1
162	CLAYTON	3458 ADAMS ST	ELWOOD & MARY L JONES		3458 ADAMS ST	DENVER	CO	80205	303-322-7587	149.6	188.2
164	CLAYTON	3541 STEELE ST	DIZZIE WHITAKER	CLEO C CROCKETT	4751 PERRY ST	DENVER	CO	80212	303-377-8998	76.0	212.0
164	CLAYTON	3535 STEELE ST	JOSE CHAVEZ VILLALPANDO		3535 STEELE ST	DENVER	CO	80205		99.6	304.0
165	CLAYTON	3510 SAINT PAUL ST	ALBERT JR HENDERSON		3510 SAINT PAUL ST	DENVER	CO	80205	303-355-9586	117.5	236.6
165	CLAYTON	3516 SAINT PAUL ST	OLIVIA E TOLES		3516 SAINT PAUL ST	DENVER	CO	80205	303-322-6647	219.2	300.3
166	CLAYTON	3501 GARFIELD ST	LONA M BARKSDALE		3501 GARFIELD ST	DENVER	CO	80205		157.1	308.7
166	CLAYTON	3501 GARFIELD ST	FERNANDO GALLO		3501 GARFIELD ST	DENVER	CO	80205		157.1	308.7
167	CLAYTON	3559 GARFIELD ST	WILBUR & ESTELIA CAGNOLATTI		3559 GARFIELD ST	DENVER	CO	80205	303-388-7387	79.2	108.3
168	CLAYTON	3600 HARRISON ST	BORIS KLEIN		7670 ARIZONA DR	DENVER	CO	80231	303-306-9539	214.9	353.6
169	CLAYTON	3510 HARRISON ST	GILBERTO PASILLAS	GILBERTO PASILLAS	3510 HARRISON ST	DENVER	CO	80205	303-394-4066	83.7	172.8
169	CLAYTON	3540 JACKSON ST	REYNALDO & MARIANO NAVA		3540 JACKSON ST	DENVER	CO	80205	303-31-9842	89.6	207.5
1699	CLAYTON	3533 HARRISON ST	SAM & FRANCES I PASSARELLI		424 EMERSON ST	DENVER	CO	80218	303-778-8678	135.5	119.0
1707	CLAYTON	3532 GARFIELD ST	ELLIE & CHRISTOPHER A WILLIAMS		3532 GARFIELD ST	DENVER	CO	80205	303-399-2920	189.5	213.6
1713	CLAYTON	3501 JACKSON ST	RODRIGO HERRERA-CHAIREZ	CRISANTA VASQUEZ-MADERA	3501 JACKSON ST	DENVER	CO	80205	303-316-9786	80.5	118.6
1719	CLAYTON	3615 GARFIELD ST	ALFRED TRUST COLLIER		12620 UTICA CIR	BROOMFIELD	CO	80020		223.8	218.1
1722	CLAYTON	3641 GARFIELD ST	THOMAS A & MUMEKO HERNDON		3641 GARFIELD ST	DENVER	CO	80205	303-333-9645	117.1	210.7
1724	CLAYTON	3653 GARFIELD ST	MIGUEL PASILLAS		3653 GARFIELD ST	DENVER	CO	80205	303-377-3492	112.8	122.9
1727	CLAYTON	3638 GARFIELD ST	SAM JR & GAYLA R STEWART		3638 GARFIELD ST	DENVER	CO	80205		143.0	158.6
1743	CLAYTON	3635 HARRISON ST	PAUL & ANTONIA RIVERA		3635 HARRISON ST	DENVER	CO	80205	303-322-2094	113.1	146.7
1748	CLAYTON	3636 HARRISON ST	BETHSAIDA RIVIVAL FELLOWSHIP		3930 E 37TH AVE	DENVER	CO	80205	303-355-2668	76.6	248.3

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
1749	CLAYTON	3620 HARRISON ST	BETHSAIDA REVIVAL FELLOWSHIP		3930 E 37TH AVE	DENVER	CO	80205	303-355-2668	98.8	122.5
1757	CLAYTON	3650 COOK ST	FELIPE MARBAN		3650 COOK ST	DENVER	CO	80205	303-388-4511	179.7	129.0
1789	CLAYTON	3745 STEELE ST	MARTHA MARIA & SERGIO GARGIA		3745 STEELE ST	DENVER	CO	80205	303-333-7139	98.0	109.4
1795	CLAYTON	3758 SAINT PAUL ST	DILLARD JR ROLISON	BETTY JEAN ROLISON	3758 SAINT PAUL ST	DENVER	CO	80205	303-322-9547	132.5	152.6
1798	CLAYTON	3621 STEELE ST	LOLA CHATMAN GIBSON		3621 STEELE ST	DENVER	CO	80205		101.5	241.6
1800	CLAYTON	3601 STEELE ST	ALLEZE J WESTBROOKS		3601 STEELE ST	DENVER	CO	80205	303-333-4471	87.9	161.5
1801	CLAYTON	3600 SAINT PAUL ST	JACQUELINE G ACOSTA		3600 SAINT PAUL ST	DENVER	CO	80205	303-377-3630	70.1	374.0
1802	CLAYTON	3620 SAINT PAUL ST	MIGUEL A VILLARREAL	GUADALUPE QUEZADA	3620 SAINT PAUL ST	DENVER	CO	80205	303-331-6649	258.5	468.2
1814	CLAYTON	3705 GARFIELD ST	ANGEL OLEGARIO IBARRA-FERRER		3705 GARFIELD ST	DENVER	CO	80205		70.6	132.5
1829	CLAYTON	3710 COOK ST	MICHAEL M WAFER		14831 E PENWOOD PL	AURORA	CO	80015	303-572-5564	191.9	114.1
1830	CLAYTON	3706 COOK ST	FRANK J & ANN M MAGAN		3706 COOK ST	DENVER	CO	80205		93.1	126.9
1837	CLAYTON	3701 COOK ST	SAUL & MARIA ROSA VASQUEZ		3701 COOK ST	DENVER	CO	80205	303-394-0829	163.0	157.1
1902	CLAYTON	3636 STEELE ST	PATRICIA R ROBINSON		3636 STEELE ST	DENVER	CO	80205	303-399-6582	184.8	130.3
1924	CLAYTON	3838 MADISON ST	ALFREDO MARTINEZ		3838 MADISON ST	DENVER	CO	80205	303-377-2086	89.5	261.3
1925	CLAYTON	3880 MADISON ST	THE CECIL E FOURTH HART FAMILY		6095 S IOLA WAY	ENGLEWOOD	CO	80111	303-694-2391	79.7	132.8
1931	CLAYTON	3940 JACKSON ST	JOELLEN DAVIS		5012 XANADU ST	DENVER	CO	80239	303-371-6058	73.3	207.8
1936	CLAYTON	3926 STEELE ST	JAMES & LEOLA CURRY		3928 STEELE ST	DENVER	CO	80205		80.2	170.2
1951	SWANSEA	4171 ADAMS ST	ERNESTO D CASTELLANOS	MARIO H CASTELLO	4171 ADAMS ST	DENVER	CO	80216	303-388-9753	121.8	188.3
1964	SWANSEA	4021 MILWAUKEE ST	RODOLFO A AVILA	MARCELLA JOAN AVILA	4021 MILWAUKEE ST	DENVER	CO	80216		236.4	420.3
1966	SWANSEA	4040 CLAYTON ST	CORINNE M GONZALES		4040 CLAYTON ST	DENVER	CO	80216	303-394-2063	198.5	269.7
1969	SWANSEA	4111 SAINT PAUL ST	ELIAS & BLANCA CARDENAS		4111 SAINT PAUL ST	DENVER	CO	80216	303-394-3324	128.7	215.8
2002	SWANSEA	4110 SAINT PAUL ST	TITO JR & LUCIE MONTOYA		4110 SAINT PAUL ST	DENVER	CO	80216	303-316-4367	116.2	228.9
2005	SWANSEA	4141 MILWAUKEE ST	MERRILL MERCER		4141 MILWAUKEE ST	DENVER	CO	80216	303-780-0685	85.1	144.4
2054	SWANSEA	4362 JOSEPHINE ST	EVARISTO & SIMON TALAVERA		4362 JOSEPHINE ST	DENVER	CO	80216	303-293-0275	235.5	250.8
2056	SWANSEA	4314 JOSEPHINE ST	CLORINDA SANTISTEVAN		4314 JOSEPHINE ST	DENVER	CO	80216	303-296-8025	237.5	579.0
2057	SWANSEA	4350 JOSEPHINE ST	FEDERICO & ROSALBA CASILLAS		4352 JOSEPHINE ST	DENVER	CO	80216	303-296-9195	166.9	171.1
2058	SWANSEA	4305 COLUMBINE ST	EMMANUEL & DANIEL RODRIGUEZ		4305 COLUMBINE ST	DENVER	CO	80216		30.6	537.9
2061	SWANSEA	4336 THOMPSON CT	VIRGINIA M MIRELEZ		4336 THOMPSON CT	DENVER	CO	80216	303-297-8483	97.2	350.3
2069	SWANSEA	4347 CLAYTON ST	MARGARITA & VICENTE MENDOZA		3343 CURTIS ST	DENVER	CO	80205	303-295-2048	177.7	333.5
2101	SWANSEA	4350 ST PAUL AVE	LESLIE ROGERS		4350 ST PAUL ST	DENVER	CO	80216	303-296-1070	74.0	153.3
2110	SWANSEA	4445 MILWAUKEE ST	TINA M SCHMITZER		4445 MILWAUKEE ST	DENVER	CO	80216	303-295-1386	98.8	330.1
2112	SWANSEA	4442 MILWAUKEE ST	GREGORIO SOTO		4442 MILWAUKEE ST	DENVER	CO	80216	303-295-0092	168.3	345.7
2123	SWANSEA	4460 ELIZABETH ST	JORGE & IRMA LETICA GARCIA		4460 ELIZABETH ST	DENVER	CO	80216	303-292-3102	234.8	274.1
2138	SWANSEA	4424 JOSEPHINE ST	JOYCE P LOPEZ		4424 JOSEPHINE ST	DENVER	CO	80216	303-296-8851	188.9	388.0
2157	SWANSEA	4680 CLAYTON ST	FRANCISCO Z & CECELIA AREVALO		4680 CLAYTON ST	DENVER	CO	80216	303-292-6280	102.5	557.7
2162	SWANSEA	4685 FILLMORE ST	DONALD EARL NUFFER	DEBORAH JUNE NUFFER REWERTS	4685 FILLMORE ST	DENVER	CO	80216		99.0	233.8
2173	SWANSEA	4623 THOMPSON CT	LUCILLE A DAVIS		4625 THOMPSON CT	DENVER	CO	80216	303-296-4953	163.0	314.6
2194	SWANSEA	4730 THOMPSON CT	ANA JONES		4730 THOMPSON CT	DENVER	CO	80216	303-296-7693.	79.5	204.7
2195	SWANSEA	4710 THOMPSON CT	SULEMA CASTRO		4710 THOMPSON CT	DENVER	CO	80216	303-292-2657	134.6	164.3
2197	SWANSEA	4730 ELIZABETH ST	MARIA B MORALES		4730 ELIZABETH ST	DENVER	CO	80216	303-298-1394	90.3	196.2
2200	SWANSEA	4761 THOMPSON CT	FILOMENA ROYBAL		PO BOX 11593	DENVER	CO	80211	303-295-6147	89.9	456.7
2208	SWANSEA	4776 FILLMORE ST	PEDRO A FLORES	RITA A MEDRANO FLORES	4776 FILLMORE ST	DENVER	CO	80216		114.8	173.3
2214	SWANSEA	4785 FILLMORE ST	ANTONIO & JULIA LOPEZ		4785 FILLMORE ST	DENVER	CO	80216		207.8	174.1
2223	SWANSEA	4757 CLAYTON ST	DOROTHY KARG		4761 CLAYTON ST	DENVER	CO	80216	303-296-6057	85.3	148.7
2225	SWANSEA	4740 CLAYTON ST	MALCOLM D WHITMAN	ROBERTA NADINE WHITMAN	4740 CLAYTON ST	DENVER	CO	80216	303-296-4963	113.0	158.7
2226	SWANSEA	4760 CLAYTON ST	CARMEN TORRES	LAURA M DELAO	4760 CLAYTON ST	DENVER	CO	80216	303-292-6994	174.1	360.0
2227	SWANSEA	4778 CLAYTON ST	MARIA CRUZ CASILLAS	GUMARO L CASILLAS	4778 CLAYTON ST	DENVER	CO	80216	303-297-3969	90.3	281.3
2232	SWANSEA	4344 STEELE ST	VICTOR M DESANTIAGO	EVANGELINA DESANTIAGO	4344 STEELE ST	DENVER	CO	80216	303-296-2641	148.1	130.3
2234	SWANSEA	4309 ADAMS ST	ABE S & LUPITA MAES		4309 ADAMS ST	DENVER	CO	80216	303-294-9423	119.1	381.8
2235	SWANSEA	4300 STEELE ST	JOSE A MONTES		4300 STEELE ST	DENVER	CO	80216		175.4	388.5
2255	COLE	3785 WILLIAMS ST	PAUL W II BROWN		3785 WILLIAMS ST	DENVER	CO	80205	303-295-3027	17.6	538.5
2256	COLE	3765 GILPIN ST	LORRIE KINGSBERRY		3765 GILPIN ST	DENVER	CO	80205		59.2	444.1
2256	COLE	3765 GILPIN ST	LORRIE KINGSBERRY		3765 GILPIN ST	DENVER	CO	80205		111.8	573.1
2258	COLE	3781 GILPIN ST	ANN-MARIE MORISSETTE		3781 GILPIN ST	DENVER	CO	80205	303-288-7727	133.5	578.3
2303	COLE	3840 FRANKLIN ST	JUAN & RAQUEL MENDOZA		3840 FRANKLIN ST	DENVER	CO	80205	303-293-8609	24.5	402.1
2305	COLE	3843 GILPIN ST	REVEST LLC		174 PLAYERS CLUB DR	CASTLE ROCK	CO	80104	303-688-1372	22.1	404.8
2321	ELYRIA	4351 RACE ST	BERNADETTE D TANGREN		4351 RACE ST	DENVER	CO	80216	303-296-8225	206.5	643.9
2324	ELYRIA	4677 GAYLORD ST	MIGUEL & SILVINA ARRIAGA		4677 GAYLORD ST	DENVER	CO	80216	303-388-0592	19.9	472.7
2325	ELYRIA	4687 GAYLORD ST	LEONARDO VASQUEZ CASILLAS	MARIA LOMELI	4687 GAYLORD ST	DENVER	CO	80216	303-293-9131	30.9	473.3
2333	ELYRIA	4690 HIGH ST	SEVERIANO ARMENDARIZ	MARIA ISABEL GUERRERO ZAPATA	4690 HIGH ST	DENVER	CO	80216	303-296-7488	100.2	422.1

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
2335	ELYRIA	4644 HIGH ST	CECILE V HOLFORD		4644 HIGH ST	DENVER	CO	80216	303-296-4450	17.4	438.6
2335	ELYRIA	4644 HIGH ST	CECILE V HOLFORD		4644 HIGH ST	DENVER	CO	80216	303-296-4450	17.4	438.6
2335	ELYRIA	4644 HIGH ST	CECILE V HOLFORD		4644 HIGH ST	DENVER	CO	80216	303-296-4450	17.4	438.6
2335	ELYRIA	4644 HIGH ST	CECILE V HOLFORD		4644 HIGH ST	DENVER	CO	80216	303-296-4450	17.4	438.6
2344	ELYRIA	4695 WILLIAMS ST	CARLOS & JOSEPHINE A MARTINEZ		2855 CURTIS ST	DENVER	CO	80205	303-298-8226	22.5	422.3
2345	ELYRIA	4684 BRIGHTON BLVD	CELSO & MARTINA ORDONEZ		4684 BRIGHTON BLVD	DENVER	CO	80216	303-296-2753	90.8	454.5
2346	ELYRIA	4658 WILLIAMS ST	JOSIE P GONZALES	ERNEST SANCHEZ	4658 WILLIAMS ST	DENVER	CO	80216		144.6	559.4
2353	ELYRIA	4695 HIGH ST	CLEO MEDINA	ANDREA M MARTINEZ	4695 HIGH ST	DENVER	CO	80216	303-296-6269	17.0	430.0
2363	ELYRIA	4660 BALDWIN CT	ROB MANN		4660 BALDWIN CT	DENVER	CO	80216	303-668-1927	29.7	500.6
2367	ELYRIA	4775 WILLIAMS ST	HUMBERTO SAENZ GUZMAN	TOMASA GUZMAN	4775 WILLIAMS ST	DENVER	CO	80216	303-296-8437	24.4	408.6
2382	ELYRIA	4766 WILLIAMS ST	MARIA HELENA GAWLIK	ZDZISLAWA HENRYKA BULLOCK	1550 W 52ND AVE	DENVER	CO	80221	303-477-2707	30.6	437.8
2386	ELYRIA	4715 WILLIAMS ST	ANGELES C & TERESA HERRERA	HILDA HERRERA	4715 WILLIAMS ST	DENVER	CO	80216	303-296-1881	110.1	279.4
2387	ELYRIA	4780 RACE ST	CATALINO CHAVEZ		4780 RACE ST	DENVER	CO	80216	303-292-6626	18.7	459.1
2391	ELYRIA	4752 HIGH ST	JOHN TED ROZINSKI		4752 HIGH ST	DENVER	CO	80216	303-293-9108	16.2	408.7
2392	ELYRIA	4704 GAYLORD ST	RACHEL M TRUJILLO		4704 GAYLORD ST	DENVER	CO	80216		18.6	408.3
2392	ELYRIA	4704 GAYLORD ST	GLORIA ANN TEAMER		8515 PARK LN APT 502	DALLAS	TX	75231		18.6	408.3
2394	ELYRIA	4758 VINE ST	MARIO & NORMA SOLIS		4762 VINE ST	DENVER	CO	80216		19.6	409.6
2403	ELYRIA	4706 CLAUDE CT	WILLIAM J & ROBERT E GARCIA		4706 CLAUDE CT	DENVER	CO	80216	303-295-2773	5.5	421.3
2409	GLOBEVILLE	4012 FOX ST	MARIO TRUJILLO		636 E DOUGLAS LN	CASTLE ROCK	CO	80104	303-814-8457	24.1	425.7
2447	GLOBEVILLE	4463 CHEROKEE ST	MARION & CARMEN M WHATLEY		4463 CHEROKEE ST	DENVER	CO	80216	720-855-9644	86.6	310.9
2460	SWANSEA	5058 ADAMS ST	BARBARA A CHERINO		5058 ADAMS ST	DENVER	CO	80216	303-298-8727	199.6	210.1
2461	SWANSEA	5050 ADAMS ST	SILVINO CHAVEZ		5050 ADAMS ST	DENVER	CO	80216	303-292-9187	185.7	205.6
2490	SWANSEA	4840 CLAYTON ST	JIMMIE O SOUTHALL		4840 CLAYTON ST	DENVER	CO	80216	303-296-6080	101.7	358.6
2536	SWANSEA	5065 MILWAUKEE ST	HAROLD L GRIBOSKI		5065 MILWAUKEE ST	DENVER	CO	80216	303-790-1932	77.0	244.9
2543	SWANSEA	5060 MILWAUKEE ST	JORGE GONZALEZ TOVAR	VIDAID GONZALEZ	5060 MILWAUKEE ST	DENVER	CO	80216	303-298-8647	98.2	143.6
2556	SWANSEA	4965 STEELE ST	REBECA GARCIA-GUTIERREZ	PEDRO GARCIA	4965 STEELE ST	DENVER	CO	80216	303-298-8393	89.6	103.5
2556	SWANSEA	4965 STEELE ST	PEDRO GARCIA		4965	STEELE ST	CO	80216		89.6	103.5
2559	SWANSEA	4960 FILLMORE ST	CHARLES S II DAVIS		120 E 2ND ST	FLORENCE	CO	81226		126.0	276.6
2560	SWANSEA	4956 FILLMORE ST	PAMELA J BARTON		4956 FILLMORE ST	DENVER	CO	80216		123.9	481.0
2564	SWANSEA	4972 FILLMORE ST	MARIA DEL SOCORRO		4972 FILLMORE ST	DENVER	CO	80216	303-293-2057	207.1	170.9
2565	SWANSEA	4970 FILLMORE ST	FRANCINE LAPPIN		4970 FILLMORE ST	DENVER	CO	80216	303-296-3157	187.1	205.4
2576	SWANSEA	4957 CLAYTON ST	CARL REIBER		4957 CLAYTON ST	DENVER	CO	80216		119.2	447.3
2588	SWANSEA	4912 FILLMORE ST	DOROTHY GARCIA		4912 FILLMORE ST	DENVER	CO	80216	303-296-3538	129.2	213.9
2593	SWANSEA	4908 MILWAUKEE ST	ALFANSO & VICTORIA MONTOYA	JOSE FRANK MONTOYA	4908 MILWAUKEE ST	DENVER	CO	80216	303-298-0206	80.6	169.5
2607	COLE	1705 BRUCE RANDOLPH AVE	WILLOW APTS DENVER		23404 EDGEWATER DR	FRANKSTON	TX	75763	205-933-2585X203	11.9	458.0
2642	FIVE POINTS	3527 DELGANY ST	JOHN PADILLA		3527 DELGANY ST	DENVER	CO	80216	2953044	155.7	369.2
2643	FIVE POINTS	3733 WYNKOOP ST	MICHAEL NAYADLEY						720 946-3159	133.4	540.4
2644	FIVE POINTS	3739 WYNKOOP ST	PHYLLIS MANTYCH		3739 WYNKOOP ST	DENVER	CO	80216	2949567	123.0	498.0
2645	FIVE POINTS	3741 WYNKOOP ST	JIM GERHOLD		3741 WYNKOOP ST	DENVER	CO	80216	2973744	25.4	501.2
2647	FIVE POINTS	3750 DELGANY ST	SAUL ROJAS		3750 DELGANY ST	DENVER	CO	80216	2921795	19.1	403.4
2648	FIVE POINTS	3742 DELGANY ST	TONY GONZALES		3742 DELGANY ST	DENVER	CO	80205	2969576	335.3	516.6
2654	COLE	3533 MARION ST	MARIA RUIZ DE VASQUEZ		3533 MARION ST	DENVER	CO	80205	297-3710	25.6	440.3
2658	COLE	3554 MARION ST	JAMES MICHAEL WEAVER		3554 MARION ST	DENVER	CO	80010	296-9480	19.2	447.2
2660	COLE	3515 LAFAYETTE ST	FERNANDO L BARRON		3515 LAFAYETTE ST	DENVER	CO	80205	296-8112	154.4	598.4
2661	COLE	3531 LAFAYETTE ST	LORENE R REPOSA		3002 ABILENE ST	AURORA	CO	80010	3668386	149.2	623.6
2664	COLE	3550 HUMBOLDT ST	Neighborhood Partners		3550 HUMBOLDT ST	DENVER	CO	80205	298-1458	22.6	401.6
2665	COLE	3528 HUMBOLDT ST	LUCY & JERRY TSUTSUI		3528 HUMBOLDT ST	DENVER	CO	80205	295-6957	76.6	327.6
2670	COLE	3548 GILPIN ST	RAMON & GLORIA H ROYBAL		3548 GILPIN ST	DENVER	CO	80205	296-4603	31.1	517.6
2670	COLE	3548 GILPIN ST	TERESA GUTIERREZ		3548 GILPIN ST	DENVER	CO	80205	303-295-1989	31.1	517.6
2675	COLE	3527 WILLIAMS ST	ADELAIDO E & SOLANO		3521 WILLIAMS ST	DENVER	CO	80205	297-8808	19.8	408.5
2676	COLE	3624 GILPIN ST	RUDOLPH & CORA DOMINGO		3624 GILPIN ST	DENVER	CO	80205	296-6193	74.7	247.7
2677	COLE	3658 WILLIAMS ST	ADALBERTO PASILLAS		3658 WILLIAMS ST	DENVER	CO	80205	2939241	51.0	404.9
2685	COLE	3734 MARION ST	JOSE LUIS & MARIA C & GARCIA		3736 MARION ST	DENVER	CO	80205	2988847	26.7	464.6
2686	COLE	3613 LAFAYETTE ST	MARILYN E OLEN		9036 CLYDESDALE SU RD	CASTLE ROCK	CO	80104	7994915	148.2	531.7
2690	COLE	3748 LAFAYETTE ST	ROBERT BACCA		4933 GROVE ST	DENVER	CO	80221	2987281	171.1	384.9
2691	COLE	3744 LAFAYETTE ST	ROBERT BACCA		4933 GROVE ST	DENVER	CO	80221	2987281	103.1	335.6
2693	COLE	3726 MARION ST	JOHN J VELASQUEZ		3726 MARION ST	DENVER	CO	80205	296-9519	25.1	449.9
2698	COLE	3727 HIGH ST	ANDREW RAMOS		3727 HIGH ST	DENVER	CO	80205	2969580	99.3	256.3
2710	COLE	3532 VINE ST	EVA M GRAY		3532 VINE ST	DENVER	CO	80205	2956475	103.5	214.4
2713	COLE	3540 RACE ST	ROBERTA L GOODSON		9831 E WALSH PL	DENVER	CO	80231	3437275	75.8	138.3

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
2734	COLE	3508 RACE ST	LINDA YOUNGER-OUALLS		3508 RACE ST	DENVER	CO	80205	2988133	91.2	240.9
2731	COLE	3538 GAYLORD ST	ROSALIE SANDERS		3538 GAYLORD	DENVER	CO	80205	2987022	164.5	242.5
2702	COLE	3527 YORK ST	LULA MAE BOLDEN		3256 MADISON ST	DENVER	CO	80205	3200438	113.6	373.1
2734	COLE	3742 HIGH ST	NORTHEAST DENVER HOUSING CENTER	ATTN: BRIAN DOYLE	2416 EAST COLFAX AVE	DENVER	CO	80205		14.8	445.8
2728	COLE	3610 HIGH ST	MARILYN E OLEN		9036 CLYDESDALE SU RD	CASTLE ROCK	CO	80104	7994915	171.9	419.6
2730	COLE	3619 VINE ST	ROGER B MAUPIN		PO BOX 621061	LITTLETON	CO	80162	9790243	81.4	461.0
2737	COLE	3715 RACE ST	WILLIAM S & JO ANN JACKSON		3715 RACE ST	DENVER	CO	80205		17.1	407.8
2754	CLAYTON	3625 SAINT PAUL ST	GLORIA KING		3625 SAINT PAUL ST	DENVER	CO	80205	3557723	102.7	285.5
2761	CLAYTON	3611 FILLMORE ST	JERRY & DEBRA J STEPNEY		3611 FILLMORE ST	DENVER	CO	80205	3990209	118.3	157.5
2768	CLAYTON	3621 JOSEPHINE ST	SHIRLEY A & TAYLOR		3421 COLUMBINE ST	DENVER	CO	80205	3555012	214.9	202.4
2776	CLAYTON	3730 YORK ST	ART ARITA		1020 CUCHARA ST	DENVER	CO	80221	4295382	99.4	637.0
2778	CLAYTON	3840 E 35TH AVE	ORLANDO R & LYDIA R ARAGON		16027 E LEHIGH CIR	AURORA	CO	80013	6907517	89.6	99.5
2791	CLAYTON	3540 SAINT PAUL ST	BARBARA JONES		3540 SAINT PAUL ST	DENVER	CO	80205	3204528	76.4	194.5
2795	CLAYTON	3515 MONROE ST	ANNIE B WICKLIFFE		2880 HOLLY ST	DENVER	CO	80207	3200975	121.3	114.5
2795	CLAYTON	3515 MONROE ST	EZEKIEL TAYLOR		3515 MONROE ST	DENVER	CO	80205	303-355-7621	121.3	114.5
2797	CLAYTON	3536 HARRISON ST	FRANCES N GOODWIN		3536 HARRISON ST	DENVER	CO	80205	3206983	77.8	134.4
2807	CLAYTON	3627 JACKSON ST	FRED & JULIA ANN WILKINS		3585 SWGLENVIEW CIR	ATLANTA	GA	30331		74.3	178.9
2819	CLAYTON	3610 SAINT PAUL ST	OZEN C RAGSDALE		3610 SAINT PAUL ST	DENVER	CO	80205	3223362	83.0	473.7
2822	CLAYTON	3720 MADISON ST	THOMAS WHITE		743 9TH ST	BOULDER	CO	80302	303-444-3341	82.0	223.6
2822	CLAYTON	3720 MADISON ST	DANIELA CLEMONS		743 9TH ST	BOULDER	CO	80302	4443341	82.0	223.6
2824	CLAYTON	3750 COOK ST	SPENCER L THOMPSON		3750 COOK ST	DENVER	CO	80205	3885409	73.2	77.1
2827	CLAYTON	3710 ADAMS ST	JIMMY G & DOROTHY J SNODDY		3710 ADAMS ST	DENVER	CO	80205	3887453	235.1	153.4
2828	CLAYTON	3700 ADAMS ST	MARIBETH THOMAS		3700 ADAMS ST	DENVER	CO	80205	3779580	152.7	135.9
2832	CLAYTON	3808 STEELE ST	BETTY JOE REEVES		3808 STEELE ST	DENVER	CO	80205	3216418	60.7	430.2
2837	CLAYTON	3835 ADAMS ST	JUDITH BANKS		3835 ADAMS ST	DENVER	CO	80205	3949742	164.8	132.4
2856	CLAYTON	3855 COOK ST	DAN-ALBERT F & JOY L PIERCE		3855 COOK ST	DENVER	CO	80205	3206255	82.7	151.0
2879	CLAYTON	3990 JACKSON ST	ANDREW SALAZAR		3990 JACKSON ST	DENVER	CO	80205		95.1	136.0
2893	CLAYTON	3971 HARRISON ST	BEVERLY JEAN WILLIAMS		3971 HARRISON ST	DENVER	CO	80207	3296894	165.4	154.1
2923	SWANSEA	4033 ADAMS ST	JUAN FLORES		4033 ADAMS ST	DENVER	CO	80216	3998681	148.9	133.0
2930	SWANSEA	4150 ADAMS ST	VERN F MITCHEL		4150 ADAMS ST	DENVER	CO	80216	3227353	234.5	204.0
2943	SWANSEA	4050 FILLMORE ST	NARCISO FLOREZ		4050 FILLMORE ST	DENVER	CO	80216	303-377-9053	186.7	226.8
2948	SWANSEA	4027 FILLMORE ST	HOWARD & META AMSTUTZ		4027 FILLMORE ST	DENVER	CO	80216	3213273	60.0	502.3
2962	SWANSEA	4115 STEELE ST	JOSEPHINE V LAFEVRE		4115 STEELE ST	DENVER	CO	80216	3556628	166.1	377.1
2964	SWANSEA	4145 STEELE ST	JOSEPH R CRAWFORD		4145 STEELE ST	DENVER	CO	80216	3229841	96.4	313.0
2978	SWANSEA	4110 FILLMORE ST	JOHN & ELIZABETH MUNIZ		4110 FILLMORE ST	DENVER	CO	80216	3332994	99.3	183.2
2979	SWANSEA	4120 FILLMORE ST	FRANCES HERRERA		4120 FILLMORE ST	DENVER	CO	80216	3167640	132.3	399.4
2981	SWANSEA	4109 MILWAUKEE ST	JOSEFINO & LUZ M SANDOVAL		4109 MILWAUKEE ST	DENVER	CO	80216	3993910	146.7	162.1
2988	SWANSEA	4251 COLUMBINE ST	WAYNE ARCHULETA		7008 ZENOBIA PLACE	WESTMINSTER	CO	80030	4264364	32.3	445.7
2994	SWANSEA	4395 COLUMBINE ST	RAYMOND F VISINTIN		4395 COLUMBINE ST	DENVER	CO	80216	2953733	13.8	520.0
2995	SWANSEA	4312 YORK ST	BRUCE SHUPE		4312 YORK ST	DENVER	CO	80216	2922026	23.0	434.2
2999	SWANSEA	3120 E 47TH AVE	RAYMOND LLOYD DURAN JR		3120 E 47TH AVE	DENVER	CO	80216	2981788	189.8	142.4
3015	SWANSEA	4325 CLAYTON ST	DIONISIO & MARIA VASQUEZ		4325 CLAYTON ST	DENVER	CO	80216	2981289	102.4	233.0
3016	SWANSEA	4375 CLAYTON ST	ETHEL M DASIS		4375 CLAYTON ST	DENVER	CO	80216	6750608	115.2	329.7
3016	SWANSEA	4375 CLAYTON ST	JUAN M PADILLA		4375 CLAYTON ST	DENVER	CO	80216	2981748	115.2	329.7
3018	SWANSEA	4343 CLAYTON ST	ROSENDO RODRIGUEZ		4343 CLAYTON ST	DENVER	CO	80216	2953685	146.8	312.6
3028	SWANSEA	4344 SAINT PAUL ST	ISMAEL & LILIA DIMAS		4344 SAINT PAUL ST	DENVER	CO	80216	2921943	102.3	144.7
3038	SWANSEA	4355 SAINT PAUL ST	DAVID A & PEGGY L POLLACK		4355 SAINT PAUL ST	DENVER	CO	80216	2953928	94.1	136.5
3043	SWANSEA	4335 MILWAUKEE ST	EUSTACIO & RAFELITA DURAN		4335 MILWAUKEE ST	DENVER	CO	80216	2949341	82.7	226.9
3046	SWANSEA	4328 CLAYTON ST	CELESTINO GALLEGOS		4328 CLAYTON ST	DENVER	CO	80216	2966150	97.0	223.3
3051	SWANSEA	4424 MILWAUKEE ST	RAYMUNDO CENICEROS		4424 MILWAUKEE ST	DENVER	CO	80216	2920514	113.0	275.9
3054	SWANSEA	4441 SAINT PAUL ST	NOE PUENTES		4441 ST PAUL ST	DENVER	CO	80216	2970298	75.7	252.3
3057	SWANSEA	4442 SAINT PAUL ST	CATHERINE V MONTOYA		4442 SAINT PAUL ST	DENVER	CO	80216	2929023	156.8	138.5
3059	SWANSEA	4430 SAINT PAUL ST	KENNETH KNOX		4430 SAINT PAUL ST	DENVER	CO	80216	2968281	119.7	182.8
3075	SWANSEA	4363 STEELE ST	HILDA SOLANO		4363 STEELE ST	DENVER	CO	80216	2970349	91.4	196.6
3078	SWANSEA	4435 THOMPSON CT	FOSTER CLYDE WEINER		515 DAHLIA WAY	LOUISVILLE	CO	80027	2962191	120.3	305.0
3087	SWANSEA	4400 CLAYTON ST	JUAN B & LOUISE ORTEGA		4400 CLAYTON ST	DENVER	CO	80216	2973568	72.3	150.3
3093	SWANSEA	4446 FILLMORE ST	MARIE A GARCIA		4446 FILLMORE ST	DENVER	CO	80216	2964945	5.5	440.3
3095	SWANSEA	4430 FILLMORE ST	JOHN D & FAYE R THOMPSON		4430 FILLMORE ST	DENVER	CO	80216	2961255	149.7	314.3
3096	SWANSEA	4424 FILLMORE ST	ROBERTO & LAURETTA J GONZALEZ		4424 FILLMORE ST	DENVER	CO	80216	2978930	75.8	166.2
3099	SWANSEA	4433 MILWAUKEE ST	THERESA CALDERON		4433 MILWAUKEE ST	DENVER	CO	80216	2988852	171.3	380.6

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
3132	SWANSEA	4539 COLUMBINE ST	JAMIE RAMIREZ		4539 COLUMBINE ST	DENVER	CO	80216	2925762	188.2	678.8
3142	SWANSEA	4436 JOSEPHINE ST	DARLENE SINNETT		4436 JOSEPHINE ST	DENVER	CO	80216	2952243	24.2	421.1
3145	SWANSEA	4543 MILWAUKEE ST	RANDALL T LOPEZ		5610 E 66TH AVE	COMMERCE CITY	CO	80022	2966175	135.6	266.3
3153	SWANSEA	4507 CLAYTON ST	JOSE ADELBERTO VELASQUEZ		4507 CLAYTON ST	DENVER	CO	80216	2964165	97.9	453.8
3162	SWANSEA	4650 CLAYTON ST	ALFREDO & LOUISE PACHECO		4650 CLAYTON ST	DENVER	CO	80216	2988153	72.3	188.9
3167	SWANSEA	4615 FILLMORE ST	LAVONNE EMIKO GRIFFIE		4615 FILLMORE ST	DENVER	CO	80216	2966836	130.9	178.2
3172	SWANSEA	4680 MILWAUKEE ST	ROBERT F & MARY ELLEN HERRERA		4680 MILWAUKEE ST	DENVER	CO	80216		160.1	314.0
3173	SWANSEA	4670 MILWAUKEE ST	KIM METHANY		4670 MILWAUKEE ST	DENVER	CO	80216	2962889	79.1	136.0
3179	SWANSEA	4518 MILWAUKEE ST	ABRAHAM GONZALES		4518 MILWAUKEE ST	DENVER	CO	80216	2949342	119.1	269.3
3201	SWANSEA	4651 CLAYTON ST	CORNELIO C CASTANON		4651 CLAYTON ST	DENVER	CO	80216	2978034	95.9	146.1
3225	SWANSEA	4682 JOSEPHINE ST	MARTHA SCHELL		4682 JOSEPHINE ST	DENVER	CO	80216	2964508	11.8	443.7
3238	SWANSEA	4751 ELIZABETH ST	MARIA SANCHEZ DE MUNOZ		4751 ELIZABETH ST	DENVER	CO	80216	2910464	120.7	147.8
3253	SWANSEA	4785 COLUMBINE ST	ANTHONY APODACA		4785 COLUMBINE ST	DENVER	CO	80216		140.2	178.5
3253	SWANSEA	4785 COLUMBINE ST	EDWIN MEININGER		4785 COLUMBINE	DENVER	CO	80216	2925352	140.2	176.5
3262	SWANSEA	4740 THOMPSON CT	ANNA M ZIEBARTH		4740 THOMPSON CT	DENVER	CO	80216	2920375	232.1	123.5
3270	SWANSEA	4710 ELIZABETH ST	JOHN R MCDONALD		320 AURORA ST	FT MORGAN	CO	80701		81.4	505.2
3271	SWANSEA	4741 THOMPSON CT	CLAUDIO RIVERA		4741 THOMPSON CT	DENVER	CO	80216	2970559	170.4	115.5
3275	SWANSEA	4780 COLUMBINE ST	DAVID SILVA	MARIANA CHAVEZ	4780 COLUMBINE ST	DENVER	CO	80216	303-308-9657	156.2	572.8
3275	SWANSEA	4780 COLUMBINE ST	IGHALIOTT MOLINA		4780 COLUMBINE ST	DENVER	CO	80216	2925785	156.2	572.8
3276	SWANSEA	4770 COLUMBINE ST	FRANCES DUFFY		4770 COLUMBINE ST	DENVER	CO	80216	4523533	149.0	308.5
3279	SWANSEA	4695 MILWAUKEE ST	ALLEN & SHIRLEY M MONDRAGON		4695 MILWAUKEE ST	DENVER	CO	80216		120.5	191.9
3300	SWANSEA	4620 FILLMORE ST	MARY SANTA CRUZ		4620 FILLMORE ST	DENVER	CO	80216	2926864	203.1	308.8
3302	SWANSEA	4775 FILLMORE ST	ESLI O FERNANDEZ		4775 FILLMORE ST	DENVER	CO	80216	2966101	138.5	423.7
3310	SWANSEA	4770 SAINT PAUL ST	CONCEPCION & LAURA RAMIREZ		4770 SAINT PAUL ST	DENVER	CO	80216	2932895	236.2	174.1
3319	SWANSEA	4725 SAINT PAUL CT	REUBEN STALEY		4725 SAINT PAUL CT	DENVER	CO	80216	2964225	138.9	227.3
3338	SWANSEA	4701 MILWAUKEE ST	LAVERNE J LIPPOLDT		520 W 79TH PLACE	DENVER	CO	80221	4521005	130.7	157.4
3349	SWANSEA	4780 CLAYTON ST	FRED C & MARTHA NUANES		4780 CLAYTON ST	DENVER	CO	80216	5717442	70.0	298.0
3352	SWANSEA	4700 CLAYTON ST	CONNIE S MARTINEZ		4700 CLAYTON ST	DENVER	CO	80216	2950683	120.4	371.8
3353	SWANSEA	4725 CLAYTON ST	WILLIAM JAMES LACRUE		4725 CLAYTON ST	DENVER	CO	80216	2981401	93.0	213.9
3365	COLE	3778 GILPIN ST	TONY D & CARMEN M MEDINA		3778 GILPIN ST	DENVER	CO	80205	2950780	16.5	465.5
3367	COLE	3778 FRANKLIN ST	DAMASIO R & VICTORIA E MEDINA		645 CARR ST	LAKEWOOD	CO	80215		5.5	491.8
3369	COLE	3770 FRANKLIN ST	EVARISTO & MARTHA OROSCO		3766 FRANKLIN ST	DENVER	CO	80205	2971027	19.1	428.9
3371	COLE	3770 GILPIN ST	HENRY & ELIZABETH SOLORIO		3770 GILPIN ST	DENVER	CO	80205	2929705	21.6	452.2
3413	COLE	3846 GILPIN ST	JERRY & LAVINIA M DOTTAVIO		10475 KALAMATH ST	NORTHGLENN	CO	80234	4572762	42.5	507.6
3415	COLE	3846 GILPIN ST	ROSEMARIE FONTAINE		10475 KALAMATH ST	NORTHGLENN	CO	80234	303-457-2762	42.5	507.6
3418	COLE	3843 WILLIAMS ST	JERRY & LAVINIA M DOTTAVIO		10475 KALAMATH ST	NORTHGLENN	CO	80234	4572762	137.0	469.5
3419	COLE	3843 WILLIAMS ST	RAYMOND & THERESA NIETO		3843 WILLIAMS ST	DENVER	CO	80205	303-292-0408	137.0	469.5
3422	COLE	3830 WILLIAMS ST	WILLIE N & JULIA R TRUJILLO		3830 WILLIAMS ST	DENVER	CO	80205	2973506	14.9	447.1
3429	COLE	3830 FRANKLIN ST	LARRY & MARY ODELIA MARTINEZ		3830 FRANKLIN ST	DENVER	CO	80205	2953801	178.9	697.7
3432	COLE	3805 GILPIN ST	ELIAS CAMPOS		3805 GILPIN ST	DENVER	CO	80205	2993782	87.7	390.1
3437	COLE	3839 GILPIN ST	LEROY VIGIL		3839 GILPIN ST	DENVER	CO	80216		21.7	444.2
3443	COLE	3919 HUMBOLDT ST	ERNESTINE MARTINEZ		3919 HUMBOLDT ST	DENVER	CO	80205	2988845	20.2	531.4
3454	SWANSEA	4359 CLAUDE CT	SALLY MEDINA		4359 CLAUDE ST	DENVER	CO	80216	2966273	75.2	423.5
3465	SWANSEA	4665 VINE ST	ESTHER LOPEZ		4665 VINE ST	DENVER	CO	80216	303-455-1463	50.7	426.9
3466	SWANSEA	4665 VINE ST	PAUL & PAULINE HERNANDEZ		4665 VINE ST	DENVER	CO	80216	2973307	50.7	426.9
3468	SWANSEA	4679 VINE ST	BILLY SCOTT		5730 E IOWA AVE	DENVER	CO	80224	7571491	11.1	477.4
3469	SWANSEA	4660 RACE ST	RICHARD D MORALEZ		4660 RACE ST	DENVER	CO	80216	2949482	19.2	435.6
3475	SWANSEA	4620 CLAUDE CT	LINDA MERVIN		4620 CLAUDE CT	DENVER	CO	80216	303-297-8705	30.7	527.4
3475	SWANSEA	4620 CLAUDE CT.	DAVID L MERVIN		PO BOX 16154	DENVER	CO	80216	2978705	30.7	527.4
3478	SWANSEA	4668 HIGH ST	FRANK PONCE		2127 LARIMER ST	DENVER	CO	80205	2951990	21.3	466.3
3481	SWANSEA	4669 RACE ST	MARIA G & ALFREDO M RUIZ		4649 RACE ST	DENVER	CO	80205	2987716	83.9	248.1
3483	SWANSEA	4626 RACE ST	DONALD WAYNE & EYDIE G BELL		4626 RACE ST	DENVER	CO	80216	2970863	18.8	475.2
3490	SWANSEA	4651 WILLIAMS ST	LUCAS J & THEODORA M VALDEZ		4651 WILLIAMS ST	DENVER	CO	80216	2963279	23.6	491.8
3501	SWANSEA	4653 HIGH ST	WALTER PINE		4653 HIGH ST	DENVER	CO	80216	2963969	326.0	480.9
3506	SWANSEA	4751 WILLIAMS ST	ANTHONY GARCIA		4751 WILLIAMS ST	DENVER	CO	80216		15.3	449.8
3508	SWANSEA	4751 WILLIAMS ST	BALTAZAR ROCHA		1151 S VALLEJO ST	DENVER	CO	80223	303-937-1949	15.3	449.8
3509	SWANSEA	4753 WILLIAMS ST	CHARLES E ROBINSON		4753 WILLIAMS ST	DENVER	CO	80216	2964433	24.1	532.2
3510	SWANSEA	4765 WILLIAMS ST	JOSE LUEVANO						4100650	16.6	444.6
3511	SWANSEA	4781 WILLIAMS ST	BERNARDO DOMINQUEZ PEREZ		4781 WILLIAMS ST	DENVER	CO	80216	2972648	24.9	501.4
3513	SWANSEA	4727 BRIGHTON BLVD	LILY POTTER		4727 BRIGHTON BV	DENVER	CO	80216	2964880	16.5	445.0

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
3519	SWANSEA	4763 RACE ST	DAVID BRUCE GARCIA		4763 RACE ST	DENVER	CO	80216	2957308	15.7	538.2
3521	SWANSEA	4777 RACE ST	JAVIER & MARIE S SAUCEDO JR		4777 RACE ST	DENVER	CO	80216	2973027	15.5	404.6
3529	SWANSEA	4750 WILLIAMS ST	JOHN M & SHIRLEY A MARTINEZ		4750 WILLIAMS ST	DENVER	CO	80216	2950108	98.8	348.4
3532	SWANSEA	4720 WILLIAMS ST	GABRIEL & DOMINGA ZUNIGA		4720 WILLIAMS ST	DENVER	CO	80216	2953919	174.5	256.0
3533	SWANSEA	4708 WILLIAMS ST	ANNA & EUSTACHIUS KRAWCZUK		4708 WILLIAMS ST	DENVER	CO	80216	2963297	28.3	447.7
3535	SWANSEA	4767 HIGH ST	CLARENCE ROLLINS		PO BOX 613	LONGMONT	CO	80502	2968632	28.0	415.0
3535	SWANSEA	4767 HIGH ST	JUSTIN SHAW		4767 HIGH ST	DENVER	CO	80216		28.0	415.0
3536	SWANSEA	4775 HIGH ST	BENITO & MARY ZAMORA		2745 CARNATION WAY	THORNTON	CO	80229	2964486	254.5	411.1
3543	SWANSEA	4700 VINE ST	CITY & COUNTY OF DENVER		144 W COLFAX AVE	DENVER	CO	80202		56.5	435.1
3543	SWANSEA	4700 VINE ST	RAMON F GALLEGOS		4700 VINE ST	DENVER	CO	80216	2963950	56.5	435.1
3551	SWANSEA	4736 RACE ST	JAMES R & PEGGY SUE PAYNE		4736 RACE ST	DENVER	CO	80216	2968375	221.2	378.1
3552	SWANSEA	4730 RACE ST	GEORGIA H CLARK		4730 RACE ST	DENVER	CO	80216	2910913	44.5	414.9
3553	SWANSEA	4722 RACE ST	LUIS & SOLEDAD CASILLAS		4722 RACE ST	DENVER	CO	80216	2988756	21.2	427.9
3555	SWANSEA	4719 VINE ST	PHILIP KIEFABER		2105 LEWIS ST	LAKEWOOD	CO	80215	2331262	17.8	409.7
3557	SWANSEA	4723 VINE ST	JOSE MANUEL & ZENAIDA LUEVANO		4723 VINE ST	DENVER	CO	80216		5.5	411.7
3565	SWANSEA	4762 HIGH ST	FERNANDO ALMODOVAR		4762 HIGH ST	DENVER	CO	80216	2981254	19.8	414.2
3569	SWANSEA	4726 HIGH ST	ANGELINA MILAN		4725 HIGH ST	DENVER	CO	80216	2960219	68.3	474.4
3570	SWANSEA	4732 GAYLORD ST	BERTA BALBUENA		4732 GAYLORD ST	DENVER	CO	80216		73.5	387.3
3575	SWANSEA	4765 CLAUDE CT	JOHN TAYLOR		4765 CLAUDE CT	DENVER	CO	80216	2923057	116.7	234.9
3577	SWANSEA	4793 CLAUDE CT	MARIANA PEREA		4793 CLAUDE ST	DENVER	CO	80216	2957261	30.1	461.3
3578	SWANSEA	4720 GAYLORD ST	R RODRIGUEZ		4720 GAYLORD ST	DENVER	CO	80216	2968335	129.0	381.1
3581	SWANSEA	4785 CLAUDE CT	DELIA VIOLA ORTEGA		4785 CLAUDE CT	DENVER	CO	80216	2973946	248.0	416.4
3585	SWANSEA	4732 VINE ST	DAN F & JUNE B GRIFFIN		7 LONDONDERRY LN	LINCOLNSHIRE	IL	60069		15.5	461.0
3591	SWANSEA	4729 GAYLORD ST	JOE N & DORA F DURAN		4731 GAYLORD ST	DENVER	CO	80216	2964488	217.9	426.9
3592	SWANSEA	4765 GAYLORD ST	ANNA STADLBAUER		4765 GAYLORD ST	DENVER	CO	80216		18.3	410.4
3617	GLOBEVILLE	4211 FOX ST	SALVADOR & CONSUELO DELATORRE		5970 S WOLFF CT	LITTLETON	CO	80123	7953203	13.1	527.0
3621	GLOBEVILLE	4422 DELAWARE ST	ERIKS E LINDEMANIS		6592 S DOVER ST	LITTLETON	CO	80123	303-550-2438	258.7	517.6
3621	GLOBEVILLE	4422 DELAWARE ST	STEPHEN W MADSEN		2533 W 43RD AVE W MOFFAT PL	DENVER	CO	80221	4771466	258.7	517.6
3626	SWANSEA	5025 ADAMS ST	LUIS LUCIO		5025 ADAMS ST	DENVER	CO	80216	303-298-0485	137.7	189.4
3626	SWANSEA	5025 ADAMS ST	EVA CHAVEZ		5025 ADAMS	DENVER	CO	80216	2961803	137.7	189.4
3630	SWANSEA	5040 ADAMS ST	DANIEL & STELLA MARQUEZ		9974 LANE ST	DENVER	CO	80216	2549764	147.6	179.4
3635	SWANSEA	4831 ADAMS ST	NORMA I GONZALES		4831 ADAMS ST	DENVER	CO	80216	2968651	79.0	230.7
3644	SWANSEA	4990 ADAMS ST	DAVID ANTHONY PENA		4990 ADAMS ST	DENVER	CO	80216	6913541	97.0	220.6
3649	SWANSEA	4986 STEELE ST	DARLENE A KARLO		4986 STEELE ST	DENVER	CO	80216	2956158	81.4	107.8
3651	SWANSEA	4970 STEELE ST	STEVEN M VALDEZ		4970 STEELE ST	DENVER	CO	80206	2989353	140.7	244.1
3653	SWANSEA	4965 ADAMS ST	REYNALDO PADILLA-LECHUGA		4965 ADAMS ST	DENVER	CO	80216	2929303	145.1	155.8
3655	SWANSEA	4979 ADAMS ST	PHILLIP J & CECELIA J SENA		4979 ADAMS ST	DENVER	CO	80216	2968936	90.0	143.2
3658	SWANSEA	4955 ADAMS ST	MARY ESCAFERA		4955 ADAMS ST	DENVER	CO	80216		144.1	169.6
3684	SWANSEA	5044 STEELE ST	FELISA ORTEGA		5044 STEELE ST	DENVER	CO	80216	2962983	157.7	605.7
3687	SWANSEA	5020 STEELE ST	RAMONA & EDDIE MARTINEZ		5020 STEELE ST	DENVER	CO	80216	2956237	124.9	141.2
3689	SWANSEA	5088 STEELE ST	JACK H PIERSON		5088 STEELE ST	DENVER	CO	80216	2966879	111.3	115.5
3690	SWANSEA	5070 STEELE ST	THOMAS F & ALICE F HORA		5070 STEELE ST	DENVER	CO	80216		148.7	116.1
3706	SWANSEA	4815 FILLMORE ST	IMELDA ARROYOS		4815 FILLMORE ST	DENVER	CO	80216	2953625	140.5	111.8
3719	SWANSEA	4914 SAINT PAUL ST	MARIA FLOR HERNANDEZ		4914 SAINT PAUL ST	DENVER	CO	80216	2940216	139.6	281.1
3720	SWANSEA	4906 SAINT PAUL ST	LINDA G & RALPH PICASO		4906 SAINT PAUL ST	DENVER	CO	80216	2966308	79.8	250.8
3722	SWANSEA	4929 STEELE ST	DAVID AQUADO		4929 STEELE ST	DENVER	CO	80216	2966474	172.8	150.0
3730	SWANSEA	4857 STEELE ST	RONALD J SANDERS		4520 PEARL ST	DENVER	CO	80216	2978557	67.1	495.6
3738	SWANSEA	4825 SAINT PAUL ST	LORETTA A DAVIS		4825 SAINT PAUL ST	DENVER	CO	80216	2969820	82.9	159.8
3739	SWANSEA	4815 SAINT PAUL ST	ANGIE VASQUEZ		4815 SAINT PAUL ST	DENVER	CO	80216	2924622	237.0	341.7
3780	SWANSEA	5075 MILWAUKEE ST	ARTURO & VIRGINIA QUINONEZ		5075 MILWAUKEE ST	DENVER	CO	80216	303-292-4502	237.6	242.7
3780	SWANSEA	5075 MILWAUKEE ST	GEORGE O JOHNSON		5075 MILWAUKEE ST	DENVER	CO	80216	2960962	237.6	242.7
3792	SWANSEA	5075 SAINT PAUL ST	LORRAINE GRANADO		5075 SAINT PAUL ST	DENVER	CO	80216	2966367	103.9	222.3
3798	SWANSEA	5096 SAINT PAUL ST	GALEN E STEWART		5096 SAINT PAUL ST	DENVER	CO	80216	2989306	174.9	92.7
3801	SWANSEA	5060 SAINT PAUL ST	MIGUEL SENA		5060 ST PAUL ST	DENVER	CO	80216	2970148	116.4	192.4
3808	SWANSEA	5031 STEELE ST	SHERRY BLACK		5031 STEELE ST	DENVER	CO	80216	2972855	87.6	397.0
3815	SWANSEA	4962 SAINT PAUL ST	JOE T & TESSIE V MEDINA		4962 SAINT PAUL ST	DENVER	CO	80216	2929013	159.3	250.0
3829	SWANSEA	4963 SAINT PAUL ST	SALVADOR JIMENEZ		4963 SAINT PAUL ST	DENVER	CO	80216	6750483	71.2	176.1
3849	SWANSEA	4905 CLAYTON ST	LOUIS AND DEBRA GOMEZ		4905 CLAYTON ST	DENVER	CO	80216	2964961	137.3	105.7
3853	SWANSEA	4907 FILLMORE ST	MARTHA LOPEZ		4907 FILLMORE ST	DENVER	CO	80216	2923730	184.3	242.3
3864	SWANSEA	4905 MILWAUKEE ST	JOHN R & FRANCES M JIMENEZ		4909 MILWAUKEE ST	DENVER	CO	80216	2970091	136.3	254.8

Table A-2 (Continued)

Property Owner Details for Remedial Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
3867	SWANSEA	4921 MILWAUKEE ST	RUBEN RAMIREZ		4921 MILWAUKEE ST	DENVER	CO	80216	2989187	92.3	282.3
3870	SWANSEA	4930 MILWAUKEE ST	GILBERTO MENDEZ		4930 MILWAUKEE ST	DENVER	CO	80216	2964633	116.6	201.1
3873	SWANSEA	4912 MILWAUKEE ST	ROBERT L TRUJILLO		4912 MILWAUKEE ST	DENVER	CO	80216	2962144	150.3	127.4
3880	CLAYTON	3639 FILLMORE ST	MARIA MEDINA		3639 FILLMORE ST	DENVER	CO	80205	303-344-0994	105.9	228.6
3881	CLAYTON	3838 STEELE ST	LUIS & MARIA CASTANON		3838 STEELE ST	DENVER	CO	80205	303-355-2419	126.9	208.8
3883	SWANSEA	4041 STEELE ST	GREGORY P DOZBABA		4041 STEELE ST	DENVER	CO	80216	303-316-9055	115.0	271.8
3884	SWANSEA	4334 SAINT PAUL ST	JOHN COPLAND		4334 SAINT PAUL ST	DENVER	CO	80216	303-294-0917	105.7	208.2
3885	SWANSEA	4336 STEELE ST	JAMES M KOHUT		4336 STEELE ST	DENVER	CO	80216	303-296-8221	78.4	184.5
3886	SWANSEA	4451 SAINT PAUL ST	CHERYL C WILLIAMSON		4451 SAINT PAUL ST	DENVER	CO	80216	303-296-8273	80.5	183.5
3894	SWANSEA	4721 THOMPSON CT	JOSE CARDOZA		4721 THOMPSON CT	DENVER	CO	80216	303-421-9051	124.4	468.4
3895	SWANSEA	4755 MILWAUKEE ST	GERALD BYRON PFANNENSTIEL		4755 MILWAUKEE ST	DENVER	CO	80216	303-296-8958	102.7	144.8
3896	ELYRIA	4755 VINE ST	ROSALBA PULGARIN		4755 VINE ST	DENVER	CO	80216	303-291-1170	121.2	365.6
3909	ELYRIA	4783 HIGH ST	JOSE G & OLIVIA LOPEZ		4783 HIGH ST	DENVER	CO	80216	303-293-8085	131.6	409.1
3913	SWANSEA	4959 ADAMS ST	RAYMOND ANTHONY BLATNIK		4959 ADAMS ST	DENVER	CO	80216	303-298-7332	174.6	107.8
3914	SWANSEA	4992 STEELE ST	JAMES J & FLORENCE GARCIA		4994 STEELE ST	DENVER	CO	80216	303-297-3062	227.0	158.7
3915	SWANSEA	5010 STEELE ST	ANNIE DIAZ		5010 STEELE ST	DENVER	CO	80216	303-675-0080	124.0	141.5
4041	SWANSEA	3750 YORK ST	ROGER & LINDA RODINE		3758 YORK ST	DENVER	CO	80205	303-296-8408	330.0	513.3

Note: Some properties have entries on multiple lines to show details for multiple owners.

Tabbed Page: Appendix B

APPENDIX B

SAMPLE DOCUMENTS

APPENDIX B-1

ACCESS AGREEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18th STREET, SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

Ref: 8EPR-SR

May 24, 2004

«Owner»
«MailingAddress»
«MailingCityStateZip»

RE: «Address»
(«PropertyID»)

Dear «Owner»,

The United States Environmental Protection Agency (EPA) has tested your property for arsenic and lead soil contamination as part of the Vasquez Boulevard/I-70 (VB/I70) Superfund Site. Concentrations of arsenic («As_EPC» mg/Kg) and/or lead («Pb_Avg» mg/Kg) found in your soil are high enough for your property to qualify for the removal action EPA is performing this year.

EPA would like to remove the top layer of soil from your yard and replace it with clean soil. EPA will then re-landscape your yard to a condition similar to original, as allowed by the Denver Water Board water usage restrictions. The EPA will perform and pay for the clean up of your property. EPA requires your consent to proceed as soon as possible.

An Access Agreement that will allow the EPA to perform the soil removal work accompanies this letter. I strongly encourage you to sign this agreement and mail it back to the following address:

USEPA – VB/I-70 Project Site
Attention: Victor Ketellapper
10 East 55th Avenue
Denver, Colorado 80216

Your property will be scheduled for soil removal provided we promptly receive the signed Access Agreement. EPA will coordinate the soil removal activity with you to reduce any inconvenience to you.

Upon completion of the clean up, EPA will issue a letter stating your property has been cleaned.

Once an access agreement has been received, representatives of EPA will contact you to discuss the removal of contaminated soil from your property. In the meantime, if you have further questions regarding the removal of contaminated soil at your property, you may contact the VB/I-70 Command Center at (303) 487-0377.

Sincerely,

United States Environmental Protection Agency

Victor Ketellapper
Remedial Project Manager

«PropertyID»

Consent For Access To Property

RIGHT OF ENTRY TO PREMISES

Grantor (the property owner) consents to and authorizes the United States Environmental Protection Agency (EPA) or its authorized representatives, collectively the Grantee, to enter and perform certain environmental response activities upon the following described premises:

Owner's Name: «Owner»	**Phone:**

Addresses of Properties covered by this Agreement:	**Address:** «Address»
	Address:
	Address:
	Address:
	Address:

PURPOSE OF RESPONSE ACTIVITIES

The EPA is requesting access to collect soil samples and remove soil that contains elevated concentrations of arsenic and/or lead and may pose a health hazard. The soil will be removed and the excavated area(s) will be replaced with clean materials and restored. This work is being performed under the Vasquez Boulevard/I-70 Superfund Site remediation program.

An EPA representative will contact the Grantor in-person to discuss the work to be performed, the Grantor will have an opportunity to review and approve the planned soil removal, and restoration work before it begins. Once the work is finished, the Grantor will be asked to review the work and confirm that it is complete and meets with the Grantor's approval. Upon completion, the Grantor will receive written documentation from EPA that the property has been remediated.

ENVIRONMENTAL RESPONSE ACTIONS

By signing this Access Agreement, the Grantor is granting the EPA, its employees, contractors and subcontractors the right to enter the property, at all reasonable times and with prior notice, for the sole purpose of performing the work. This access shall remain in effect until the work has been satisfactorily completed. The Grantor also agrees to:

«PropertyID»

- Remove obstructions including boats, trailers, vehicles, playscape items, wood piles, dog houses, etc;
- Remove flower bulbs or plants that the Grantor or the Grantor's tenant may wish to save;
- Water and maintain replacement vegetation, including fertilizer application, as necessary subsequent to an initial watering period by EPA, unless watering is restricted by Denver Water Board;
- Abide by health and safety guidance provided by EPA;
- If the property is rented, assist EPA in obtaining tenant approval for access to the property to perform the work if EPA is unable to obtain such access; and
- Allow videotaping and/or photography of the property including exterior and interior areas of buildings.

AGREEMENT NOT TO INTERFERE

The Grantor agrees not to interfere or tamper with any of the activities or work done, or the equipment used to perform the activities, or to undertake any actions regarding the use of said property which would tend to endanger the health or welfare of the Grantees or the environment, or to allow others to use the property in such a manner.

Should you have any questions about this program, please contact the VB/I-70 Command Center at (303) 487-0377.

☐ **I grant access to my properties** ☐ **I do not grant access to my properties**

Signature **Date** **Signature** **Date**

☐ **I would like to be present during any sampling that is required.**

«PropertyID»

Project Resources Inc.

Restoration Agreement

The purpose of this agreement is to provide a mutual agreement as to conditions of property prior to remediation activities. This will also serve as decontamination for the purpose of assuring that restoration activities are completed to the satisfaction of the property owner and the United States Environmental Protection Agency (EPA).

Property ID:
Property Address:
Owner:
Phone:

On the attached diagram(s) indicate area(s) to excavated and depth of excavation, location of all known utilities, subsurface features, surface structures and landscaping features, access location(s) to be used by contractor, and the direction of North. Indicate distances, depths, material types, etc. Indicate digital photos by referencing the photo-log number with an arrow indicating direction of view.

Items To Be Removed By Owner Before Start Of Remediation:

(Use additional sheets as necessary)

The removal, storage, disposal, and/or return of these items is the Owner's responsibility.

Item:
Item:
Item:
Item:
Item:
Item:
Item:
Item:

Project Resources Inc.

Items To Be Removed By Contractor During Remediation And Not Replaced

(Use additional sheets as necessary)

Item:
Item:
Item:
Item:
Item:
Item:
Item:

Items To Be Removed By Contractor During Remediation And Replaced

(Use additional sheets as necessary)

Item:
Item:
Item:
Item:
Item:
Item:
Item:

Project Resources Inc.

Landscape Inventory
(Use additional sheets as necessary)

Item	Quantity	Unit	Description/Explanation
Total Area Of Property To Be Excavated		Square Feet	
Number of trees > 2 inch trunk diameter			
Number of trees < 2 inch trunk diameter			
Number of Sprinkler Zones, Control Valves, Timers, Heads, etc. Attach a sketch of the sprinkler layout.			Zones: _____ Heads: _____ Control Valves: _____
Number of and total size of all gardens / flower beds. Attach a sketch of relative sizes and locations.	# Of Beds: _____ # Of Gardens: _____		Ft^2 Of Beds: _____ Ft^2 Of Gardens: _____

Project Resources Inc.

Item	Quantity	Unit	Description/Explanation
Agreed upon value of plant materials not to be replaced by contractor. Note this value will be used to issue a plant voucher to the property owner.	Total # Of Beds: _____	$	Total Ft^2 Of Beds To Be Replaced With Certificate: _____
Agreed upon list of plant materials that will be replaced by contractor. Be very specific and detailed. Include a sketch of were each plant will be placed by the contractor.		Each	Only Use For Plants That Are Being Saved and Re-planted
Agreed upon area of property to be replaced with grass sod. Include a sketch of the area(s) to be replaced with grass sod.		SF	Total Ft^2 Of Sod To Be Laid: _____
Area of City or County property to be landscaped per their requirements. Include a sketch of the area (s)	Total Ft^2: _____	SF	Sod: _____ Brown Mulch: _____ Red Mulch: _____
Agreed upon area of property to be replaced with mulch.	Total Ft^2 Of Mulch: _____	SF	Red: _____ Brown: _____

Project Resources Inc.

Item	Quantity	Unit	Description/Explanation
Agreed upon area to be replaced rock.	Total Ft^2 Of Rock: _____	SF	Large: _____ Medium: _____ Small (pea gravel): _____ Driveway Gravel: _____
Agreed upon area to be replaced with no groundcover.	Total Ft^2 With No Groundcover: _____		

Additional Comments / Instructions:

Project Resources Inc.

Additional Comments / Instructions Continued:

☐ Check the box if Owner does not want PRI to document interior foundation walls and possible pre-existing damage. By checking this box PRI is not responsible for any damage done to the interior of house, including foundation cracks or fissures.

☐ **I agree** ☐ **I do not agree** ☐ **I agree** ☐ **I do not agree**

Owner's Signature **Date** **Contractor's Signature** **Date**

Project Resources Inc.

Property Completion Agreement

This agreement documents the completion of remedial activities performed on my property. My signature will designate that I am satisfied with the restoration of my property, and that no items are in questions, now, or at any time in the future, except those items listed below, if any.

Property ID:
Property Address:
Owner:
Phone:

Restoration Items in Question:

Item:
Item:
Item:
Item:
Item:
Item:

Additional Comments:

☐ **I agree restoration is completed, except as noted**

☐ **I do not agree restoration is completed**

☐ **I agree that the sprinkler system is working properly following reinstallation by contractor**

Owner's Signature **Date**

Contractor's Signature **Date**

APPENDIX B-2

REMEDIATION COMPLETION LETTER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18th STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

Mr./Ms. «Owner_Name»
«Mail_Address_1»
«Mail_City», «Mail_State» «Mail_Zip»

Dear Mr./Ms. «Owner_Last_Name»,

This letter certifies that soils on the property at «Address_1» in Denver, Colorado, have been remediated in accordance with the U.S. Environmental Protection Agency's (EPA) Record of Decision for the Vasquez Boulevard and Interstate 70 Superfund Site (VB/I-70), Operable Unit 1, signed by EPA on September 25, 2003. The required work was accomplished in accordance with EPA approved work plans. The remediation successfully addressed the health risks associated with exposure to arsenic and lead in soils at this property.

The clean-up action conducted by the EPA and the U.S. Army Corps of Engineers (USACE) addressed residences where the soil concentrations of lead and/or arsenic exceeded the action levels of 400 parts per million (ppm) and/or 70 ppm, respectively. The clean up consisted of excavation of the top 12 inches of soil at the listed property. The excavated area was replaced with clean soils.

In order to assure that your property remains protected from lead contamination, it may be necessary to maintain the exterior of your home to prevent any chipping or peeling paint from being deposited in your yard. Very old paint (from 1978 or before) could contain lead contaminates. An EPA representative will be contacting you to schedule a lead based paint assessment of the exterior of your home. EPA will provide for the initial abatement of lead based paint if necessary.

If you require more specific information concerning the clean-up of your property, please contact me at U.S. EPA (8EPR-SR), 999 18th Street, Suite 300, Denver, CO 80202-2466, Attn: Victor Ketellapper, or 303-312-6578, or Pat Courtney at 303-312-6631.

Sincerely,

Victor Ketellapper
Project Manager

Tabbed Page: Appendix C

APPENDIX C

PRELIMINARY LIST OF PROPERTIES TO BE SAMPLED

Appendix C
Preliminary List of Properties to be Sampled

This appendix provides a preliminary list of residential properties within the Site, which have not yet been sampled as of March 31, 2003. The list (shown on Table C-1) was generated by comparing the properties which have been sampled under the Phase III protocols or that had removal actions performed against the list of residential properties for the site.

The database used to generate this list was last updated in 2000 by Washington Group, International, the USEPA contractor who performed the Remedial Investigation for the VB/I-70 site. In a site as large as VB/I-70, property boundaries and ownership are expected to change over time. Consequently, there were issues of completeness and usability with the 2000 version of the property database. MFG took specific actions in 2003 to improve the accuracy of the property database and recommends future action to update the database should USEPA decide to maintain it through the rest of the project. MFG's recommendations are provided in the attachment. In any event, because use of property address lists or other existing sources of information available from outside sources provides only a limited benefit, it is recommended that properties to be sampled be definitively identified by "field-truthing" during upcoming removal or remedial action. The attached list, along with the existing database of properties already sampled or remediated, will provide the starting point for the field-truthing exercise.

Table C-1

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
1	2627	1331 E 33RD AVE	
2	3929	1350 E 33RD AVE	
3		1401 E 33RD AVE	
4	138	1633 E 33RD AVE	
5	139	1635 E 33RD AVE	
6		1700 E 33RD AVE	
7	183	1715 E 33RD AVE	
8	81	1720 E 33RD AVE	
9	169	1801 E 33RD AVE	
10	222	1807 E 33RD AVE	
11		1822 E 33RD AVE	
12		1830 E 33RD AVE	
13	1091	2703 E 33RD AVE	
14	1092	2707 E 33RD AVE	
15		2713 E 33RD AVE	
16	1445	3221 E 33RD AVE	
17	279	1524 E 35TH AVE	
18	280	1526 E 35TH AVE	
19		1600 E 35TH AVE	
20		1713 E 35TH AVE	
21		1721 E 35TH AVE	
22	1224	2401 E 35TH AVE	
23	1566	3400 E 35TH AVE	
24	1586	3530 E 35TH AVE	
25	481	1419 E 36TH AVE	
26	446	1509 E 36TH AVE	
27		1700 E 36TH AVE	
28	461	1717 E 36TH AVE	
29	359	1720 E 36TH AVE	# 12
30	358	1722 E 36TH AVE	# 11
31	357	1724 E 36TH AVE	# 10
32	462	1725 E 36TH AVE	
33	356	1726 E 36TH AVE	# 9
34	355	1728 E 36TH AVE	# 8
35	354	1730 E 36TH AVE	# 7
36	427	1803 E 36TH AVE	
37	389	1824 E 36TH AVE	
38	390	1828 E 36TH AVE	
39	391	1832 E 36TH AVE	# 4
40		1911 E 36TH AVE	
41	867	1919 E 36TH AVE	
42		2455 E 36TH AVE	
43		2507 E 36TH AVE	
44		2509 E 36TH AVE	
45		2511 E 36TH AVE	
46	1283	3017 E 36TH AVE	
47	1754	3375 E 36TH AVE	
48	1765	3475 E 36TH AVE	
49	515	1317 E 37TH AVE	
50	2613	1751 E 37TH ST	
51		2101 E 37TH AVE	
52	3930	2401 E 37TH AVE	
53		2522 E 37TH AVE	
54		2524 E 37TH AVE	
55		2526 E 37TH AVE	
56		2528 E 37TH AVE	
57		2530 E 37TH AVE	
58		2532 E 37TH AVE	
59	3933	2700 E 37TH AVE	
60	1786	3115 E 37TH AVE	
61		1213 E 38TH AVE	
62		1618 E 38TH AVE	
63		1621 E 38TH AVE	
64		1624 E 38TH AVE	
65	2285	1745 E 38TH AVE	
66		1900 E 38TH AVE	
67	892	2120 E 38TH AVE	
68		3230 E 38TH AVE	
69	1884	3235 E 38TH AVE	
70		1800 E 39TH AVE	
71		1815 E 39TH AVE	
72		1806 E 40TH AVE	
73		2717 E 40TH AVE	
74	2009	3015 E 40TH AVE	
75		3031 E 40TH AVE	
76	2638	3100 E 40TH AVE	
77		3115 E 40TH AVE	
78		3200 E 40TH AVE	
79		3705 E 40TH AVE	
80		3755 E 40TH AVE	
81	2017	2733 E 41ST AVE	
82	1962	3202 E 41ST AVE	
83		3505 E 41ST AVE	
84		3600 E 41ST AVE	
85		3650 E 41ST AVE	
86		3700 E 41ST AVE	
87	2053	2701 E 42ND AVE	
88	2033	2705 E 42ND AVE	
89	2035	2727 E 42ND AVE	
90	2074	2603 E 43RD AVE	
91	2038	2720 E 43RD AVE	
92		1920 E 44TH AVE	
93	2090	2736 E 44TH AVE	
94	3935	2800 E 44TH AVE	
95		314 W 44TH AVE	
96	2129	2525 E 45TH AVE	
97	2148	2645 E 45TH AVE	
98	2237	3345 E 45TH AVE	
99		2825 E 46TH AVE	
100		1634 E 47TH AVE	
101		1650 E 47TH AVE	
102		1670 E 47TH AVE	
103		1717 E 47TH AVE	
104	2332	1912 E 47TH AVE	
105	2380	1925 E 47TH AVE	
106		1980 E 47TH AVE	
107	2190	2417 E 47TH AVE	
108	3934	2650 E 49TH AVE	
109		3205 ADAMS ST	
110		3219 ADAMS ST	
111	1411	3251 ADAMS ST	
112	1421	3300 ADAMS ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
113	1441	3311 ADAMS ST	
114	1443	3335 ADAMS ST	
115	1492	3336 ADAMS ST	
116		3401 ADAMS ST	
117	1621	3435 ADAMS ST	
118	1622	3437 ADAMS ST	
119	1563	3440 ADAMS ST	
120	1683	3508 ADAMS ST	
121	1629	3530 ADAMS ST	
122	1633	3550 ADAMS ST	
123	1809	3611 ADAMS ST	
124	1894	3623 ADAMS ST	
125	1812	3626 ADAMS ST	
126	1844	3635 ADAMS ST	
127	1810	3650 ADAMS ST	
128	3939	3656 ADAMS ST	
129		3801 ADAMS ST	
130	1879	3814 ADAMS ST	
131	1885	3819 ADAMS ST	
132	1880	3822 ADAMS ST	
133	1902	3830 ADAMS ST	
134	1888	3849 ADAMS ST	
135	1889	3879 ADAMS ST	
136		3890 ADAMS ST	
137	1951	3924 ADAMS ST	
138	1938	3941 ADAMS ST	
139	1949	3948 ADAMS ST	
140	1939	3949 ADAMS ST	
141	1947	3976 ADAMS ST	
142	1946	3986 ADAMS ST	
143	1980	4101 ADAMS ST	
144	1983	4151 ADAMS ST	
145	1984	4160 ADAMS ST	
146		4300 ADAMS ST	
147	3361	4330 ADAMS ST	
148	2231	4336 ADAMS ST	
149		4340 ADAMS ST	
150	2241	4453 ADAMS ST	
151	2242	4461 ADAMS ST	
152	2243	4463 ADAMS ST	
153		4900 ADAMS ST	
154	2477	4948 ADAMS ST	
155	2458	5000 ADAMS ST	
156	2455	5017 ADAMS ST	
157	2452	5041 ADAMS ST	
158	2454	5045 ADAMS ST	
159	3628	5083 ADAMS ST	
160	2459	5090 ADAMS ST	
161		4601 BALDWIN CT	
162	2366	4608 BALDWIN CT	
163	2354	4611 BALDWIN CT	
164		4614 BALDWIN CT	
165	2355	4615 BALDWIN CT	
166	2356	4619 BALDWIN CT	
167	2357	4623 BALDWIN CT	
168		4624 BALDWIN CT	

Number	Property ID	Address	Unit
169		4632 BALDWIN CT	
170		4636 BALDWIN CT	
171	2358	4639 BALDWIN CT	
172	2365	4640 BALDWIN CT	
173	2359	4643 BALDWIN CT	
174		4646 BALDWIN CT	
175		4655 BALDWIN CT	
176	2361	4667 BALDWIN CT	
177	2362	4681 BALDWIN CT	
178		4700 BALDWIN CT	
179	2373	4712 BALDWIN CT	
180		4730 BALDWIN CT	
181		4744 BALDWIN CT	
182		4778 BALDWIN CT	
183		4780 BALDWIN CT	
184		3501 BRIGHTON BLVD	
185		3507 BRIGHTON BLVD	
186		3515 BRIGHTON BLVD	
187	15	3547 BRIGHTON BLVD	
188		3551 BRIGHTON BLVD	
189		3553 BRIGHTON BLVD	
190		3559 BRIGHTON BLVD	
191	25	3722 BRIGHTON BLVD	
192		4605 BRIGHTON BLVD	
193		4615 BRIGHTON BLVD	
194		4637 BRIGHTON BLVD	
195		4640 BRIGHTON BLVD	
196		4647 BRIGHTON BLVD	
197		4652 BRIGHTON BLVD	
198		4655 BRIGHTON BLVD	
199		4661 BRIGHTON BLVD	
200		4670 BRIGHTON BLVD	
201		4690 BRIGHTON BLVD	
202		4700 BRIGHTON BLVD	
203		4701 BRIGHTON BLVD	
204	2375	4741 BRIGHTON BLVD	
205		4747 BRIGHTON BLVD	
206		4750 BRIGHTON BLVD	
207	2376	4751 BRIGHTON BLVD	
208		4754 BRIGHTON BLVD	
209		4770 BRIGHTON BLVD	
210		1201 BRUCE RANDOLPH AVE	
211	39	1221 BRUCE RANDOLPH AVE	
212	41	1233 BRUCE RANDOLPH AVE	
213		1239 BRUCE RANDOLPH AVE	
214		1412 BRUCE RANDOLPH AVE	
215		1416 BRUCE RANDOLPH AVE	
216		1519 BRUCE RANDOLPH AVE	
217		1523 BRUCE RANDOLPH AVE	
218		1615 BRUCE RANDOLPH AVE	
219		1620 BRUCE RANDOLPH AVE	
220		1629 BRUCE RANDOLPH AVE	
221		1720 BRUCE RANDOLPH AVE	
222		1725 BRUCE RANDOLPH AVE	
223	787	1915 BRUCE RANDOLPH AVE	
224		2222 BRUCE RANDOLPH AVE	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
225		2231 BRUCE RANDOLPH AVE	
226	1031	2324 BRUCE RANDOLPH AVE	
227		2501 BRUCE RANDOLPH AVE	
228		2539 BRUCE RANDOLPH AVE	
229	1052	2626 BRUCE RANDOLPH AVE	
230	1152	2721 BRUCE RANDOLPH AVE	
231		2940 BRUCE RANDOLPH AVE	
232		3041 BRUCE RANDOLPH AVE	
233		3101 BRUCE RANDOLPH AVE	
234		3116 BRUCE RANDOLPH AVE	
235	1616	3231 BRUCE RANDOLPH AVE	
236	1619	3239 BRUCE RANDOLPH AVE	
237	1489	3300 BRUCE RANDOLPH AVE	
238	1431	3330 BRUCE RANDOLPH AVE	
239		3340 BRUCE RANDOLPH AVE	
240		3400 BRUCE RANDOLPH AVE	
241	1487	3422 BRUCE RANDOLPH AVE	
242	1518	3500 BRUCE RANDOLPH AVE	
243	1519	3508 BRUCE RANDOLPH AVE	
244	1579	3515 BRUCE RANDOLPH AVE	
245	1462	3576 BRUCE RANDOLPH AVE	
246	1516	3634 BRUCE RANDOLPH AVE	
247	1526	3635 BRUCE RANDOLPH AVE	
248		3870 BRUCE RANDOLPH AVE	
249	2433	4471 CAHITA CT	
250		4333 CHEROKEE ST	
251		4352 CHEROKEE ST	
252	2421	4353 CHEROKEE ST	
253		4400 CHEROKEE ST	
254		4401 CHEROKEE ST	
255	2442	4411 CHEROKEE ST	
256		4422 CHEROKEE ST	
257	2444	4431 CHEROKEE ST	
258		4439 CHEROKEE ST	
259	2445	4445 CHEROKEE ST	
260		4450 CHEROKEE ST	
261		4456 CHEROKEE ST	
262	2446	4459 CHEROKEE ST	
263	2434	4464 CHEROKEE ST	
264		4467 CHEROKEE ST	
265	2427	4470 CHEROKEE ST	
266		4347 CLAUDE CT	
267		4601 CLAUDE CT APPRX	
268	2327	4635 CLAUDE CT	
269		4700 CLAUDE CT	
270	2401	4764 CLAUDE CT	
271	3609	4784 CLAUDE CT	
272		3201 CLAYTON ST	
273	957	3210 CLAYTON ST	
274	942	3211 CLAYTON ST	
275	943	3217 CLAYTON ST	
276	955	3220 CLAYTON ST	
277	954	3226 CLAYTON ST	
278	953	3232 CLAYTON ST	
279	952	3238 CLAYTON ST	
280	949	3256 CLAYTON ST	

Number	Property ID	Address	Unit
281		3318 CLAYTON ST	
282		3331 CLAYTON ST	
283		3356 CLAYTON ST	
284	1149	3448 CLAYTON ST	
285	1251	3524 CLAYTON ST	
286	1271	3529 CLAYTON ST	
287	1249	3542 CLAYTON ST	
288		3601 CLAYTON ST APPRX	
289	1360	3613 CLAYTON ST	
290	1318	3620 CLAYTON ST	
291	1307	3633 CLAYTON ST	
292	1308	3639 CLAYTON ST	
293	1309	3645 CLAYTON ST	
294	1315	3646 CLAYTON ST	
295		3657 CLAYTON ST	
296	1997	4020 CLAYTON ST	
297	1998	4026 CLAYTON ST	
298	2019	4100 CLAYTON ST	
299	2018	4158 CLAYTON ST	
300	2037	4238 CLAYTON ST	
301	2065	4316 CLAYTON ST	
302	2086	4320 CLAYTON ST	
303	2070	4353 CLAYTON ST	
304		4368 CLAYTON ST	
305		4501 CLAYTON ST	
306	2149	4511 CLAYTON ST	
307	2150	4529 CLAYTON ST	
308	2147	4538 CLAYTON ST	
309	2151	4539 CLAYTON ST	
310	3156	4543 CLAYTON ST	
311	2142	4550 CLAYTON ST	
312	2176	4611 CLAYTON ST	
313	2224	4736 CLAYTON ST	
314	2492	4800 CLAYTON ST	
315	3711	4815 CLAYTON ST	
316	1935	3821 COLORADO BLVD	
317	1916	3871 COLORADO BLVD	
318	1915	3895 COLORADO BLVD	
319	1917	3901 COLORADO BLVD	
320	1914	3931 COLORADO BLVD	
321	990	3229 COLUMBINE ST	
322	992	3241 COLUMBINE ST	
323	1063	3306 COLUMBINE ST	
324		3315 COLUMBINE ST	
325	1062	3316 COLUMBINE ST	
326	1075	3330 COLUMBINE ST	
327	1014	3335 COLUMBINE ST	
328	1056	3338 COLUMBINE ST	
329		3401 COLUMBINE ST	
330	1198	3407 COLUMBINE ST	
331	1147	3414 COLUMBINE ST	
332		3440 COLUMBINE ST	
333	1228	3501 COLUMBINE ST	
334	1229	3513 COLUMBINE ST	
335	1213	3528 COLUMBINE ST	
336	1226	3533 COLUMBINE ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
337	1225	3541 COLUMBINE ST	
338		3601 COLUMBINE ST	# A
339		3632 COLUMBINE ST	
340		3634 COLUMBINE ST	
341		3636 COLUMBINE ST	
342		3638 COLUMBINE ST	
343		3640 COLUMBINE ST	
344		3660 COLUMBINE ST	
345		3662 COLUMBINE ST	
346		3664 COLUMBINE ST	
347		3666 COLUMBINE ST	
348		4215 COLUMBINE ST	
349		4323 COLUMBINE ST	
350	2059	4343 COLUMBINE ST	
351		4348 COLUMBINE ST	
352		4350 COLUMBINE ST	
353		4352 COLUMBINE ST	
354		4353 COLUMBINE ST	
355		4354 COLUMBINE ST	
356		4400 COLUMBINE ST	
357	2118	4411 COLUMBINE ST	
358	2117	4415 COLUMBINE ST	
359	2116	4419 COLUMBINE ST	
360	2115	4425 COLUMBINE ST	
361	2130	4511 COLUMBINE ST	
362		4601 COLUMBINE ST	
363	2155	4611 COLUMBINE ST	
364	2172	4621 COLUMBINE ST	
365	3931	4650 COLUMBINE ST	
366	2168	4653 COLUMBINE ST	
367	2169	4657 COLUMBINE ST	
368		4683 COLUMBINE ST	
369	2203	4760 COLUMBINE ST	
370	1472	3212 COOK ST	
371	1471	3220 COOK ST	
372	1430	3251 COOK ST	
373	1468	3280 COOK ST	
374	1423	3297 COOK ST	
375	1488	3300 COOK ST	
376	1465	3334 COOK ST	
377	1561	3433 COOK ST	
378	1562	3449 COOK ST	
379	3936	3500 COOK ST	
380	1684	3501 COOK ST	
381	1685	3511 COOK ST	
382		3601 COOK ST APPRX	
383	1828	3718 COOK ST	
384	1783	3745 COOK ST	
385	3926	3800 COOK ST	
386	1907	3821 COOK ST	
387	1896	3832 COOK ST	
388	1908	3833 COOK ST	
389	1909	3837 COOK ST	
390	1895	3838 COOK ST	
391	1911	3865 COOK ST	
392	1878	3875 COOK ST	

Number	Property ID	Address	Unit
393	1901	3894 COOK ST	
394		3901 COOK ST	
395	2906	3909 COOK ST	
396	2907	3925 COOK ST	
397	1954	3985 COOK ST	
398		4008 COOK ST	
399		4015 COOK ST	
400		4311 COOK ST	
401		4315 COOK ST	
402		4327 COOK ST	
403		4329 COOK ST	
404		4337 COOK ST	
405	2251	4420 COOK ST	
406	2244	4425 COOK ST	
407	2247	4445 COOK ST	
408		4447 COOK ST	
409	2249	4448 COOK ST	
410	2413	4217 DELAWARE ST	
411	2415	4235 DELAWARE ST	
412	2423	4324 DELAWARE ST	
413	2419	4330 DELAWARE ST	
414		4332 DELAWARE ST	
415		4338 DELAWARE ST	
416	2418	4348 DELAWARE ST	
417	2441	4414 DELAWARE ST	
418		4436 DELAWARE ST	
419	2440	4460 DELAWARE ST	
420	2439	4466 DELAWARE ST	
421	2437	4480 DELAWARE ST	
422	2435	4494 DELAWARE ST	
423		3501 DELGANY ST	
424		3533 DELGANY ST	
425		3600 DELGANY ST	
426	9	3639 DELGANY ST	
427	18	3712 DELGANY ST	
428		3728 DELGANY ST	
429	16	3756 DELGANY ST	
430		3400 DOWNING ST	
431		3412 DOWNING ST	
432		3416 DOWNING ST	
433		3420 DOWNING ST	
434		3426 DOWNING ST	
435		3430 DOWNING ST	
436		3432 DOWNING ST	
437	50	3436 DOWNING ST	
438		3438 DOWNING ST	
439		3450 DOWNING ST	
440		3454 DOWNING ST	
441		3456 DOWNING ST	
442		3724 DOWNING ST	
443		3730 DOWNING ST	
444		3732 DOWNING ST	
445		3738 DOWNING ST	
446		3740 DOWNING ST	
447		3200 ELIZABETH ST	
448	939	3222 ELIZABETH ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
449	938	3230 ELIZABETH ST	
450	1007	3231 ELIZABETH ST	
451	1008	3235 ELIZABETH ST	
452	940	3240 ELIZABETH ST	
453	937	3246 ELIZABETH ST	
454		3250 ELIZABETH ST	
455		3254 ELIZABETH ST	
456		3258 ELIZABETH ST	
457	1047	3310 ELIZABETH ST	
458	1065	3311 ELIZABETH ST	
459	1066	3315 ELIZABETH ST	
460		3322 ELIZABETH ST	
461	1103	3324 ELIZABETH ST	
462	1102	3328 ELIZABETH ST	
463	1069	3333 ELIZABETH ST	
464		3401 ELIZABETH ST APPRX	
465	1145	3449 ELIZABETH ST	
466	1146	3455 ELIZABETH ST	
467	1215	3501 ELIZABETH ST	
468	1268	3510 ELIZABETH ST	
469	1267	3514 ELIZABETH ST	
470	1220	3545 ELIZABETH ST	
471		3563 ELIZABETH ST	
472	1356	3601 ELIZABETH ST	
473		3627 ELIZABETH ST	
474		3629 ELIZABETH ST	
475	1314	3630 ELIZABETH ST	
476		3631 ELIZABETH ST	
477		3633 ELIZABETH ST	
478		3635 ELIZABETH ST	
479	1312	3638 ELIZABETH ST	
480		3675 ELIZABETH ST	
481		3677 ELIZABETH ST	
482		3679 ELIZABETH ST	
483		3681 ELIZABETH ST	
484		3683 ELIZABETH ST	
485		3685 ELIZABETH ST	
486	4027	4301 ELIZABETH ST	
487	2073	4316 ELIZABETH ST	
488	2075	4320 ELIZABETH ST	
489	2071	4336 ELIZABETH ST	
490	3019	4344 ELIZABETH ST	
491	2127	4410 ELIZABETH ST	
492	2126	4424 ELIZABETH ST	
493	3114	4431 ELIZABETH ST	
494	2125	4442 ELIZABETH ST	
495	2124	4452 ELIZABETH ST	
496	2198	4700 ELIZABETH ST	
497	922	3208 FILLMORE ST	
498	919	3224 FILLMORE ST	
499	971	3240 FILLMORE ST	
500	969	3258 FILLMORE ST	
501	1085	3308 FILLMORE ST	
502		3319 FILLMORE ST	
503	1084	3320 FILLMORE ST	
504		3342 FILLMORE ST	

Number	Property ID	Address	Unit
505		3350 FILLMORE ST	
506	1155	3419 FILLMORE ST	
507	1165	3432 FILLMORE ST	
508	1158	3439 FILLMORE ST	
509	1159	3449 FILLMORE ST	
510	1163	3458 FILLMORE ST	
511	1256	3545 FILLMORE ST	
512	1258	3559 FILLMORE ST	
513	1333	3600 FILLMORE ST	
514	1328	3610 FILLMORE ST	
515	1327	3620 FILLMORE ST	
516		3657 FILLMORE ST	
517	1375	3706 FILLMORE ST	
518	1384	3717 FILLMORE ST	
519	1385	3737 FILLMORE ST	
520	1387	3745 FILLMORE ST	
521	1372	3746 FILLMORE ST	
522	1388	3749 FILLMORE ST	
523		4001 FILLMORE ST	
524	2010	4020 FILLMORE ST	
525	2015	4135 FILLMORE ST	
526	2022	4140 FILLMORE ST	
527	2016	4151 FILLMORE ST	
528	2020	4162 FILLMORE ST	
529		4238 FILLMORE ST	
530		4240 FILLMORE ST	
531		4245 FILLMORE ST	
532		4247 FILLMORE ST	
533	2051	4248 FILLMORE ST	
534	2050	4250 FILLMORE ST	
535	2078	4300 FILLMORE ST	
536	2079	4352 FILLMORE ST	
537	2107	4431 FILLMORE ST	
538	2105	4461 FILLMORE ST	
539	2166	4500 FILLMORE ST	
540		4501 FILLMORE ST	
541	2143	4525 FILLMORE ST	
542	2146	4541 FILLMORE ST	
543	2163	4542 FILLMORE ST	
544	2161	4665 FILLMORE ST	
545	2210	4700 FILLMORE ST	
546	2207	4780 FILLMORE ST	
547	3286	4790 FILLMORE ST	
548	2485	4850 FILLMORE ST	
549	2590	4900 FILLMORE ST	
550	2583	4901 FILLMORE ST	
551	2589	4908 FILLMORE ST	
552	2584	4911 FILLMORE ST	
553	2585	4915 FILLMORE ST	
554	3861	4916 FILLMORE ST	
555	2587	4920 FILLMORE ST	
556	2563	4964 FILLMORE ST	
557	2573	4969 FILLMORE ST	
558	2566	4976 FILLMORE ST	
559		5001 FILLMORE ST APPRX	
560	2532	5016 FILLMORE ST	

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
561	2541	5050 FILLMORE ST	
562	2540	5056 FILLMORE ST	
563		5086 FILLMORE ST	
564		5100 FILLMORE ST	
565		5101 FILLMORE ST	
566		5163 FILLMORE ST	
567		5187 FILLMORE ST	
568		3930 FOX ST	
569		3936 FOX ST	
570		3950 FOX ST	
571		4000 FOX ST	
572		4040 FOX ST	
573	2408	4046 FOX ST	
574		4058 FOX ST	
575	2417	4104 FOX ST	
576	121	3210 FRANKLIN ST	
577	120	3214 FRANKLIN ST	
578	119	3220 FRANKLIN ST	
579	118	3230 FRANKLIN ST	
580		3232 FRANKLIN ST	
581	126	3246 FRANKLIN ST	
582	116	3254 FRANKLIN ST	
583	133	3314 FRANKLIN ST	
584		3330 FRANKLIN ST	
585	130	3336 FRANKLIN ST	
586	129	3340 FRANKLIN ST	
587	190	3344 FRANKLIN ST	
588		3350 FRANKLIN ST	
589		3400 FRANKLIN ST	
590		3401 FRANKLIN ST	
591		3407 FRANKLIN ST	
592		3411 FRANKLIN ST	
593		3415 FRANKLIN ST	
594	229	3416 FRANKLIN ST	
595		3420 FRANKLIN ST	
596	271	3423 FRANKLIN ST	
597	273	3431 FRANKLIN ST	
598	274	3435 FRANKLIN ST	
599	276	3447 FRANKLIN ST	
600	240	3450 FRANKLIN ST	
601	226	3454 FRANKLIN ST	
602	371	3517 FRANKLIN ST	
603	2629	3620 FRANKLIN ST	
604	455	3625 FRANKLIN ST	
605		3700 FRANKLIN ST	
606	546	3701 FRANKLIN ST	
607	548	3711 FRANKLIN ST	
608	549	3713 FRANKLIN ST	
609		3720 FRANKLIN ST	
610		3730 FRANKLIN ST	
611	496	3753 FRANKLIN ST	
612		3775 FRANKLIN ST	
613		3799 FRANKLIN ST	
614		3800 FRANKLIN ST	
615		3801 FRANKLIN ST	
616		3815 FRANKLIN ST	
617		3818 FRANKLIN ST	
618		3821 FRANKLIN ST	
619	2313	3823 FRANKLIN ST	
620		3827 FRANKLIN ST	
621	2302	3844 FRANKLIN ST	
622		3890 FRANKLIN ST	
623		4600 FRANKLIN ST	
624	3505	4610 FRANKLIN ST	
625	3457	4619 FRANKLIN ST	
626	3458	4631 FRANKLIN ST	
627	3504	4632 FRANKLIN ST	
628	3503	4638 FRANKLIN ST	
629	2318	4671 FRANKLIN ST	
630		4679 FRANKLIN ST	
631		4693 FRANKLIN ST	
632		3333 GARFIELD ST	
633	1507	3358 GARFIELD ST	
634		3400 GARFIELD ST APPRX	
635		3401 GARFIELD ST APPRX	
636		3431 GARFIELD ST	
637	1533	3434 GARFIELD ST	
638	1525	3435 GARFIELD ST	
639	1532	3440 GARFIELD ST	
640	1710	3510 GARFIELD ST	
641	1709	3516 GARFIELD ST	
642	1672	3551 GARFIELD ST	
643	1730	3600 GARFIELD ST	
644	1729	3608 GARFIELD ST	
645	1720	3617 GARFIELD ST	
646	2804	3625 GARFIELD ST	
647	1725	3658 GARFIELD ST	
648	1867	3700 GARFIELD ST	
649		3701 GARFIELD ST APPRX	
650	1866	3710 GARFIELD ST	
651		3715 GARFIELD ST	
652	1865	3720 GARFIELD ST	
653	1975	4100 GARFIELD ST	
654		4114 GARFIELD ST	
655	1973	4115 GARFIELD ST	
656		4118 GARFIELD ST	
657		4125 GARFIELD ST	
658		4134 GARFIELD ST	
659		4185 GARFIELD ST	
660		4190 GARFIELD ST	
661	606	3200 GAYLORD ST	
662	595	3214 GAYLORD ST	
663	581	3217 GAYLORD ST	
664	585	3241 GAYLORD ST	
665	588	3255 GAYLORD ST	
666	722	3309 GAYLORD ST	
667	701	3322 GAYLORD ST	
668	699	3334 GAYLORD ST	
669	698	3340 GAYLORD ST	
670	654	3345 GAYLORD ST	
671	761	3438 GAYLORD ST	
672	756	3451 GAYLORD ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
673	758	3458 GAYLORD ST	
674		3501 GAYLORD ST	
675	804	3511 GAYLORD ST	
676	805	3515 GAYLORD ST	
677	849	3526 GAYLORD ST	
678	806	3527 GAYLORD ST	
679	810	3553 GAYLORD ST	
680	845	3556 GAYLORD ST	
681	833	3626 GAYLORD ST	
682	832	3646 GAYLORD ST	
683		3650 GAYLORD ST	
684	4030	3700 GAYLORD ST	# 4
685	889	3713 GAYLORD ST	
686		4300 GAYLORD ST	
687	3460	4334 GAYLORD ST	
688	2322	4344 GAYLORD ST	
689		4346 GAYLORD ST	
690	2399	4719 GAYLORD ST	
691	84	3200 GILPIN ST	
692		3201 GILPIN ST	
693	72	3224 GILPIN ST	
694	71	3228 GILPIN ST	
695	68	3242 GILPIN ST	
696	128	3249 GILPIN ST	
697	182	3302 GILPIN ST	
698		3315 GILPIN ST	
699	178	3318 GILPIN ST	
700	148	3325 GILPIN ST	
701	173	3338 GILPIN ST	
702	172	3342 GILPIN ST	
703		3358 GILPIN ST	
704	230	3405 GILPIN ST	
705		3413 GILPIN ST	
706		3437 GILPIN ST	
707		3441 GILPIN ST	
708	235	3445 GILPIN ST	
709		3456 GILPIN ST	
710		3508 GILPIN ST	
711	398	3512 GILPIN ST	
712	459	3614 GILPIN ST	
713	411	3628 GILPIN ST	
714		3700 GILPIN ST	
715		3701 GILPIN ST	
716		3704 GILPIN ST	
717	527	3717 GILPIN ST	
718		3724 GILPIN ST	
719		3726 GILPIN ST	
720	529	3727 GILPIN ST	
721	532	3737 GILPIN ST	
722	563	3744 GILPIN ST	
723	533	3747 GILPIN ST	
724	560	3756 GILPIN ST	
725	2276	3760 GILPIN ST	
726	2257	3769 GILPIN ST	
727	2259	3783 GILPIN ST	
728	2286	3806 GILPIN ST	
729	3435	3823 GILPIN ST	
730	3436	3827 GILPIN ST	
731	2304	3831 GILPIN ST	
732		3891 GILPIN ST	
733		3897 GILPIN ST	
734		3898 GILPIN ST	
735	1502	3328 HARRISON ST	
736	1500	3338 HARRISON ST	
737		3401 HARRISON ST APPRX	
738	1553	3434 HARRISON ST	
739	1550	3445 HARRISON ST	
740	2798	3500 HARRISON ST	
741	1698	3525 HARRISON ST	
742	1700	3541 HARRISON ST	
743	1701	3549 HARRISON ST	
744	1688	3556 HARRISON ST	
745	1702	3557 HARRISON ST	
746	1740	3601 HARRISON ST	
747	1744	3645 HARRISON ST	
748	1921	3871 HARRISON ST	
749	1932	3905 HARRISON ST	
750	2890	3931 HARRISON ST	
751	2891	3941 HARRISON ST	
752	2892	3961 HARRISON ST	
753	1933	3981 HARRISON ST	
754	2894	3991 HARRISON ST	
755	97	3201 HIGH ST	
756		3212 HIGH ST	
757		3216 HIGH ST	
758	54	3237 HIGH ST	
759	55	3241 HIGH ST	
760	622	3244 HIGH ST	
761	56	3245 HIGH ST	
762	623	3246 HIGH ST	
763	687	3316 HIGH ST	
764		3354 HIGH ST	
765	168	3359 HIGH ST	
766		3400 HIGH ST	
767		3401 HIGH ST	
768		3416 HIGH ST	
769	795	3420 HIGH ST	
770	208	3423 HIGH ST	
771		3424 HIGH ST	
772	791	3432 HIGH ST	
773	209	3433 HIGH ST	
774		3434 HIGH ST	
775		3436 HIGH ST	
776		3438 HIGH ST	
777	210	3441 HIGH ST	
778		3501 HIGH ST	
779		3504 HIGH ST	
780		3524 HIGH ST	
781	774	3562 HIGH ST	
782		3600 HIGH ST	
783	869	3618 HIGH ST	
784	422	3623 HIGH ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
785	871	3642 HIGH ST	
786	424	3649 HIGH ST	
787	426	3653 HIGH ST	
788		3657 HIGH ST	
789	614	3701 HIGH ST	
790	861	3710 HIGH ST	
791	860	3724 HIGH ST	
792	914	3732 HIGH ST	
793	556	3743 HIGH ST	
794		3746 HIGH ST	
795	554	3747 HIGH ST	
796	859	3752 HIGH ST	
797	3399	3762 HIGH ST	
798	2266	3763 HIGH ST	
799	2265	3768 HIGH ST	
800	2264	3778 HIGH ST	
801		3784 HIGH ST	
802	2263	3788 HIGH ST	
803		3800 HIGH ST	
804		3801 HIGH ST	
805	2262	3842 HIGH ST	
806	2293	3849 HIGH ST	
807		3852 HIGH ST	
808		3858 HIGH ST	
809		3900 HIGH ST	
810		3901 HIGH ST	
811	2311	3910 HIGH ST	
812	2310	3914 HIGH ST	
813		3915 HIGH ST	
814	2298	3923 HIGH ST	
815		3926 HIGH ST	
816		3944 HIGH ST	
817		3948 HIGH ST	
818		3955 HIGH ST	
819		3960 HIGH ST	
820		3965 HIGH ST	
821	2308	3974 HIGH ST	
822		3995 HIGH ST	
823		4600 HIGH ST APPRX	
824	3497	4615 HIGH ST	
825		4626 HIGH ST	
826		4632 HIGH ST	
827	2350	4675 HIGH ST	
828	2351	4677 HIGH ST	
829	2339	4678 HIGH ST	
830	2352	4685 HIGH ST	
831		4725 HIGH ST	
832	3928	3240 HUMBOLDT ST	
833		3301 HUMBOLDT ST	
834		3307 HUMBOLDT ST	
835		3311 HUMBOLDT ST	
836	101	3315 HUMBOLDT ST	
837	103	3325 HUMBOLDT ST	
838	104	3331 HUMBOLDT ST	
839	105	3339 HUMBOLDT ST	
840		3400 HUMBOLDT ST	
841		3401 HUMBOLDT ST	
842	314	3415 HUMBOLDT ST	
843	267	3422 HUMBOLDT ST	
844	263	3438 HUMBOLDT ST	
845	261	3440 HUMBOLDT ST	
846	260	3444 HUMBOLDT ST	
847		3456 HUMBOLDT ST	
848		3500 HUMBOLDT ST	
849		3506 HUMBOLDT ST	
850		3554 HUMBOLDT ST	
851		3601 HUMBOLDT ST	
852		3621 HUMBOLDT ST	
853		3627 HUMBOLDT ST	
854	440	3628 HUMBOLDT ST	
855	439	3638 HUMBOLDT ST	
856		3663 HUMBOLDT ST	
857	545	3700 HUMBOLDT ST	
858		3701 HUMBOLDT ST	
859	540	3726 HUMBOLDT ST	
860	539	3730 HUMBOLDT ST	
861		3750 HUMBOLDT ST	
862		3780 HUMBOLDT ST	
863		3801 HUMBOLDT ST	
864	2317	3850 HUMBOLDT ST	
865	2312	3915 HUMBOLDT ST	
866	2316	3926 HUMBOLDT ST	
867		3936 HUMBOLDT ST	
868		3939 HUMBOLDT ST	
869		3940 HUMBOLDT ST	
870	2315	3961 HUMBOLDT ST	
871	1504	3338 JACKSON ST	
872	1508	3345 JACKSON ST	
873	1510	3353 JACKSON ST	
874	1540	3421 JACKSON ST	
875	1543	3430 JACKSON ST	
876	2799	3530 JACKSON ST	
877	1739	3600 JACKSON ST	
878	1738	3612 JACKSON ST	
879	1733	3647 JACKSON ST	
880	1735	3658 JACKSON ST	
881	1847	3700 JACKSON ST	
882	1857	3701 JACKSON ST	
883	1859	3705 JACKSON ST	
884	2829	3735 JACKSON ST	
885	1853	3746 JACKSON ST	
886	1920	3810 JACKSON ST	
887	1919	3840 JACKSON ST	
888	1918	3850 JACKSON ST	
889	1927	3998 JACKSON ST	
890		4001 JACKSON ST	
891		4095 JACKSON ST	
892		4105 JACKSON ST	
893	1974	4135 JACKSON ST	
894		4137 JACKSON ST	
895		4149 JACKSON ST	
896	985	3200 JOSEPHINE ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
897	1040	3205 JOSEPHINE ST	
898	1041	3211 JOSEPHINE ST	
899	1042	3215 JOSEPHINE ST	
900	1044	3229 JOSEPHINE ST	
901	1045	3237 JOSEPHINE ST	
902	978	3246 JOSEPHINE ST	
903	976	3260 JOSEPHINE ST	
904		3300 JOSEPHINE ST	
905	1023	3311 JOSEPHINE ST	
906	1024	3315 JOSEPHINE ST	
907	1026	3329 JOSEPHINE ST	
908		3332 JOSEPHINE ST	
909	1030	3353 JOSEPHINE ST	
910	1076	3354 JOSEPHINE ST	
911	1196	3406 JOSEPHINE ST	
912		3415 JOSEPHINE ST	
913	1181	3421 JOSEPHINE ST	
914	1194	3422 JOSEPHINE ST	
915	1182	3425 JOSEPHINE ST	
916		3501 JOSEPHINE ST APPRX	
917	1235	3509 JOSEPHINE ST	
918		3520 JOSEPHINE ST	
919	1238	3535 JOSEPHINE ST	
920		3600 JOSEPHINE ST	
921	1353	3608 JOSEPHINE ST	
922	1352	3624 JOSEPHINE ST	
923	1349	3641 JOSEPHINE ST	
924	2044	4228 JOSEPHINE ST	
925	2042	4236 JOSEPHINE ST	
926		4300 JOSEPHINE ST	
927	2055	4316 JOSEPHINE ST	
928		4319 JOSEPHINE ST	
929	2062	4329 JOSEPHINE ST	
930	2063	4349 JOSEPHINE ST	
931		4357 JOSEPHINE ST	
932		4401 JOSEPHINE ST	
933	2114	4412 JOSEPHINE ST	
934	2133	4425 JOSEPHINE ST	
935	2134	4437 JOSEPHINE ST	
936	2135	4443 JOSEPHINE ST	
937		4501 JOSEPHINE ST	
938	2128	4502 JOSEPHINE ST	
939		4600 JOSEPHINE ST APPRX	
940	2156	4608 JOSEPHINE ST	
941	2183	4628 JOSEPHINE ST	
942		4631 JOSEPHINE ST	
943	3205	4701 JOSEPHINE ST	
944	2189	4716 JOSEPHINE ST	
945	113	3323 LAFAYETTE ST	
946	155	3326 LAFAYETTE ST	
947	114	3327 LAFAYETTE ST	
948	112	3331 LAFAYETTE ST	
949	151	3344 LAFAYETTE ST	
950	149	3350 LAFAYETTE ST	# A
951	149	3350 LAFAYETTE ST	# B
952		3351 LAFAYETTE ST	

Number	Property ID	Address	Unit
953		3405 LAFAYETTE ST	
954	310	3418 LAFAYETTE ST	
955	296	3431 LAFAYETTE ST	
956		3433 LAFAYETTE ST	
957	305	3440 LAFAYETTE ST	
958	304	3442 LAFAYETTE ST	
959	3937	3536 LAFAYETTE ST	
960		3539 LAFAYETTE ST	
961		3600 LAFAYETTE ST	
962	2625	3636 LAFAYETTE ST	
963	432	3646 LAFAYETTE ST	
964	492	3656 LAFAYETTE ST	
965	488	3676 LAFAYETTE ST	
966	487	3686 LAFAYETTE ST	
967	504	3700 LAFAYETTE ST	
968	517	3715 LAFAYETTE ST	
969	518	3721 LAFAYETTE ST	
970	521	3737 LAFAYETTE ST	
971	498	3738 LAFAYETTE ST	
972		3742 LAFAYETTE ST	
973		3745 LAFAYETTE ST	
974	2640	3777 LAFAYETTE ST	
975	1416	3206 MADISON ST	
976		3233 MADISON ST	
977	1417	3238 MADISON ST	
978	1478	3257 MADISON ST	
979	1480	3301 MADISON ST	
980	1481	3311 MADISON ST	
981	1520	3334 MADISON ST	
982	1482	3335 MADISON ST	
983	1577	3433 MADISON ST	
984		3440 MADISON ST	
985	1578	3443 MADISON ST	
986		3444 MADISON ST	
987		3500 MADISON ST APPRX	
988	1675	3510 MADISON ST	
989	1681	3534 MADISON ST	
990	2811	3604 MADISON ST	
991	1771	3626 MADISON ST	
992	1762	3635 MADISON ST	
993	1770	3636 MADISON ST	
994	1769	3642 MADISON ST	
995	1816	3700 MADISON ST	
996	1825	3730 MADISON ST	
997	1815	3750 MADISON ST	
998		3801 MADISON ST	
999	1897	3811 MADISON ST	
1,000	1899	3835 MADISON ST	
1,001		4001 MADISON ST	
1,002	1959	4030 MADISON ST	
1,003	2940	4111 MADISON ST	
1,004		4120 MADISON ST	
1,005	1989	4129 MADISON ST	
1,006	1991	4161 MADISON ST	
1,007		4190 MADISON ST	
1,008		3201 MARION ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
1,009		3241 MARION ST	
1,010	111	3314 MARION ST	
1,011	110	3318 MARION ST	
1,012	109	3326 MARION ST	
1,013	108	3330 MARION ST	
1,014		3342 MARION ST	
1,015		3400 MARION ST	
1,016		3401 MARION ST	
1,017	42	3419 MARION ST	
1,018	302	3420 MARION ST	
1,019	46	3437 MARION ST	
1,020		3447 MARION ST	
1,021	49	3457 MARION ST	
1,022	337	3500 MARION ST	
1,023	2639	3503 MARION ST	
1,024		3514 MARION ST	
1,025	62	3521 MARION ST	
1,026	63	3527 MARION ST	
1,027	332	3532 MARION ST	
1,028	64	3537 MARION ST	
1,029	65	3541 MARION ST	
1,030	66	3551 MARION ST	
1,031		3555 MARION ST	
1,032	469	3606 MARION ST	
1,033		3614 MARION ST	
1,034		3622 MARION ST	
1,035		3628 MARION ST	
1,036		3652 MARION ST	
1,037	513	3700 MARION ST	
1,038		3701 MARION ST	
1,039	512	3714 MARION ST	
1,040	2	3717 MARION ST	
1,041		3722 MARION ST	
1,042	2692	3732 MARION ST	
1,043	5	3735 MARION ST	
1,044	508	3750 MARION ST	
1,045	28	1225 MARTIN LUTHER KING BLVD	
1,046		1625 MARTIN LUTHER KING BLVD	
1,047		1631 MARTIN LUTHER KING BLVD	
1,048		1721 MARTIN LUTHER KING BLVD	
1,049	95	1813 MARTIN LUTHER KING BLVD	
1,050		1819 MARTIN LUTHER KING BLVD	
1,051	941	2627 MARTIN LUTHER KING BLVD	
1,052	923	2935 MARTIN LUTHER KING BLVD	
1,053	1476	3455 MARTIN LUTHER KING BLVD	
1,054	2628	3605 MARTIN LUTHER KING BLVD	
1,055	4046	6335 MARTIN LUTHER KING BLVD	
1,056	933	3236 MILWAUKEE ST	
1,057		3252 MILWAUKEE ST	
1,058	1132	3300 MILWAUKEE ST	
1,059		3301 MILWAUKEE ST	
1,060	1129	3328 MILWAUKEE ST	
1,061	1128	3334 MILWAUKEE ST	
1,062	1124	3358 MILWAUKEE ST	
1,063		3400 MILWAUKEE ST	
1,064	1122	3414 MILWAUKEE ST	
1,065	1112	3428 MILWAUKEE ST	
1,066	1104	3435 MILWAUKEE ST	
1,067	1105	3437 MILWAUKEE ST	
1,068	1110	3450 MILWAUKEE ST	
1,069	1107	3454 MILWAUKEE ST	
1,070	1293	3510 MILWAUKEE ST	
1,071	1292	3520 MILWAUKEE ST	
1,072	1291	3530 MILWAUKEE ST	
1,073		3601 MILWAUKEE ST	
1,074	1274	3611 MILWAUKEE ST	
1,075	1281	3612 MILWAUKEE ST	
1,076	1419	3736 MILWAUKEE ST	
1,077	1380	3745 MILWAUKEE ST	
1,078	1368	3750 MILWAUKEE ST	
1,079	1367	3758 MILWAUKEE ST	
1,080		4000 MILWAUKEE ST	
1,081	2011	4019 MILWAUKEE ST	
1,082	2032	4132 MILWAUKEE ST	
1,083	2024	4137 MILWAUKEE ST	
1,084	2031	4142 MILWAUKEE ST	
1,085	2026	4162 MILWAUKEE ST	
1,086		4244 MILWAUKEE ST	
1,087		4300 MILWAUKEE ST	
1,088	2076	4344 MILWAUKEE ST	
1,089	2085	4365 MILWAUKEE ST	
1,090	2108	4401 MILWAUKEE ST	
1,091	2092	4408 MILWAUKEE ST	
1,092	2109	4415 MILWAUKEE ST	
1,093	2091	4434 MILWAUKEE ST	
1,094	2140	4501 MILWAUKEE ST	
1,095		4525 MILWAUKEE ST	
1,096	2221	4735 MILWAUKEE ST	
1,097	2219	4740 MILWAUKEE ST	
1,098		4800 MILWAUKEE ST	
1,099	3697	4801 MILWAUKEE ST	
1,100	2489	4845 MILWAUKEE ST	
1,101	2592	4916 MILWAUKEE ST	
1,102	2591	4917 MILWAUKEE ST	
1,103	2558	4956 MILWAUKEE ST	
1,104	2562	4971 MILWAUKEE ST	
1,105	2539	5071 MILWAUKEE ST	
1,106	2537	5085 MILWAUKEE ST	
1,107	2523	5123 MILWAUKEE ST	
1,108	2524	5151 MILWAUKEE ST	
1,109		5171 MILWAUKEE ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
1,110		3400 MONROE ST APPRX	
1,111	1585	3449 MONROE ST	
1,112	1664	3502 MONROE ST	
1,113	1663	3512 MONROE ST	
1,114	1679	3527 MONROE ST	
1,115	1682	3541 MONROE ST	
1,116	1660	3542 MONROE ST	
1,117	1659	3552 MONROE ST	
1,118	1779	3621 MONROE ST	
1,119	1774	3625 MONROE ST	
1,120	1781	3630 MONROE ST	
1,121	1819	3715 MONROE ST	
1,122	1876	3720 MONROE ST	
1,123	1821	3745 MONROE ST	
1,124	1874	3750 MONROE ST	
1,125		4100 MONROE ST	
1,126	1972	4110 MONROE ST	
1,127		4170 MONROE ST	
1,128	619	3211 RACE ST	
1,129	616	3227 RACE ST	
1,130	631	3232 RACE ST	
1,131	629	3260 RACE ST	
1,132	666	3306 RACE ST	
1,133	665	3312 RACE ST	
1,134	664	3318 RACE ST	
1,135	660	3344 RACE ST	
1,136		3400 RACE ST	
1,137	784	3401 RACE ST	
1,138	781	3433 RACE ST	
1,139	797	3444 RACE ST	
1,140	778	3451 RACE ST	
1,141	777	3459 RACE ST	
1,142	770	3511 RACE ST	
1,143	816	3516 RACE ST	
1,144	2707	3531 RACE ST	
1,145	767	3535 RACE ST	
1,146	813	3544 RACE ST	
1,147	2717	3545 RACE ST	
1,148	825	3553 RACE ST	
1,149	874	3601 RACE ST	
1,150	883	3610 RACE ST	
1,151	2726	3621 RACE ST	
1,152	864	3633 RACE ST	
1,153	863	3639 RACE ST	
1,154	878	3660 RACE ST	
1,155	877	3670 RACE ST	
1,156	903	3700 RACE ST	
1,157	910	3701 RACE ST	
1,158	897	3710 RACE ST	
1,159	896	3718 RACE ST	
1,160	907	3737 RACE ST	
1,161	904	3740 RACE ST	
1,162		3748 RACE ST	
1,163		4301 RACE ST	
1,164		4320 RACE ST	
1,165		4321 RACE ST	

Number	Property ID	Address	Unit
1,166		4335 RACE ST	
1,167	3462	4339 RACE ST	
1,168		4350 RACE ST	
1,169	3480	4601 RACE ST	
1,170	2337	4617 RACE ST	
1,171		4625 RACE ST	
1,172	2340	4632 RACE ST	
1,173		4633 RACE ST	
1,174		4657 RACE ST	
1,175		4666 RACE ST	
1,176	2338	4681 RACE ST	
1,177		4683 RACE ST	
1,178		4685 RACE ST	
1,179	2390	4700 RACE ST	
1,180	3932	4801 RACE ST	
1,181	2450	4900 RACE ST	
1,182	930	3213 SAINT PAUL ST	
1,183	929	3223 SAINT PAUL ST	
1,184	1406	3230 SAINT PAUL ST	
1,185		3261 SAINT PAUL ST	
1,186	1135	3317 SAINT PAUL ST	
1,187	1139	3339 SAINT PAUL ST	
1,188	1081	3343 SAINT PAUL ST	
1,189	1392	3344 SAINT PAUL ST	
1,190	1604	3420 SAINT PAUL ST	
1,191	1120	3453 SAINT PAUL ST	
1,192	1297	3521 SAINT PAUL ST	
1,193	1652	3522 SAINT PAUL ST	
1,194	1302	3557 SAINT PAUL ST	
1,195	1287	3635 SAINT PAUL ST	
1,196	1805	3650 SAINT PAUL ST	
1,197	1288	3655 SAINT PAUL ST	
1,198	1364	3705 SAINT PAUL ST	
1,199	1793	3730 SAINT PAUL ST	
1,200	1794	3740 SAINT PAUL ST	
1,201		4041 SAINT PAUL ST	
1,202	2027	4101 SAINT PAUL ST	
1,203	2029	4185 SAINT PAUL ST	
1,204	3034	4321 SAINT PAUL ST	
1,205	3037	4345 SAINT PAUL ST	
1,206	2096	4401 SAINT PAUL ST	
1,207	2099	4446 SAINT PAUL ST	
1,208		4720 SAINT PAUL CT	
1,209	3324	4775 SAINT PAUL CT	
1,210	3356	4780 SAINT PAUL CT	
1,211		4800 SAINT PAUL ST	
1,212		4801 SAINT PAUL ST	
1,213	2497	4812 SAINT PAUL ST	
1,214	2501	4846 SAINT PAUL ST	
1,215	2595	4915 SAINT PAUL ST	
1,216	2596	4923 SAINT PAUL ST	
1,217	2603	4934 SAINT PAUL ST	
1,218	2602	4938 SAINT PAUL ST	
1,219	2600	4947 SAINT PAUL ST	
1,220	3820	4950 SAINT PAUL ST	
1,221	2554	4974 SAINT PAUL ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
1,222		4985 SAINT PAUL ST	
1,223	2550	5010 SAINT PAUL ST	
1,224	2547	5050 SAINT PAUL ST	
1,225	2546	5064 SAINT PAUL ST	
1,226	2545	5095 SAINT PAUL ST	
1,227		5101 SAINT PAUL ST	
1,228	2510	5106 SAINT PAUL ST	
1,229	2509	5110 SAINT PAUL ST	
1,230	2518	5168 SAINT PAUL ST	
1,231	2521	5175 SAINT PAUL ST	
1,232	2506	5194 SAINT PAUL ST	
1,233		3200 STEELE ST	
1,234	1399	3211 STEELE ST	
1,235	1397	3233 STEELE ST	
1,236	1455	3301 STEELE ST	
1,237	1452	3323 STEELE ST	
1,238	1436	3326 STEELE ST	
1,239	1435	3338 STEELE ST	
1,240	1449	3345 STEELE ST	
1,241		3400 STEELE ST	
1,242	1601	3409 STEELE ST	
1,243	1599	3421 STEELE ST	
1,244	1635	3500 STEELE ST	
1,245	1639	3526 STEELE ST	
1,246	1647	3545 STEELE ST	
1,247	1643	3550 STEELE ST	
1,248	1646	3559 STEELE ST	
1,249	1644	3560 STEELE ST	
1,250	1893	3622 STEELE ST	
1,251	1890	3690 STEELE ST	
1,252		3701 STEELE ST APPRX	
1,253		3800 STEELE ST APPRX	
1,254		3900 STEELE ST	
1,255		3950 STEELE ST	
1,256		4001 STEELE ST	
1,257		4020 STEELE ST	
1,258		4025 STEELE ST	
1,259	1979	4100 STEELE ST	
1,260	1978	4114 STEELE ST	
1,261		4358 STEELE ST	
1,262	2097	4419 STEELE ST	
1,263		4801 STEELE ST	
1,264	2499	4823 STEELE ST	
1,265	2482	4862 STEELE ST	
1,266	2496	4945 STEELE ST	
1,267	2555	4975 STEELE ST	
1,268	3807	5023 STEELE ST	
1,269	2484	5030 STEELE ST	
1,270	2552	5039 STEELE ST	
1,271	2513	5125 STEELE ST	
1,272	2519	5155 STEELE ST	
1,273		5157 STEELE ST	
1,274	2515	5171 STEELE ST	
1,275	2516	5187 STEELE ST	
1,276	2517	5191 STEELE ST	
1,277		4234 THOMPSON CT	

Number	Property ID	Address	Unit
1,278	2068	4320 THOMPSON CT	
1,279		4535 THOMPSON CT	
1,280	2153	4555 THOMPSON CT	
1,281	2175	4667 THOMPSON CT	
1,282	2193	4750 THOMPSON CT	
1,283		5000 THOMPSON CT	
1,284		5100 THOMPSON CT	
1,285		5138 THOMPSON CT	
1,286		5148 THOMPSON CT	
1,287		5182 THOMPSON CT	
1,288		3001 VASQUEZ BV APPRX	
1,289	2468	4819 VASQUEZ BLVD	
1,290	2469	4829 VASQUEZ BLVD	
1,291	638	3207 VINE ST	
1,292	639	3215 VINE ST	
1,293	642	3247 VINE ST	
1,294	674	3361 VINE ST	
1,295	744	3420 VINE ST	
1,296	735	3445 VINE ST	
1,297	741	3446 VINE ST	
1,298	1	3600 VINE ST	
1,299	886	3611 VINE ST	
1,300	830	3651 VINE ST	
1,301	831	3659 VINE ST	
1,302		3701 VINE ST	
1,303		3711 VINE ST	
1,304		4335 VINE ST	
1,305		4343 VINE ST	
1,306	3461	4353 VINE ST	
1,307		4601 VINE ST APPRX	
1,308	2323	4629 VINE ST	
1,309		4653 VINE ST	
1,310		4655 VINE ST	
1,311		4680 VINE ST	
1,312		4701 VINE ST	
1,313		4727 VINE ST	
1,314		4729 VINE ST	
1,315	2389	4731 VINE ST	
1,316	2396	4738 VINE ST	
1,317		4740 VINE ST	
1,318		3600 WALNUT ST	
1,319		3722 WALNUT ST	
1,320		3724 WALNUT ST	
1,321	92	3218 WILLIAMS ST	
1,322	91	3220 WILLIAMS ST	
1,323	90	3224 WILLIAMS ST	
1,324	86	3240 WILLIAMS ST	
1,325	85	3242 WILLIAMS ST	
1,326		3247 WILLIAMS ST	
1,327		3248 WILLIAMS ST	
1,328	82	3249 WILLIAMS ST	
1,329	80	3255 WILLIAMS ST	
1,330		3301 WILLIAMS ST	
1,331	185	3343 WILLIAMS ST	
1,332	215	3348 WILLIAMS ST	
1,333	186	3357 WILLIAMS ST	

Table C-1 (Continued)

Preliminary List of Remedial Properties That Have Not Been Sampled Using Phase III Protocols

Number	Property ID	Address	Unit
1,334		3358 WILLIAMS ST	
1,335	213	3408 WILLIAMS ST	
1,336	206	3410 WILLIAMS ST	
1,337	193	3417 WILLIAMS ST	
1,338	205	3420 WILLIAMS ST	
1,339		3423 WILLIAMS ST	
1,340	204	3426 WILLIAMS ST	
1,341	203	3430 WILLIAMS ST	
1,342	196	3433 WILLIAMS ST	
1,343	197	3439 WILLIAMS ST	
1,344	387	3510 WILLIAMS ST	
1,345		3511 WILLIAMS ST	
1,346	386	3514 WILLIAMS ST	
1,347	385	3518 WILLIAMS ST	
1,348	2674	3525 WILLIAMS ST	
1,349	400	3535 WILLIAMS ST	
1,350	381	3536 WILLIAMS ST	
1,351	347	3539 WILLIAMS ST	
1,352	380	3540 WILLIAMS ST	
1,353	348	3549 WILLIAMS ST	# 1
1,354	349	3551 WILLIAMS ST	# 2
1,355	350	3553 WILLIAMS ST	# 3
1,356	351	3555 WILLIAMS ST	# 4
1,357	352	3557 WILLIAMS ST	# 5
1,358	353	3559 WILLIAMS ST	# 6
1,359	463	3601 WILLIAMS ST	
1,360	417	3620 WILLIAMS ST	
1,361		3625 WILLIAMS ST	
1,362	404	3631 WILLIAMS ST	
1,363	406	3643 WILLIAMS ST	
1,364		3644 WILLIAMS ST	
1,365		3700 WILLIAMS ST	
1,366		3701 WILLIAMS ST	
1,367	575	3709 WILLIAMS ST	
1,368		3716 WILLIAMS ST	
1,369	2703	3717 WILLIAMS ST	
1,370		3721 WILLIAMS ST	
1,371	567	3725 WILLIAMS ST	
1,372	568	3729 WILLIAMS ST	
1,373	569	3733 WILLIAMS ST	
1,374	557	3736 WILLIAMS ST	
1,375	572	3749 WILLIAMS ST	
1,376	607	3758 WILLIAMS ST	
1,377	2252	3771 WILLIAMS ST	
1,378	2269	3784 WILLIAMS ST	
1,379		3789 WILLIAMS ST	
1,380		3800 WILLIAMS ST	
1,381		3810 WILLIAMS ST	
1,382	2280	3819 WILLIAMS ST	
1,383	2282	3831 WILLIAMS ST	
1,384		3835 WILLIAMS ST	
1,385	2283	3847 WILLIAMS ST	
1,386		3895 WILLIAMS ST	
1,387		3900 WILLIAMS ST	
1,388	2301	3928 WILLIAMS ST	
1,389	2296	3930 WILLIAMS ST	

Number	Property ID	Address	Unit
1,390		3934 WILLIAMS ST	
1,391	2295	3946 WILLIAMS ST	
1,392		3954 WILLIAMS ST	
1,393		4600 WILLIAMS ST	
1,394	3502	4632 WILLIAMS ST	
1,395	2348	4634 WILLIAMS ST	
1,396		4644 WILLIAMS ST	
1,397		3501 WYNKOOP ST	
1,398	7	3535 WYNKOOP ST	
1,399	8	3541 WYNKOOP ST	
1,400	1038	3216 YORK ST	
1,401	1035	3232 YORK ST	
1,402	1033	3250 YORK ST	
1,403	604	3251 YORK ST	
1,404	605	3257 YORK ST	
1,405	1021	3300 YORK ST	
1,406	705	3303 YORK ST	
1,407	709	3325 YORK ST	
1,408		3326 YORK ST	
1,409	1018	3334 YORK ST	
1,410		3349 YORK ST	
1,411		3358 YORK ST	
1,412		3400 YORK ST	
1,413	1179	3420 YORK ST	
1,414	1175	3438 YORK ST	
1,415	697	3455 YORK ST	
1,416	1234	3504 YORK ST	
1,417	800	3511 YORK ST	
1,418	854	3517 YORK ST	
1,419		3558 YORK ST	
1,420		3601 YORK ST APPRX	
1,421	842	3639 YORK ST	
1,422	844	3657 YORK ST	
1,423		3700 YORK ST	
1,424	915	3701 YORK ST	
1,425		3750 YORK ST	
1,426		3754 YORK ST	
1,427		4300 YORK ST	
1,428		4328 YORK ST	
1,429		4350 YORK ST	
1,430		4400 YORK ST	
1,431		4444 YORK ST	
1,432		4454 YORK ST	
1,433		4462 YORK ST	
1,434	2331	4601 YORK ST	
1,435	2180	4634 YORK ST	
1,436		4638 YORK ST	
1,437		4692 YORK ST	# A
1,438		4692 YORK ST	# B

ATTACHMENT

VB/I70 Soil Sampling Database, Mailing Lists, and Associated GIS Coverages – Summary of Work Completed to Date and Recommendations for Future Database and GIS Data Management Activities

MFG
consulting
scientists and
engineers

MEMORANDUM

TO: Bonnie Lavelle - USEPA

FROM: Marty Petach & Andy Koulermos – MFG Boulder

DATE: March 11, 2003

SUBJECT: VB/I70 Soil Sampling Database, Mailing Lists, and Associated GIS Coverages - Summary of Work Completed and Recommendations for Future Database and GIS Data Management Activities

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This memo provides a brief status update on the VB/I70 soil sampling database and introduces recommendations for resolving some of the current errors and inconsistencies in the various components of the interconnected Database/Mailing List/Map Coverage.

Background

MFG received several data files and tables from USEPA pertaining to residential yard soil sampling results and associated resident/owner mailing lists for the superfund site. MFG also received a number of ArcInfo GIS map "coverages" for the site from USEPA. These files were received with little or no documentation. Furthermore, the data files were not received in the best condition vis-à-vis "data integrity", and represent what USEPA was able to extract from a contractor that had become insolvent prior to the delivery of a final, documented, database product. Although there was little or no documentation of the electronic files, EPA has hard copies of all field data sheets, chain of custody records, sample preparation documentation, analytical data packages and data validation records to support the electronic files of the residential soil sampling results.

What has been done with the information to date

MFG has developed an understanding of the information in the database tables so that we are able to assist USEPA in providing a wide variety of data summaries and statistics pertaining to the site, including identifying the number of properties that require remediation under various cleanup criteria. As requested, MFG has provided USEPA with information regarding: the number of yards that exceed various chemical concentration criteria, identifying which yards had been sampled, determining which yards have not been sampled, tracking which residents have been sent various mailings, etc.

MFG has also added 48 new records to the soil sampling tables based on recent yard sampling activities.

Recently, as MFG began to use the database files in greater detail, it has become apparent that there are some data integrity issues that need to be resolved between the various database tables so that all of the appropriate records from each of the tables reliably match, or "relate" to one another. This is particularly

true between the various mailing lists, and the GIS map coverage that shows where particular properties /yards are located. The database file MFG received from USEPA contained a number of separate database tables, along with queries and reports used to generate mailing lists. The tables appeared to be several disjoined subsets of a larger database, rather than a complete relational database. In general, the database was quite 'messy'. Many of the queries and reports did not run properly, and most of the tables existed as stand-alone entities, with no relationships established to join data attributes across tables. For example, the file had a properties table and property owners table, but there was no relationship definitively linking owners with the properties they owned. MFG was able to 'clean-up' the database and resolve many of the problems. However, a comparison between the database and the residential properties GIS coverage revealed that there are many property addresses in the GIS coverage that are not in the database, and vice-versa.

This issue leads to the uncertainty as to what serves as the "master list" of residential properties within the site. The database and residential properties GIS coverage comprise the most complete property lists in MFG's possession. Each list contains property addresses that are not in the other. MFG has attempted to combine these two lists and fill in the "holes", but it is probable that there are additional residential properties within the site that do not appear on either of these lists. A master list is crucial to answer questions such as "Which properties have not been sampled yet?" With the master list, the answer is simple: Those yards in the master list that do not have any associated sampling results. Without a master list, there is no definite answer.

With respect to the GIS coverages received from USEPA, the most significant was the "residential properties" coverage. As received from USEPA, the coverage had several topological errors including polygons with duplicate label points, and polygons with no label points. MFG fixed these errors with the best available information and the result is a coverage that currently has no topological errors, however, the "content" and completeness issues still remain.

In using the residential GIS coverage, it became apparent that there were both inconsistencies and incomplete portions within the coverage. In some cases, there was no corresponding polygon for records in the soil sampling database. In other cases, there are duplicate addresses for non-connected yards, and based on some limited field verification exercises, there are some yards attributed with incorrect addresses.

Many of the issues related to "missing yards" in the GIS coverage seem to be the result of limitations in the original data that was used to create the coverage. The original source appears to be a 1999-era parcel database from the City of Denver. Some of the parcels were edited by the original USEPA contractor in an attempt to convert the parcel database into a "yard" database (In many cases, one "tax parcel" has a number of residences on in, each residence having a different address. The original parcel database from the City had only one polygon for the parcel containing all of the residences owned by a single entity). Furthermore, there does not appear to be a reliable, discernible, identifier for "Multiunits" in either the mailing lists or the GIS coverage.

Recommended Approach to Address the Remaining Database Issues

1) Develop a definitive master "yard" list, by address, which is directly related to map polygons. The uncertainty in the origins, completeness and inability to link the various mailing lists leads us to recommend developing a "master list of yards" for the site.

Recommended approach:

a) Purchase high resolution aerial imagery for the site
(approx 2 week delivery, ~$1000 GlobeXplorer, 6" color, SEP2000 imagery.
Kirstin Kemner: kemner@globexplorer.com

Or, 1foot black and white from City of Denver for approx $350
www.denvergov.org).

b) Print a detailed series of maps with the best known address/yard outlines from the current database (using aerial photo as base)

c) Field verify, using detailed map series, correct addresses and identify address changes, including:
-Add residence polygons where missing
-Delete polygons where not appropriate
-Identify the location of multi-units
* flag map polygon as multi-unit on field check map,
* develop list of unit numbers associated with each yard address flagged as a multiunit
(Approx 3 days field effort, 3 to 5 days database/GIS editing)

-Note: Even with this approach for multiunits, there may need to be a "region" based GIS data model as opposed to a polygon data storage model to handle one-to-many relationships between addresses and "yards". Dave Colvin has pointed out a property that has one yard, and a two story structure with a different address for each level. Per USEPA, the data for the yard has been assigned (duplicated) at each address record in the sampling database, yet both of these addresses referring to the same physical "yard"...

d) Edit the master yards GIS coverage based on the field map check.

e) Create the tables for the "yard address" to individual multiunit mailing address.

2) Resolve any discrepancies (if any) between the soil sampling database and the newly created master yard list.

3) Update the offsite owner mailing list. This will involve purchasing an updated tax roll table from the City of Denver and using it to update the addresses of people who own property within the site, but reside offsite. It is likely a fresh copy of the parcel database also be purchased from the City GIS department to verify property boundaries in the master yard coverage where possible.
Tax Roll: $180, 10-12 days to purchase (Debra Coak 720.913.4056)
GIS parcels: $1400 (www.denvergov.org Dave Louhan 720.865.2670)

4) Use the master yard list, in conjunction with the previously sampled list, to identify yards that still need to be sampled.

Tabbed Page: Appendix D

APPENDIX D

TRANSPORTATION AND DISPOSAL PLAN

TRANSPORTATION AND DISPOSAL PLAN FOR RESIDENTIAL REMEDIATION OPERABLE UNIT 1 VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE DENVER, COLORADO

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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TABLE OF CONTENTS

1.0 INTRODUCTION

This Transportation and Disposal Plan (TDP) describes the activities associated with transport and disposal of materials excavated from residential properties in the Off-Facility Soils Operable Unit 1 (OU1) of the Vasquez Boulevard and Interstate 70 (VB/I-70) Superfund Site located in the north-central section of Denver, Colorado. This plan establishes the procedures to be implemented and documentation to be maintained in order to ensure worker and public safety and compliance with applicable laws, rules and regulations. It also establishes procedures to properly document such activities and to avoid the possible release of contaminated materials into the environment during transportation and disposal of excavated soil. This plan is supported by and is an appendix to the Remedial Design Work Plan for the Site.

The remedial action in the Off-Facility Soils OU1 of the VB/I-70 Superfund Site will include excavating accessible surface soils in residential yards with arsenic and/or lead concentrations above the residential action levels to a depth of 12 inches and restoring the excavated areas with clean material. The selected Construction Contractor will be responsible for the transport and disposal of the excavated materials, using a qualified transporter identified by the Contractor during the bidding process. Contractor and sub-contractor, as applicable, shall be responsible for the safety of the trucks and for all loading and hauling activities associated with transport activities.

The excavated materials will be transported to either the Asarco Globe Plant or an approved licensed municipal solid waste (MSW) disposal facility. Candidate solid waste disposal facilities include: BFI's Tower Road Landfill; the Denver Regional Landfill near Erie, Colorado; the Republic Services/Front Range Landfill near Erie, Colorado; BFI's Foothills/Highway 93 Landfill; and the Waste Management Denver Arapahoe Disposal Site. Prior to commencing the remedial action, USEPA will identify whether the excavated material will be disposed at the Globe plant or a licensed solid waste disposal facility.

This Plan has been prepared based on the expectation that the excavated materials will be managed as solid waste. This expectation is based on waste characterization analyses from previous removal actions at the Site during excavation of soil with higher arsenic and lead concentrations. Prior to initiating the current removals, waste characterization sampling and analysis will be performed to confirm this expectation (see Appendix F; Construction Quality Assurance Plan). If the waste characterizations show

that a portion of the material cannot be managed as solid waste, this Plan will be amended to incorporate the revised transportation and disposal strategy.

2.0 TRANSPORTATION PLAN

Residential yard materials will be excavated in accordance with the Technical Construction Specifications for the project, and as generally described in Section 4.0 of the remedial design work plan. This section of the TDP provides a description of the OU1 areas and transport activities to the alternative disposal facilities.

2.1 SITE AREAS

The boundaries of OU 1 are shown on Figure D-1 and include approximately 4 square miles in north-central Denver. The VB/I-70 OU1 site includes the Elyria, Swansea, Cole, and Clayton neighborhoods and a small portion of Globeville. Materials will be removed from individual properties located within the OU where soil lead or arsenic concentrations exceed the action levels. To provide for worker and public safety, the active work zone and surrounding areas will be visually marked during material excavation and loading. Soils will likely be removed from residential properties within two or more neighborhoods at a time and therefore, the transportation and disposal plan will provide for work within various areas at any given time.

The remediation contractor will be required to determine the condition and availability of public roads, access, rights-of-way, load restrictions and any other limitations affecting transportation of waste materials. Each residential property shall be reviewed for other access requirements affecting loading.

2.2 SITE LOADING AND ASSOCIATED ACTIVITIES

This section presents the material loading and associated activities within OU1. Included are requirements for loading of materials from the properties into haul trucks, truck decontamination, inspection, and documentation for transportation activities.

2.2.1 Loading of Trucks

Excavated materials will be loaded into dump trucks or roll off boxes for transport to the disposal site. Dump trucks or trucks with roll-off boxes will be operated by a licensed carrier. Dump trucks or truck with roll-off boxes will be staged immediately adjacent to each excavation area, or as close as practicable, during loading. If necessary, empty trucks waiting to be loaded may be staged in a safe location down the street such that they do not block the neighboring driveways or alleyways. It is anticipated that in general, one to three residential property soils removals will occur within a neighborhood with another one to three removals being performed within another neighborhood concurrently. Each removal and truck loading area will be subject to the same requirements presented in this TDP.

In the process of positioning the trucks to be loaded, the loader operator will be required to position the truck and to ensure that no pedestrians or vehicular traffic are in the immediate area. When the truck is being loaded, the driver will be required to keep pedestrian and vehicular traffic away from the loading zone. When haul trucks are loaded within or near public traffic-ways such as streets, alleys or sidewalks, traffic cones will be required to direct traffic away from the loading zone.

Trucks and roll off boxes will be loaded in a manner that will minimize spillage of excavated materials. Spilled soil will be isolated by traffic cones as necessary, and will be picked up immediately to minimize any subsequent tracking of materials or run-off of materials into local storm drains. Sediment-control protective devices will be placed around storm drain inlets in the vicinity of all active truck loading operations during potentially wet weather. Loading of trucks will be performed to avoid interference with overhead electrical lines and other potential utility interferences. Dust control will be maintained during loading in accordance with the Fugitive Emissions Dust Control Plan (Appendix E). This may require loading during non-windy periods, or possibly using a limited water spray to minimize fugitive dust emissions during loading.

It is anticipated that haul trucks will require safety beepers when backing up at the loading areas. Such safety beepers will be in compliance with noise limitations and will be in accordance with City/County of Denver regulations. The remediation contractor will provide board or steel ramps and covers where vehicles cross public curbs and sidewalks and will remove such devices at the end of each day.

2.2.2 Inspection and Decontamination

After loading, trucks and roll off boxes will be covered with an adequately secured tarp or other device and inspected for loose/spilled material within the loading zone. Additionally, each truck will be inspected to verify that rear truck bed gates are adequately secured, and that no other potential problems may occur with the trucks such as under-inflated tires, problems with mufflers, leaking fuel or oil and the like.

If loose soil is observed, it will be removed by brushing and scraping in a contained area. In the event that effective decontamination cannot be accomplished by dry methods, a high-pressure wash may be utilized, as necessary to prevent tracking of materials onto public streets and alleyways. If such wheel washing is necessary, contaminated wash water will be contained and treated or disposed of appropriately.

2.2.3 Documentation

The transport of all excavated material to the disposal site will be documented either through use of a non-hazardous waste manifest if the material is shipped to a licensed MSW disposal facility, or a load tracking form if the material is shipped to the Globe Plant. Example non-hazardous waste manifest and load tracking forms are provided in Attachment A.

In addition to documenting the transport and receipt of the materials, the manifest and tracking form provides documentation of the quantity of materials transported. If the materials are shipped to a solid waste disposal facility, the facility will use weigh tickets (loaded weight and tare weight) to verify the quantity received. This information will be added to or attached to the manifest.

If the materials are shipped to the Globe plant, the volume of the shipping container and the number of loads delivered will be used to calculate the quantity of material delivered. Based on requirements presented in the previous residential yard remediation at Globe (Asarco, 1996), the contractor will be required to employ a system to track soils transported to the Globe plant. Such load tracking will include the following: date, material, source (property address), estimated volume, time hauled, driver's signature, placement location on Globe plant and receiver's signature.

2.3 TRANSPORTATION ACTIVITIES

This section presents the transportation activities including transport to the Globe Plant, transportation to potential off-site MSW facilities, traffic control and safety, noise control, emergency response and truck driver requirements.

2.3.1 Site Transportation with Disposal at Globe Plant

Preliminary transport routes within OU1 are shown on Figures D-1 and 2 . Transport trucks will generally follow primary streets within the neighborhoods such as 37th, 40th, 45th and 47th Avenues east and west, and Washington, 38th, Fox, Steele and York Streets north and south. Haul trucks will have maps to the disposal site as necessary. When hauling is performed on back streets or alleys, caution will be taken to give all other traffic the right-of-way.

Routing to the Globe plant will follow major streets east or west to Washington Street north to the plant. Access onto the Globe Plant will be from 55th Avenue at the north side of the plant and routes within the plant will be in accordance with Asarco requirements for the particular disposal location on the plant. Trucks leaving the Plant disposal area will be required to stop and yield the right-of-way to other site traffic. Empty truck routes back to the OU1 remediation areas will follow the same route back from the Globe Plant.

2.3.2 Transportation Haul Routes to MSW Disposal Facilities

Trucks traveling to MSW disposal facilities will exit the OU1 neighborhoods onto major highways (I-70 initially and I-25, as necessary) as soon as possible and follow the most direct route to the facility (Figure D-3). The Tower Road MSW Landfill is located approximately 15 to 20 miles northeast of OU1, and haul routes could utilize I-70 east to Pena Boulevard north to Tower Road, or I-25 north to I-76 north to 96th Avenue and east to Tower Road. The Denver Regional and Front Range MSW Landfills near Erie are located approximately 20 to 25 miles north of OU1, and haul routes would likely utilize I-25 north to Colorado State Route 7 west to a local county road north to the facilities. The Foothills/Highway 93 MSW landfill is located approximately 20 to 25 miles northwest of OU1, and haul routes could utilize I-70 west to Colorado 58 through Golden to Highway 93 north to the facility. Alternatively, the haul route could

utilize Colorado Highway 72 from I-70 north through Arvada and west to Highway 93 and the Foothills/Highway 93 facility. The Denver-Arapahoe MSW Landfill is located approximately 20 to 25 miles southeast of OU1, and haul routes would likely utilize I-70 east to E-470 south to Hampden and Gun Club Road to the facility. Empty trucks will return to the active work area by the reverse route. Transport over public roads to the selected MSW disposal facility will comply with the safety requirements of the State of Colorado (CDOT, 1999).

The final transportation route(s) will be identified by the remediation contractor following selection of the disposal site, with approval by USEPA. Transit routes will be selected in such a manner as to minimize impact on local traffic. A map will be located in the work trailer, or base station, indicating current transportation routes. Such maps will be updated as necessary depending upon work locations and disposal sites.

2.3.3 Traffic Control and Safety

Hauling operations will be performed in such a manner to avoid interference with local traffic on city streets. Where required by City and County of Denver or State of Colorado regulations, flag persons and signage will be utilized to provide for public safety. Trucks will generally be limited to speeds of 25 miles per hour (mph) on local residential roads or to the posted speed limits on major arteries and highways. Other truck traffic and safety regulations required by the county or municipality through which waste may be hauled will be followed, as required.

Warning signs, such as "Construction Area" or "Men Working" will be placed on the streets where removals are being performed and haul trucks are being loaded. "Trucks Entering" or "Trucks Turning" signs will be utilized at secondary and primary street intersections as necessary. Any other signage required by local authorities will also be utilized to provide for public safety.

2.3.4 Noise Control

All haul trucks will be required to comply with the requirements of the Colorado Noise Abatement Statute, as presented in the specifications, as will all other construction equipment such as excavators and

loaders. In addition, any local noise ordinances required by Denver or other haul-route jurisdictions will be followed to prevent noise violations during waste transport.

Haul trucks will be maintained as necessary during the course of remediation to provide adequate, functioning mufflers to minimize engine noise. Excessive use of down-shifting to slow the trucks will be avoided to minimize truck noise at intersections within residential areas.

2.3.5 Emergency Response

The OU1 area lies entirely within the jurisdiction of the Denver Emergency Response Service. Potential transportation routes to disposal facilities may lie within various emergency response jurisdictions such as Adams, Arapahoe or Jefferson County. Before remediation work begins, the Supervising Contractor shall notify Denver, and each additional emergency response jurisdiction through which waste may be transported, of the proposed remediation and transportation activities. The remediation base station at OU1 will have an Emergency Response Guide containing a list of emergency numbers along with guidelines to be utilized for properly responding to emergencies.

The Construction Contractor's Construction Superintendent, Site Safety Officer and base station personnel will be in continual contact via cell phone and the truck drivers will have two-way radio contact with the base station. Each truck will contain emergency response guidelines to follow in the event of an emergency such as an accident or spill. Thus, continual contact will be maintained between truck drivers and the site remediation management team during all loading and transportation activities. If any emergency event occurs the truck drivers will immediately call the base station, and personnel at the base station will then immediately call the Site Safety Officer. Depending upon the emergency, the appropriate 9-1-1 call will then be made by the base station or truck driver, as necessary. The remediation contractor Construction Superintendent will notify the Supervising Contractor and USEPA of any emergency response events and subsequent response actions as soon as possible. The remediation contractor will be required to develop a Construction Health and Safety Plan (HASP) prior to beginning remediation. Such HASP will detail additional emergency response actions to be taken in the event of accidents or injuries sustained during remediation.

The Construction Contractor will take immediate response actions in the event of a spill. Such actions will include securing the area and restricting public access to any spilled materials. This may require safety cones in roadways along with safety tape or fence and appropriate signage as necessary. As soon as safely possible, any spilled materials will be picked-up and loaded onto the original or a replacement transport truck for delivery to the disposal site. The contractor shall immediately notify the Supervising Contractor and USEPA of any emergency response events and the subsequent response actions.

2.3.6 Truck and Driver Requirements

Transport trucks and drivers shall comply with all applicable federal, state and local regulations. Drivers shall be licensed to operate the equipment under their control and the drivers will be subject to safety record checks. Transport vehicles shall pass all required safety, emission and noise inspections. Trucks will be inspected for leaks of fluids and fuel and will be checked for potential fire hazards associated with loading equipment and haul trucks. Loaded trucks shall not exceed applicable weight restrictions and the selected transport routes shall be checked for weight-restricted bridges or other load limits prior to initiating transport.

All truck drivers will be responsible for complying with all posted speed limits and other traffic controls on public roads. Unless otherwise posted, trucks shall not exceed 25 mph on residential streets.

Prior to any materials being transported, truck drivers will be briefed regarding the loading, inspection, and documentation requirements and any additional safety procedures specified in the contractor's Construction HASP. All haul trucks will contain guidelines regarding emergency procedures and motor vehicle accident report forms. Completed accident report forms will be submitted to the Site Safety Officer, as necessary.

3.0 DISPOSAL PLAN

This section of the TDP contains information regarding selection of the disposal site, off-loading of materials at the disposal site, and related activities.

3.1 DISPOSAL SITE

Excavated materials will be disposed either at a licensed MSW disposal facility, as described above in Section 1.0, or the Asarco Globe plant north of OU1. The MSW facilities are licensed by the State of Colorado Department of Public Health and Environment (CDPHE) to accept non-hazardous solid waste. The residential yard wastes from OU1 containing non-hazardous levels of arsenic and lead will be designated a special waste for disposal at the MSW facilities. The Asarco Globe Plant contains areas suitable for the disposal of excavated yard soils. USEPA will select the disposal site prior to commencing the remedial action. Alternatively, the Construction Contractor may select the disposal site with the approval of USEPA. The selection of disposal site(s) will be dependent upon a number of factors including negotiations with Asarco, availability of various MSW disposal facilities to accept the volumes of materials to be transported, the characteristics of the excavated soil and the costs of hauling and disposal. It is possible that more than one disposal site may be utilized depending upon these factors.

3.2 DISPOSAL PROCEDURES

All disposal activities will follow requirements established at the disposal site including the appropriate documentation, weigh-in and weigh-out procedures, and off-loading procedures. As described in Section 2.2.3, each shipment of materials delivered to the disposal site will be documented using either a non-hazardous waste manifest or tracking form, as applicable.

The following procedure will be used for transport to a MSW disposal facility. Upon arrival at the disposal site, the truck will be weighed and the weight recorded on the manifest form. The truck driver will then proceed to the unloading point and unload the truck or container. Truck drivers will be required to follow all instructions and signs at the disposal site to ensure proper unloading of the materials. After each truck has been unloaded, it will be re-weighed, and the facility scale operator will record the tare

weight on the manifest form. The scale operator will then sign the manifest form, and a copy of the manifest will be removed and retained for their records.

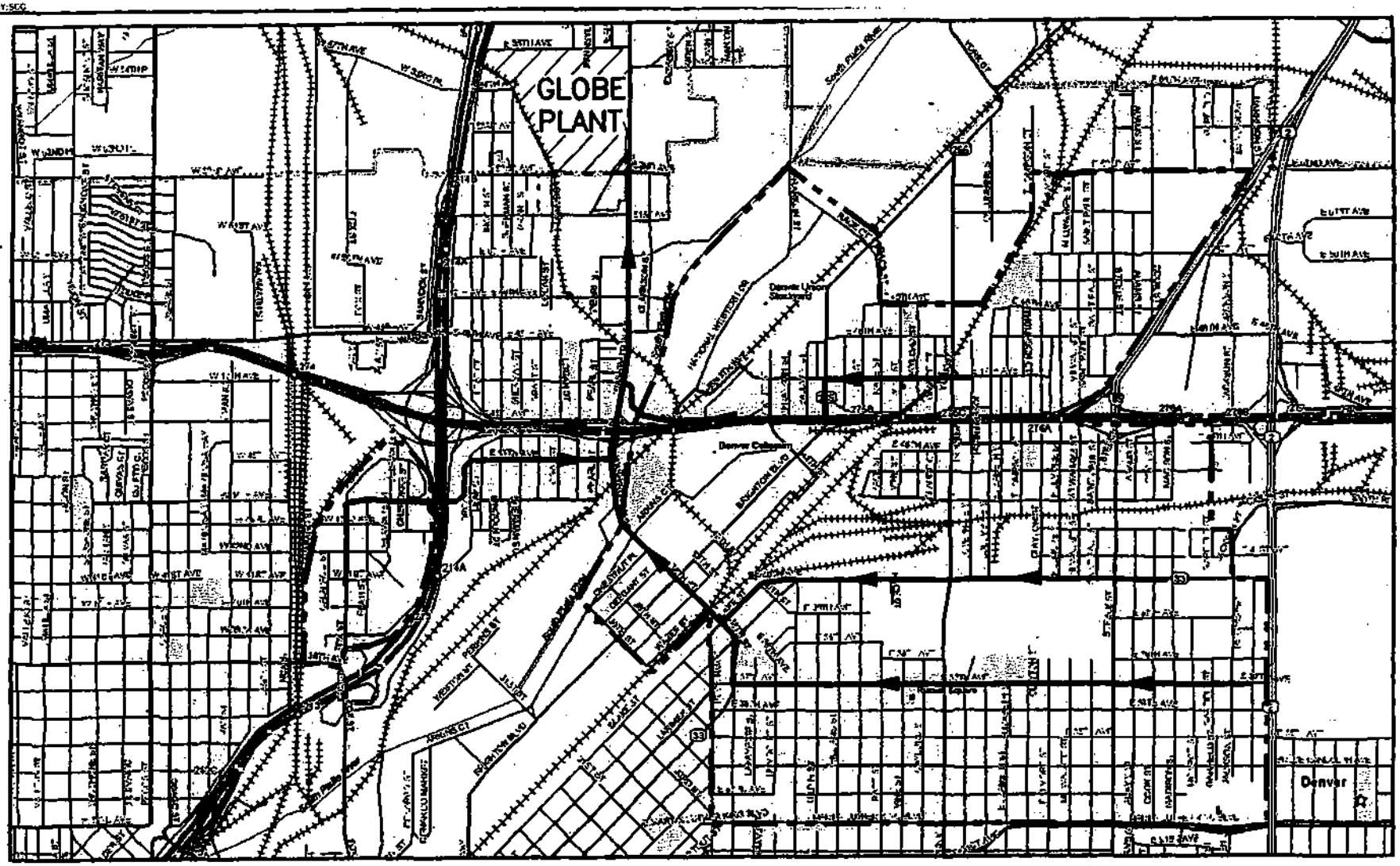
For disposal at the Globe plant, truck drivers shall enter the plant area at the designated entrance, proceed to the designated unloading point and unload the truck or container. Drivers shall abide by the posted speed limits at the Globe plant and follow any other instructions or posted requirements. Truck traffic shall be coordinated with plant activities to minimize impacts on existing plant operations. Asarco may also require limited spreading of deposited yard soil wastes within an area. The Construction Contractor may also be required to install temporary haul roads along with associated temporary gravel and drainage features if required on the Globe Plant. If these conditions become necessary, the Construction Contractor would have bulldozers, graders or other equipment at the Globe Plant temporarily to construct access roads and to spread wastes as necessary.

4.0 REFERENCES

Asarco, 1996. Prefinal Soil Remediation Specifications Community Soils and Vegetable Gardens Operable Unit, Asarco Globe Plant Site, Denver, Colorado.

Colorado Department of Transportation (CDOT), 1999. Standard Specifications for Road and Bridge Construction.

FIGURES



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LEGEND:

SITE BOUNDARY

ROUTES TO GLOBE PLANT

U.S. EPA REGION VIII

VB/I-70 SUPERFUND SITE – OPERABLE UNIT 1
TRANSPORTATION AND DISPOSAL PLAN

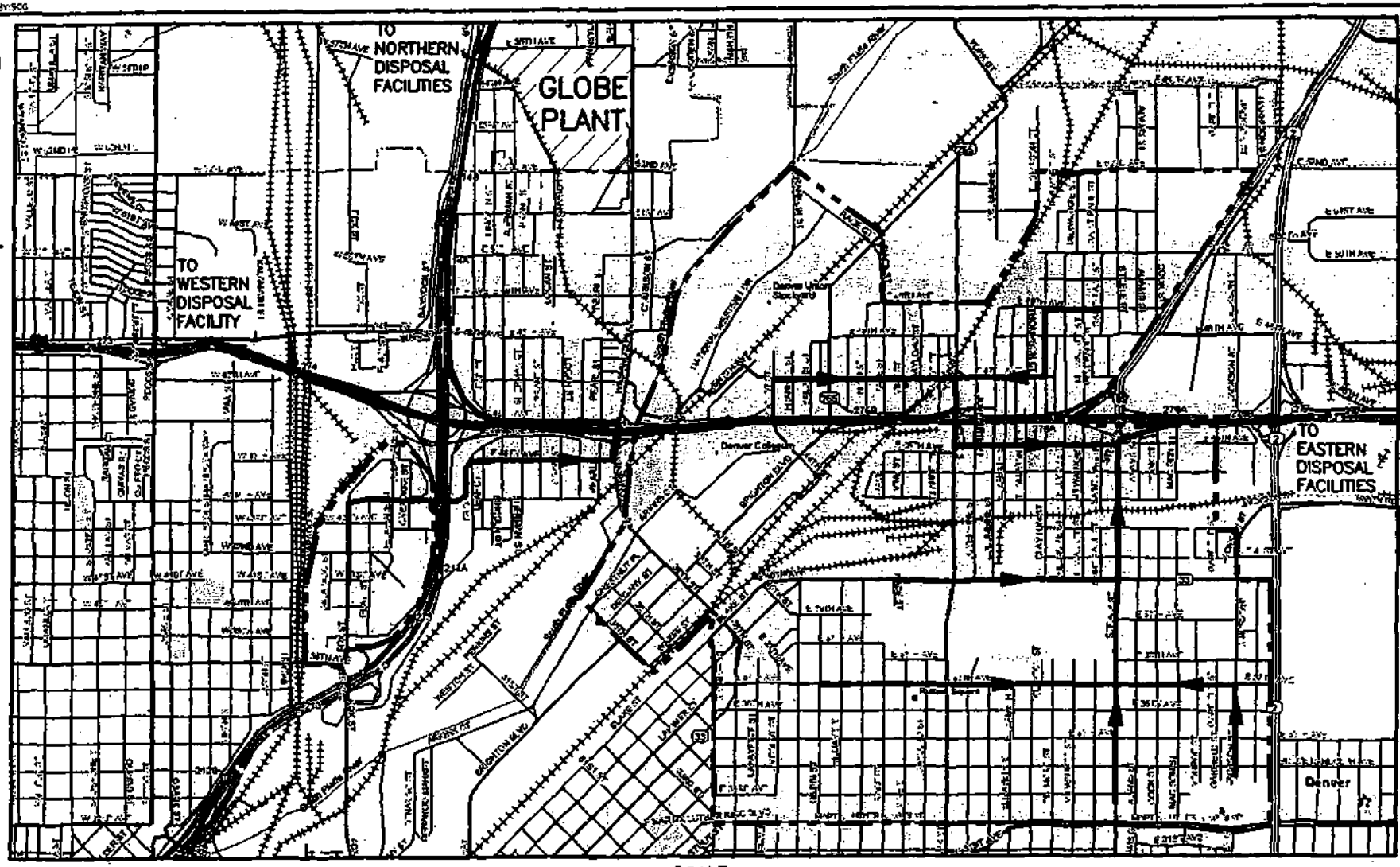
FIGURE D-1

TRANSPORTATION ROUTES TO GLOBE PLANT

PROJECT: 010107.X	DATE: AUGUST 2002
REV:	BY: SCG CHECKED: DEP

MFG, Inc.

consulting scientists and engineers



SCALE

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LEGEND:

SITE BOUNDARY

ROUTES TO GLOBE PLANT

U.S. EPA REGION VIII

VB/I-70 SUPERFUND SITE – OPERABLE UNIT 1
TRANSPORTATION AND DISPOSAL PLAN

FIGURE D-2

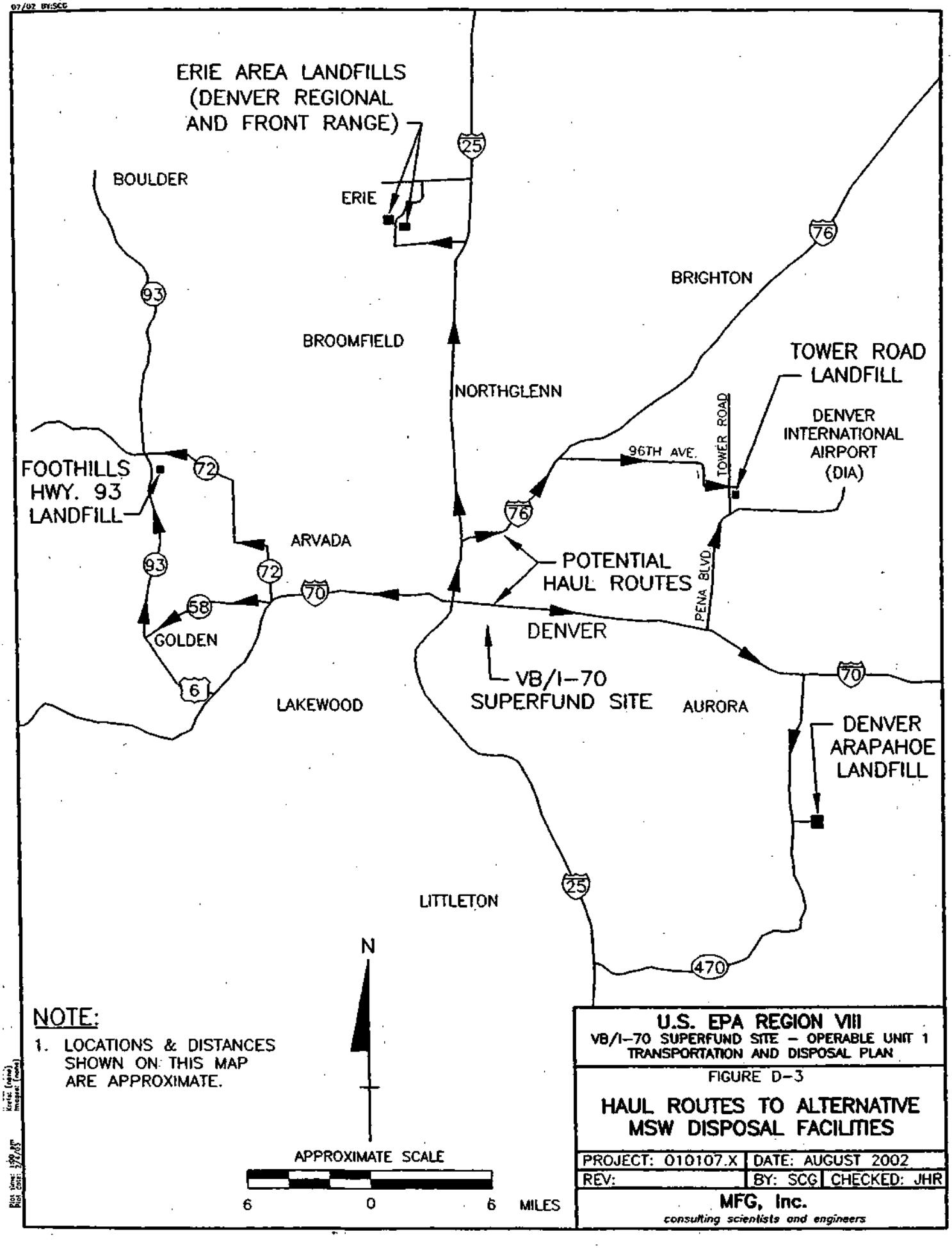
TRANSPORTATION ROUTES TO SOLID WASTE DISPOSAL FACILITIES

PROJECT: 010107.X	DATE: AUGUST 2002	
REV:	BY: SCG	CHECKED: DEP

MFG, Inc.

consulting scientists and engineers

07/02 BY:SCG



NOTE:

1. LOCATIONS & DISTANCES SHOWN ON THIS MAP ARE APPROXIMATE.

U.S. EPA REGION VIII
VB/I-70 SUPERFUND SITE – OPERABLE UNIT 1
TRANSPORTATION AND DISPOSAL PLAN

FIGURE D-3

HAUL ROUTES TO ALTERNATIVE MSW DISPOSAL FACILITIES

PROJECT: 010107.X	DATE: AUGUST 2002
REV:	BY: SCG CHECKED: JHR

MFG, Inc.
consulting scientists and engineers

ATTACHMENT A

Example Documentation Forms

Load Tracking Form

VASQUEZ BOULEVARD/INTERSTATE I-70
SUPERFUND SITE

Date: ________

Load number	Time	Truck/Container ID	Volume (cy)	Comments

Total Volume

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	WM	254844

GENERATOR

1. Generator's Name and Project Location	2. Bill to:
1a. Generator's Phone	2a. Account #
3. Transporter 1 Company Name	3a. Transporter's Phone
4. Transporter 2 Company Name	4a. Transporter's Phone
5. Designated Management Facility Name and Site Address	5a. Facility's Phone

6. Waste Code/Profile #	Waste Description	Quantity	Units

IF ASBESTOS WASTE (Please check the appropriate box)

Waste Code/Profile #		Waste Description	Quantity	Units
	☐	Friable RQ Asbestos Class 9 NA 2212 PG III		
	☐	Nonfriable Asbestos		

7. Regulatory Agency:
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80222-1530

Emergency Notification: CHEMTREC (800) 424-9300
24 hr. toll free phone number

8. Contractor/Generator Certification:
I hereby certify that the above described waste is not a hazardous waste as defined by federal, state or local regulations and does not contain regulated quantities of PCB's or radioactive materials. This waste has been accurately classified, described, packaged, marked and labeled and is in proper condition for transportation according to applicable international and governmental regulations.

Printed/Typed Name	Signature	Month Day Year

TRANSPORTER

9. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

10. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

11. Discrepancy Indication Space

12. Ticket #

13. Management Method/Location ☐ Solidification ☐ Monofill ☐ Landfill ☐ Bio-Bede

Grid Location (if applicable): _____

14. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 11.

Printed/Typed Name	Signature	Month Day Year

ORIGINAL – RETURN TO GENERATOR

Tabbed Page: Appendix E

APPENDIX E

FUGITIVE EMISSIONS DUST CONTROL PLAN

FUGITIVE EMISSIONS DUST CONTROL PLAN
FOR
REMEDIATION OF RESIDENTIAL PROPERTIES
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
DENVER, COLORADO

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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1.0 INTRODUCTION

This document presents the Dust Control Plan for remediation of residential properties in Operable Unit 1 of the Vasquez Boulevard/Interstate 70 (VBI70) Superfund Site located in Denver, Colorado. This Dust Control Plan complies with the Applicable or Relevant and Appropriate Requirements (ARARs) identified in the Feasibility Study (USEPA, 2001). More specifically, it is intended to meet the applicable requirements of Regulation Nos. 1 and 8 of the Colorado Air Pollution Prevention and Control Act. The pertinent ARARs from the Feasibility Study are shown in Tables 1 and 2. It is expected that USEPA will issue a Record of Decision for the Operable Unit that will finalize the ARARs within the next few months. If the final ARARs are different from those listed in Tables 1 and 2, this Plan will be revised, as necessary, to comply with the final ARARs.

2.0 MONITORING APPROACH

During the course of removing soils from residential properties, movement of equipment and vehicles in work areas may liberate dust containing lead and arsenic, particularly in dry and windy weather conditions. The primary concerns with respect to dust are compliance with the State and Federal air quality standards and protecting residents from unacceptable levels of arsenic or lead. The Colorado Ambient Air Quality Standard (CAAQS) in Regulation 8 requires that ambient lead concentrations not exceed 1.5 $\mu g/m^3$ averaged over a 30-day period. The National Ambient Air Quality Standard (NAAQS) is less restrictive in that it requires that the ambient lead concentration not exceed 1.5 $\mu g/m^3$ over a three-month period. State and Federal standards for particulate matter formerly based on total suspended particulate (TSP) concentrations have been replaced by NAAQS standards for particulate matter less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$) in diameter. Those standards require that PM_{10} concentrations not exceed 150 $\mu g/m^3$ and $PM_{2.5}$ concentrations not exceed 65 $\mu g/m^3$ based on a 24-hour average. Average annual PM_{10} and $PM_{2.5}$ standards are 50 and 15 $\mu g/m^3$, respectively. There are no air quality standards for arsenic.

The effectiveness of dust control measures in meeting these standards will be evaluated using real-time monitoring equipment that measures TSP concentrations and laboratory analysis of dust samples for TSP, arsenic and lead. The real-time monitoring equipment will be used to determine the immediate effectiveness of fugitive dust control measures. Exceedances of the established action levels for TSP will trigger the implementation of additional dust control measures or temporary suspension of activities. At the same time, filter samples of the ambient dust will be used to document compliance with the standards given above; help identify the source and nature of the dust; and assess the potential for offsite, airborne transport of arsenic and lead.

In the urban setting of the VBI70 site, it is likely that background sources will contribute PM_{10} and $PM_{2.5}$ to the air at levels that approach the NAAQS. Therefore, use of TSP as a direct measure of PM_{10} and $PM_{2.5}$ concentrations would likely be too conservative and result in dust control activities and work stoppages that were caused by sources not related to the remediation. To allow for real-time TSP data to be used over the long-term, an initial monitoring effort will be performed to provide data to correlate TSP, PM_{10}, and $PM_{2.5}$ concentrations. In addition, a background monitor will be operated to provide data on

urban air quality not affected by the remediation. When background conditions are contributing significantly to exceedences of air quality action levels at the remediation sites, the Supervising Contractor will apply professional judgment on the need for additional remediation dust control actions (such as increased water application) and may allow remedial activities to continue if background air quality is believed to be the major problem.

2.1 Monitoring Activities

Air monitoring activities will be implemented to measure TSP concentrations and collect samples at representative locations around the active working area(s). TSP samples will be submitted to an offsite laboratory for analyses of lead and arsenic. The placement of samplers and essential elements of the monitoring activities are described below.

2.1.1 Monitoring Equipment and Parameters Measured

Real-time monitoring of ambient TSP concentrations at each residential site will be conducted with a personal DataRAM (referred to as a MiniRAM) manufactured by MIE, Incorporated, or equivalent. The MiniRAM is a miniature real-time aerosol monitor/data logger that is able to measure dust concentrations over a range of 0.001 to 400 mg/m^3. The MiniRAM is equipped with an audible alarm that sounds whenever a user-specified level is exceeded. The two-line LCD continuously displays real-time and time-weighted average (TWA) concentration values.

Filter samples of the ambient dust will be collected with an Airmetrics MINIVOL sampler, or equivalent. A MINIVOL sampler draws ambient air at a rate of 5 liters per minute through a pre-weighed 47-mm Teflon filter, where the particles are deposited. The portable MINIVOLs are compact, lightweight, battery-operated, and constructed from durable PVC.

The MINIVOLs will sample TSP. Although PM_{10} and $PM_{2.5}$ inlets are available, the TSP particle size fraction is preferred primarily because of the coarse, mass distribution of fugitive dust; and the lead NAAQS is based on the TSP size fraction. Exposed filters will be delivered to the analytical laboratory for final gravimetric analysis and laboratory analysis for lead, and arsenic. The average concentration of the

constituents over the monitoring period will be calculated by dividing the mass values for TSP, lead, and arsenic by the volume of air sampled. TSP concentrations will be corrected to account for the estimated $PM_{2.5}$ and PM_{10} fraction (determined during the initial monitoring phase; see Section 2.1.2) and these estimates will be compared to the NAAQS.

A non-data-logging wind speed and direction monitor will be placed at the MINIVOL location. Readings from the monitor will be recorded on the MiniRAM Monitoring form (contained in Attachment A). This method will be used instead of a windsock located at the site, because previous removal actions found that local wind directions were often different between the central monitoring location and the property being remediated (URS, 1998).

2.1.2 Initial Monitoring Period

The initial monitoring period will consist of the first 20 work-days when construction and air monitoring activities are performed. Air quality data generated during the initial monitoring period will be used to generate correlations between PM_{10} and $PM_{2.5}$ and TSP.

During the initial monitoring period three MINIVOL samplers will be co-located to provide data on TSP, PM_{10} and $PM_{2.5}$. At least 20 co-located samples will be collected and a linear correlation developed to allow for estimation of PM_{10} and $PM_{2.5}$ levels based on TSP concentrations. Using these data a linear correlation will be developed for PM_{10} and $PM_{2.5}$ concentrations and TSP concentrations using the least squares method. For each parameter, the 95th percent upper confidence limit of the slope will be used to define the relationship between PM_{10} and $PM_{2.5}$ concentrations and TSP concentrations. For example, for $PM_{2.5}$:

$$PM_{2.5}\ \text{concentration} = B_1 * \text{TSP concentration} + b_0$$

Where B_1 is the slope of the correlation at the upper 90% prediction interval (i.e., 90 percent of measurements will be below the predicted value) and b_0 is the estimated intercept.

Once the correlation parameters have been determined, they will be used to back-calculate a TSP action level that corresponds to the $PM_{2.5}$ NAAQS (65 $\mu g/m^3$):

TSP Action Level ($PM_{2.5}$) = $(65 - b_0) / B_1$

The same approach would be taken for PM_{10} and the TSP action level implemented would be the lower of the two calculated for $PM_{2.5}$ and PM_{10}.

2.1.3 Sampling Real-time TSP Concentrations

The MiniRAM monitor will be used to measure any generation of dust during remediation activities that disturb yard soils (i.e., soil removal and excavation) to determine the immediate effectiveness of dust control measures. The Supervising Contractor will be responsible for operating the MiniRAM unit and documenting monitoring activities. The unit will be calibrated, zeroed, operated, and maintained in accordance with the manufacturer's specifications. The procedure used for the placement and operation of the MiniRAM sampler is summarized below and detailed in the Standard Operating Procedure (SOP) entitled REAL-TIME DUST MONITORING (see Attachment A).

Location

One MiniRAM sampler will be placed within or on the boundary of the work area (typically at the property boundary of the area of soil disturbance. The Supervising Contractor will reference the non-data-logging wind speed and direction monitor to determine the local wind direction and then place the sampler accordingly. The MiniRAM may be periodically relocated so as to remain generally downwind of dust generating activities. The time and location of placement will be noted on the appropriate Dust Monitoring Form (see SOPs in Attachment A). The MiniRAM unit will be removed at the conclusion of each workday. In addition, a background sampler will be operated within the site, but in a location that would not be affected by remedial activities, as selected by the Supervising Contractor.

Procedure

MiniRAM samplers will be operated every workday at each residential property where soil remediation is performed. Real-time monitoring will be performed on the workdays when remediation activities disturb soils on the property; real-time monitoring will not be performed on days when there is no soil disturbance.

At the beginning of each workday, the MiniRAM units will be zeroed according to the manufacturer's instructions. After zeroing, one MiniRAM will be placed downwind of dust generating activities and the time, location, and wind direction will be noted on the Dust Monitoring Form (included in SOP for REAL-TIME DUST MONITORING). The unit will be programmed to store one-hour average concentrations. Four times a day, the Supervising Contractor will interrogate the MiniRAM and note the previous hourly averages on the Dust Monitoring Form. Any time the unit is interrogated, the Supervising Contractor will note the time checked, the location, and the wind direction for reporting purposes.

Quality Assurance and Quality Control

Each MiniRAM is gravimetrically calibrated (NIST-traceable) in mg/m^3 using standard SAE fine (ISO Fine) test dust. The internal software has an automatic calibration check referenced to the optical background that is set at the factory. This optical background is near the wavelength of natural soil. Therefore, it should be representative of soil work in the residential areas. However, at the beginning of the program, a gravimetric field calibration will be performed by placing the MiniRAM next to the MINIVOL and comparing the TSP concentration results. If a significant difference exists, the MiniRAM's calibration constant will be changed accordingly.

At the beginning of each day, the units will be zeroed according to the procedure described in the MiniRAM instruction manual. Zeroing with particle free air is accomplished quickly and effectively under field conditions using the zeroing kit included.

2.1.4 Sampling for TSP and Metals Concentrations

The portable MINIVOL samplers will be used to evaluate TSP, arsenic, and lead concentrations at the boundaries of each residential site. Boundary sampling will be used to evaluate compliance with the lead CAAQS and the PM_{10} and $PM_{2.5}$ NAAQS and to provide information about arsenic concentrations. The MINIVOL samplers will be calibrated, operated, and maintained in accordance with the manufacturer's specifications and the SOP entitled PORTABLE DUST MONITORING (see Attachment B).

Location

The Supervising Contractor will determine the location of the MINIVOL sampler the night before remedial activities begin at a property. Samples will be collected within or on the boundary of the work area. The location is dependent on the prevailing wind direction and location of remedial activities. The Supervising Contractor will use the prevailing wind direction data from the non-data-logging wind speed and direction monitor, local weather forecasts, and site experience to select the sampling locations.

The unit will be placed on tripod/mast assemblies and elevated to approximately 2 meters above the ground surface. The intake will be positioned at least 30 centimeters from any obstacle to airflow. The sampler will then be secured to the ground using stakes.

Procedure

The MINIVOL samplers will be operated each workday that soil remediation is being performed. The MINIVOL sampler will be operated at a property selected by the Supervising Contractor where contaminated soil is disturbed (e.g., soil removal, regrading, etc.). If no properties are having soil excavated, then a property where backfilling activities are being performed will be monitored. Twenty-four-hour samples will be collected commencing the midnight before onsite activities with shutoff 24 hours later.

Gravimetric analysis of the MINIVOL filters for mass concentration will follow USEPA guidance for TSP and lead (40 CFR Part 50, Appendix G). Teflon or other filter media with extremely low metal impurities will be conditioned in a controlled environment then pre-weighed by the analytical laboratory on a balance sensitive to 10 µg. Immediately prior to use, each filter will be placed in the filter holder assembly and attached to the sampler. A recharged battery will then be installed and the timer will be programmed for 24-hour operation. The filter assembly will be collected the next workday following the end of the 24-hour sampling period. Each filter will be inserted and removed from the filter assembly in a sheltered location to prevent potential sample loss from wind or other activity. The filter will be stored in a safe location pending submittal to the laboratory for analysis.

Quality Assurance and Quality Control

To assure the sampler has an ambient flow rate of 5 liters per minute and that there is consistent performance of the TSP inlet, a new, corrected indicated flow rate must be established for this Dust Control Plan. The procedure accounts for the differing air temperatures and atmospheric pressures due to elevation and seasonal changes. Before the start of the program each MINIVOL will have a six-point calibration to calculate the flow rate based on the ambient conditions. The six-point calibration will be repeated as an audit at the beginning and end of each construction season or at 6-month intervals, whichever is more frequent, thereafter. The six-point calibration/audit will be performed in a manner consistent with the MINIVOL User's Manual.

A single-point calibration check will be performed once every month and at the first sign of the following warning lights: low flow threshold indicator and low flow cutoff indicator. The single-point calibration will be performed in a manner consistent with the User's Manual.

Typical maintenance and cleaning procedures also will be performed as required in the User's Manual. These include cleaning the flow meter, checking pump valves and diaphragms, cleaning the rain hat and filter assembly, checking the tubing and fittings, and checking the battery charge.

Once a week during remedial activities, the group of filters collected during that week will be delivered to the laboratory. A chain of custody (COC) form will be included with each batch. Every tenth sample will be accompanied by a filter blank. After conditioning and weighing, the laboratory will analyze the filters using the modified USEPA reference method for lead based on inductively coupled plasma-atomic emission mass spectrometry (ICP-MS, SW-846 Method 6020). Although the original USEPA reference method calls for Graphic Furnace Atomic Absorption (GFAA) for lead, ICP-MS has a comparable detection limit, that is less subject to matrix interference, and can be used for multiple metals. After the digestion, each sample extract will be analyzed for arsenic and lead. Based on expected ICP-MS detection limits, a 5 liter per minute sample rate and a 24-hour sampling period, the method detection limits are expected to be 7 ng/m^3 for lead, and 21 ng/m^3 for arsenic.

The analytical laboratory will follow Quality Assurance (QA) and Quality Control (QC) measures, such as calibrating and auditing laboratory equipment, duplicate weighing, field blanks, solution spike,

solution duplicate, reagent spike, laboratory control sample, data validation, and flagging, required by their Quality Assurance Plan and USEPA's SW-846 Method 6020 (ICP-MS). The results of the laboratory analysis will be provided no later than ten days after delivering the filter group.

The TSP, lead and arsenic sampling methods will be assessed for precision and accuracy. Precision will be evaluated by comparing the monitoring results of two co-located samplers. Once every month, two MINIVOLs will be placed within 2 meters of each other for one sample day. The absolute difference of the co-located samples should not exceed 5 $\mu g/m^3$ when the mass concentrations are below 80 $\mu g/m^3$ and a fractional bias of 7 percent for concentrations above 80 $\mu g/m^3$. The accuracy of the measurements will be addressed based on audits performed by the Supervising Contractor after the monitoring program begins, at six-month intervals, and at the program's conclusion.

2.1.5 Meteorological Monitoring

Wind velocity at each residential property will be measured using a non-data-logging wind speed and direction monitor (such as a hand-held anemometer) to ensure that work is not conducted in wind conditions that exceed 30 mph. At the beginning of the workday and throughout the day when data are collected from the MiniRAM (as described above), the wind speed will be measured and recorded. If wind gusts exceed 30 mph, the Supervising Contractor will order work to stop. Work will resume when a 15-minute period has passed in which no wind speeds over 30 mph are measured. Any dust-related shut downs will be noted in the Dust Monitoring Form.

The wind direction will be estimated using a non-data-logging wind speed and direction monitor placed in the property being remediated. At the beginning of the workday and throughout the day when data is collected from the MiniRAM (as described above), the wind direction will be measured and recorded in the Dust Monitoring Form.

2.1.6 Personal Exposure Air Monitoring

Personnel working at the Site, particularly those in areas near active operations, could potentially be subject to airborne lead levels that exceed Occupational Safety and Health Administration (OSHA)

exposure limits. Personal monitoring will be conducted in accordance with the project Construction Health and Safety Plan (CHASP) to assess workers' exposure to airborne dust. To accomplish this assessment, personal air sampling pumps will be worn by a typical worker in each job type for a total of three consecutive workdays. Personal air monitoring will be performed on the same days as the real-time TSP monitoring activities described above. Details of personnel air monitoring will be detailed in the Health and Safety Plan prepared by the Construction Contractor.

2.1.7 Reporting

The results of air monitoring at individual properties will be included in the routine monthly reports. The reports will include monitoring and laboratory analysis results; field and laboratory quality assurance information; results for QC analyses of blanks, duplicates and spike samples. Calculations performed to determine flow rate will also be provided.

3.0 FUGITIVE DUST ACTION LEVELS AND CONTROL MEASURES

This section outlines the dust control practices that will be followed during remedial activities and the action levels for more aggressive dust control measures and possible cessation of activities. Controls will be implemented to minimize fugitive dust generation from excavation activities. Visual observations, real-time monitoring and samples collected at the site perimeter will be used to evaluate the effectiveness of the controls. Decisions to implement more aggressive controls or to temporarily cease activities will be based on pre-defined action levels. The remainder of this section describes the criteria that will be used and provides an overview of the expected dust control practices.

3.1 Dust Control Measures

Dust control measures will be a high priority for remediation personnel. To minimize the off-site migration of airborne dust, removal actions will include aggressive dust control measures to minimize the potential for the dispersion of lead, arsenic, and suspended particulate matter. Dust control will be achieved primarily by watering down work areas and vehicle traffic routes. Watering will be provided on an as-needed basis, as follows:

- During soil excavation activities (by heavy equipment and by hand crews);
- During stockpiling and/or loading of soils for transport; and
- To wet down truck loads to prevent any visible emissions during transport (truck loads will also be covered when traveling public roads).

Additional dust control measures will be implemented in response to TSP concentrations measured above the action levels specified below. Additional dust control measures will be aggressively implemented under arid or windy conditions, whenever dust plumes are observed leaving the residential property or as needed to address real-time TSP measurements. Dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Other dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of

surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

Dust control alternatives may be re-evaluated, on an as-needed basis, in consultation with USEPA.

3.2 Action Levels

Action levels for more aggressive dust control measures and possible cessation of activities will be based on both visual observations and data from the monitoring program. During the course of removing soils from residential properties, the Supervising Contractor will alert operations personnel when visible fugitive dust is observed. Visual observations of fugitive dust plumes will trigger more aggressive controls. Should generation of visible dust plumes continue after the additional dust mitigation measures have been implemented, work will stop until conditions abate or additional measures will be taken to reduce dust generation and airborne transport.

The Supervising Contractor will check the MiniRAM sampler four times a day during remedial activities for the following: instrument status and previous hourly averages. In addition to the visual observations, these records will allow on-site personnel to employ pro-active measures to protect against a violation of the 24-hour $PM_{2.5}$ and PM_{10} ambient air quality standards. Initial action levels for TSP as measured by the MiniRAM are summarized in Table 3. These will be revised based on the findings of the initial monitoring effort (see Section 2.1.2).

A concentration of 100 $\mu g/m^3$ will be used as the initial action level for TSP measured by the MiniRAM. Any 15-minute average concentration over 100 $\mu g/m^3$ will necessitate additional dust mitigation. If levels exceed the 100 $\mu g/m^3$ action level an alarm will sound on the MiniRAM. The Construction Contractor will then implement additional dust control measures (see previous section). After additional controls are implemented, the Supervising Contractor will take a downwind, 15-minute, time-weighted average concentration. If this successive TSP measurement is below 100 $\mu g/m^3$ the added mitigation measures may be discontinued. If mitigation measures are unsuccessful and result in

concentrations greater than 150 $\mu g/m^3$ then work will stop. Work will be allowed to resume only if a downwind 15-minute average concentration is less than the 100 $\mu g/m^3$ action level.

As stated above, a wind speed of 30 mph will also trigger mitigation activities. If wind gusts exceed 30 mph, the Supervising Contractor will order work to stop. Work will resume when a 15-minute period has passed in which no wind speeds over 30 mph are measured. Any dust-related shut downs will be noted in the Dust Monitoring Form.

The action levels shown above are expected to provide protection for lead and arsenic, because calculations show that when TSP action levels are exceeded, both lead and arsenic concentrations in air are predicted to be at least an order of magnitude lower that their respective action levels. Approximately 3,000 of the 4,000 properties at the site have been sampled (Washington Group, 2001). The highest lead concentration (average value for a single residential yard) found was 1,130 mg/Kg. Using this value, a TSP concentration of 100 $\mu g/m^3$ would correspond to a lead air concentration of 0.044 $\mu g/m^3$. Therefore, dust control measures will be implemented due to an exceedence of the TSP action level when lead concentrations are an order of magnitude or more lower than the NAAQS of 1.5 $\mu g/m^3$ (because the maximum lead concentration in soils was used for the calculation). For arsenic, there are no Federal or State air quality standards. However, as a point of reference, CDPHE has established fence line air quality criteria for remediation at the Rocky Mountain Arsenal. For arsenic the Acute Reference Concentration is 2.8 $\mu g/m^3$ (CDPHE, 2002). The Acute Reference Concentration is defined as an allowable air concentration, based on animal and/or human toxicity data, derived with the intent of negligible potential health impacts to the public. Any reports of measured concentrations exceeding the Acute Reference Concentration require work modifications to reduce emissions. For the VB/I70 site the highest measured concentration of arsenic (measured as an property-wide exposure point concentration) was approximately 1,500 mg/Kg. Using this value, a TSP concentration of 100 $\mu g/m^3$ would correspond to an arsenic concentration of 0.06 $\mu g/m^3$. Therefore, as for lead, dust control measures will be implemented due to TSP levels when arsenic concentrations are over an order of magnitude lower than the reference concentration (because the maximum arsenic concentration in soils was used for the calculation). Action levels for lead and arsenic are shown on Table 3.

4.0 MONITORING PROGRAM REVIEW AND MODIFICATION

Upon collection of sufficient monitoring data from a variety of soil remediation work areas/properties, data may be reviewed to evaluate the relative contributions from remediation activities and seasonal variations to the TSP levels measured during work activities. The evaluation will consider potential contributions from excavation activities, comparison of results with the MiniRAM data and medical monitoring results. If these results indicate that real-time dust monitoring could be performed less frequently while still providing sufficient data to demonstrate compliance with the air quality standards (CAAQS for lead and NAAQS for $PM_{2.5}$ and PM_{10}), then a request for less frequent monitoring may be made to USEPA. Similarly, if a representative number of samples measure low TSP concentrations (below the established action level) and/or lead and arsenic concentrations well below their action levels, the frequency of sample collection from the MINIVOL sampler may be re-evaluated with a request for a reduction in frequency if it can be demonstrated that a lower frequency will provide sufficient data for documenting compliance. Changes in the frequency of monitoring and sampling will not be made without prior approval from USEPA.

5.0 REFERENCES

CDPHE, 2002. Rocky Mountain Arsenal Medical Monitoring Program. http://www.cdphe.state.co.us/rma/rmahom.asp

USEPA, 2001. Feasibility Study Report Vasquez Boulevard/Interstate 70 Superfund Site. Prepared by MFG, Inc.

URS Operating Service, Inc., 1998. *Removal Summary Report Vasquez Boulevard and I-70 Denver Colorado*. Prepared for the USEPA.

Washington Group, 2001. *Remedial Investigation Report Vasquez Boulevard/I-70 Site Operable Unit 1.* Prepared by Washington Group International for the USEPA.

TABLES

TABLE 1

SUMMARY OF POTENTIAL CHEMCIAL-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES
VB/I-70 OU1

Standard, Requirement or Criteria	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment
			FEDERAL		
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/I70 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.
			STATE		
Colorado Air Pollution Prevention and Control Act	Yes	--	5 CCR 1001-14;	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS.	Construction activities associated with potential remedial actions at the site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.
	No	Yes	5 CCR 1001-10 Part C (I) Regulation 8	Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 2

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**
Air Emission Control 1. Particulate emissions during excavation and backfill.	Yes	--	5 CCR 1001-3, Regulation 1, Section III (D) 5 CCR 1001-5, Regulation 3 5 CCR 1001-2, Section II	Colorado air pollution regulations require owners or operators of sources that emit fugitive particulates to minimize emissions through use of all available practical methods to reduce, prevent, and control emissions. In addition, no off-site transport of particulate matter is allowed. A fugitive dust control measure will be written into the workplan in consultation with the state for the remedial activity.	Applicable to alternatives where soil is excavated, moved, stored, transported or redistributed.
2. Emission of hazardous air pollutants.	No	Yes	5 CCR 1001-10, Regulation 8	Emission of certain hazardous air pollutants is controlled by NESHAPs. Excavation and backfill of soils could potentially cause emission of hazardous air pollutants. Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The potential remedial actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 2 (CONTINUED)

POTENTIAL ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**
3. Air emissions from diesel-powered vehicles associated with excavation and backfill operations.	Yes	--	5 CCR 1001-15, Regulation 12	Colorado Diesel-Powered Vehicle Emissions Standards for Visible Pollutants apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways, and state as follows: 1) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing 7,500 pounds and less, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity. 2) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing more than 7,500 pounds, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 35% opacity, with the exception of subpart "C". 3) Any diesel-powered motor vehicle exceeding these requirements shall be exempt for a period of 10 minutes if the emissions are a direct result of a cold engine startup and provided the vehicle is in a stationary position. 4) These standards shall apply to motor vehicles intended, designed, and manufactured primarily for travel or use in transporting persons, property, auxiliary equipment, and/or cargo over roads, streets, and highways.	Applicable to alternatives that include transportation of soil.

TABLE 2 (CONTINUED)

POTENTIAL ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**
4. Odor emissions.	Yes	--	5 CCR 1001-4, Regulation 2	Colorado odor emission regulations require that no person shall allow emission of odorous air contaminants that result in detectable odors that are measured in excess of the following limits: For residential and commercial areas – odors detected after the odorous air has been diluted with seven more volumes of odor-free air.	Applicable to alternatives that include construction activities in residential areas.
5. Smoke and opacity.	No	Yes	5 CCR 1001-3, Regulation 1, Sect. II.A	Excavation and backfilling of soils must be conducted in a manner that will not allow or cause the emission into the atmosphere of any air pollutant that is in excess of 20% opacity.	Regulation specifically exempts fugitive emissions generated by excavation/backfilling activities. Relevant and appropriate to alternatives that include excavation and backfilling of soils.
6. Ambient Air Standard for Total Suspended Particulate Matter.	Yes	--	5 CCR 1001-14	Air quality standards for particulates (as PM10) are 50 $\mu g/m^3$; annual geometric mean, 150 $\mu g/m^3$ 24 hour.	Applicable to alternatives that include actions that generate fugitive dust.
7. Ambient Air Standard for Lead.	Yes	--	5CCR 1001-10, Regulation 8	Monthly air concentration must be less than 1.5 $\mu g/m^3$.	Applicable to alternatives that include actions on contaminated soil that generate fugitive dust.

TABLE 2 (CONTINUED)

POTENTIAL ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

FEDERAL ARARs					
Standard, Requirement or Criteria	**Potentially Applicable**	**Potentially Relevant and Appropriate**	**Citation**	**Description**	**Comments**
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standards are: 150 micrograms per cubic meter for particulate matter for a 24 hour period; 50 micrograms per cubic meter for particulate matter- annual arithmetic mean; 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with proposed remedial action at VB/I70 OU1 would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to particulates and to lead are relevant and appropriate.

TABLE 3

ACTION LEVELS

CONDITION	ACTION
TSP, 15 minute average	
< 100 $\mu g/m^3$	No additional dust control.
> 100 and < 150 $\mu g/m^3$	Additional dust mitigation measures.
> 150 $\mu g/m^3$	Work stoppage.
Lead, 30 day average	
> 1.5 $\mu g/m^3$	Work stoppage until additional dust measures are implemented to ensure compliance with the standard.
Arsenic, 24-hour average	
> 2.8 $\mu g/m^3$	Additional dust mitigation measures.

Note: The TSP action levels are initial conservative levels that assume all TSP is PM_{10}. After the initial monitoring period, the TSP action levels will be revised to account for measured fractions of PM_{10} and $PM_{2.5}$.

ATTACHMENTS

ATTACHMENT A

STANDARD OPERATING PROCEDURE
FOR REAL-TIME DUST MONITORING

STANDARD OPERATING PROCEDURE FOR REAL-TIME DUST MONITORING

1.0 INTRODUCTION

The following section describes procedures to be followed for real-time dust monitoring during remediation of residential areas at the Vasquez Boulevard/Interstate 70 Superfund Site.

The purpose of this protocol is to specify methods to be used when operating the personal DataRAM (referred to as a MiniRAM) manufactured by MIE, Incorporated, or equivalent. The MiniRAM will be used to measure total suspended particulate (TSP) at boundaries of residential properties during remediation. These data will be used to measure any generation of dust from soil remediation work and to determine the immediate effectiveness of fugitive dust control measures.

2.0 SAMPLE COLLECTION

Placing the samplers:

- The units will be placed on a tripod and elevated to approximately 2 meters during operation.
- A MiniRAM sampler will be placed within or on the boundary of the work area.
- The operator will use the prevailing wind direction data from the meteorological station, local weather forecasts, neighborhood wind sock and site experience to select the downwind sampling locations.
- The MiniRAM will be periodically relocated so as to remain generally downwind of dust generating activities.
- A MiniRAM will also be operated to measure background TSP levels at the site. The sampler will be sited in a location that will not be affected by remedial activities.

Frequency of sampling:

- The MiniRAM sampler will be operated every workday at each residential property when removal of contaminated soil is being performed.

Preparing the MiniRAM:

- Remove the MiniRAM from a ziplock plastic bag.
- At the beginning of each workday inside an enclosed building, place the MiniRAM inside the MIE Zeroing Kit.
- Zero the MiniRAM according to the manufacturer's instructions.

- Note the date, general location, name of representative, and general activities in the MiniRAM Monitoring Form.
- Verify that the MiniRAM is programmed to store 1-hour average concentrations.
- Verify that the MiniRAM is programmed to trigger an alarm when a 15-minute average TSP concentration reaches 100 $\mu g/m^3$. This action level will be modified based on site-specific data generated during the initial monitoring period.
- Attach the unit onto a tripod.
- Place the MiniRAM downwind of dust generating activities and note the time, location, and wind direction on the MiniRAM Monitoring Form.
- Four times a day (typically mid-morning, noon, mid-afternoon, and end of day), interrogate the MiniRAM and note the time checked, location, wind direction and previous hourly averages on the MiniRAM Monitoring Form.
- At the conclusion, detach MiniRAM from tripod and place it inside a ziplock plastic bag.
- Store in a secure location.

Maintenance and Calibration:

- At the beginning of the program, a gravimetric field calibration will be performed by placing the MiniRAM next to the MINIVOL and operating both instruments for one day. The TSP concentration results from the two instruments will be compared. If a significant difference exists (see Dust Control Plan), the MiniRAM's calibration constant will be changed accordingly. The field calibration will be performed in a manner consistent with the User's Manual.
- Recharge the nickel-metal-hydride batteries every 72 hours of use.
- An aerosol dust cleaner will periodically be used to blow air across the sensor chamber to free up any lodged wind-blown material.

3.0 ACTION LEVELS AND IMPLEMENTATION OF DUST CONTROL MEASURES

Action levels for more aggressive dust control measures and possible cessation of activities will be based mainly on the real-time TSP monitoring results, as shown in Table 1. Additional alterations to the dust mitigation activities will be based on the action levels for lead listed in the SOP for PORTABLE DUST MONITORING.

TABLE 1 PROTECTION PROGRAM SUMMARY	
CONDITION	**ACTION**
TSP, 15-minute average [a]	
< 100 µg/m^3	no additional dust mitigation
>100 and < 150 µg/m^3	additional dust mitigation
> 150 µg/m^3	work stoppage

[a] The MiniRAM has an audible alarm that will be set to go off at a 15-minute average of 100 µg/m^3. The MiniRAM alarm can only be set to real-time (instantaneous) or 15-minute averages. These are initial action levels that will be modified based on site-specific data from the initial monitoring period.

If the alarm sounds on the MiniRAM, a 15-minute average concentration has exceeded 100 µg/m^3, extra dust mitigation measures are required (see below) and the following additional monitoring procedures will apply:

- After additional controls are implemented, take a downwind 15-minute time-weighted average concentration.
- If this successive TSP measurement is below 100 µg/m^3, the added mitigation measures will cease.
- If mitigation measures are unsuccessful resulting in higher concentrations in excess of 150 µg/m^3, the remediation manager will order work to stop.
- Work is allowed to resume only if a downwind 15-minute average concentration is below the 100 µg/m^3 threshold.

As described in the Dust Control Plan, dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Additional dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

4.0 DOCUMENTATION

Activities relating to real-time TSP monitoring will be recorded on an MiniRAM Monitoring Form for each day of active soil remediation. Information recorded on the MiniRAM Monitoring Form will include the following for the MiniRAM:

- general location;
- remediation manager;
- general activities; and
- an initial of the person who zeroed the MiniRam.

Under the General Notes,

- identify the time the MiniRAM was checked;
- the location of the sampler (i.e., SW side of excavation area); and
- the direction from which the wind was blowing.

Under the Dust Concentration Notes,

- identify the ending hour of time weighted average concentration and;
- the TSP concentration in micrograms per cubic meters ($\mu g/m^3$).

All daily MiniRAM Monitoring Forms will be maintained on-site and made available to EPA's on-site, oversight representative at his/her request. Copies of the daily logs, and all data print-outs from the monitors will be maintained on file at the Supervising Contractor's office.

MiniRAM Monitoring Form

Date:_____
General Location:_____
Asarco Representative:_____
General Activities:_____
Person Who Zeroed the MiniRAM (initial)?_____

Dust Concentration			General Notes	
Hour Ending	TWA (ug/m^3)	Time	Location of Sampler	Wind Direction (from which the wind blows)
Example 7:00 AM	*0.010*	*9:10 AM*	*SW side of excavation area*	*NE*

ATTACHMENT B

STANDARD OPERATION PROCEDURE
FOR PORTABLE DUST MONITORING

STANDARD OPERATING PROCEDURE FOR PORTABLE DUST MONITORING

1.0 INTRODUCTION

The following describes procedures to be followed for ambient portable dust monitoring during remediation of residential properties in the Vasquez Boulevard/Interstate 70 Superfund Site.

The purpose of this protocol is to specify methods to be used when collecting filter samples of the ambient total suspended particulates (TSP) with Airmetrics MINIVOL samplers, or equivalent. In addition to TSP, the filters will also be analyzed for arsenic and lead. These data will be used to document compliance with standards, where applicable, help identify the source and nature of the dust, and assess potential offsite, airborne transport of arsenic and lead.

2.0 SAMPLE COLLECTION

Placing the samplers:

- The units will be placed on tripod/mast assemblies and elevated to approximately 2 meters above the ground surface during operation.
- The intake should be positioned at least 30 cm from an obstacle to air flow.
- The tripods will be secured to the ground using stakes.
- The MINIVOL sampler will be located at a fixed location based on the active work area in relation to the wind patterns and background sources.
- The remediation manager will use the prevailing wind direction data from the meteorological station, neighborhood wind sock, local weather forecasts and site experience to select the sampling locations.

Frequency of sampling:

- A MINIVOL portable sampler will be placed in a location anticipated to be downwind of the dust-generating remedial or redevelopment activities.
- The MINIVOL sampler will be operated every work day, when soil removal/replacement activities are being performed.
- Twenty-four hour samples will be collected commencing the night before onsite activities and continuing until the next night (midnight to midnight).
- Once every month, two MINIVOLs will be placed within two meters of each other for one sample day for quality assurance purposes.
- During days when the second MINIVOL is not being used to collect quality assurance samples, random samples will be collected at the discretion of the MINIVOL operator. This

will depend on the initial (periodic) monitoring results and on observations made during site activities. (Expected applications might include background sampling or measurements to augment the coverage of the primary MINIVOL during intensive remedial activities.)

Preparing the MINIVOL:

- The MINIVOL samplers will be calibrated, operated, and maintained in accordance with the manufacturer's specifications.
- Upon purchasing the 47-mm Teflon filters, the filters will be sent to the laboratory for initial tare weighing.
- After the laboratory sends the pre-weighed filters to the Site, each filter will be put into its own individual petri slide. Each unused filter arrives with two numbered labels attached. One label is attached to the filter holder inside the sampler, while the other is attached to the petri slide.
- Remove the sampler from the hanging bracket.
- Inside a building, remove the timer and pump assembly by grasping the 6" lid, taking care not to disconnect the power cord from the battery. Do not grasp the center of the circuit board. Mount the assembly on the edge of the sampler casing using the pump mount stand. Leave battery attached.
- Record the hours shown on the elapsed time totalizer in the MINIVOL Monitoring Log.
- Press the Timer On/Auto/Off button to start pump.
- If a RED LIGHT is illuminated (indicating either low flow or low battery), press the Reset button to start pump.
- With the sampler held vertically, read the flowmeter (to the nearest tenth at center of ball) and record the ending flow rate.
- Lower assembly back into tube.
- Before removing the preseparator/filter holder assembly from sampler, cross-check the filter sticker number on the assembly against the filter number for that site on the worksheet. These numbers should match. If not, make a note of this, recording the actual filter number.
- Remove the preseparator/filter holder assembly at the quick-connect and place it in clean plastic bag for transport back to the building.
- Attach a new preseparator/filter holder assembly containing a new filter at the sampler quick-connect.
- Change the battery pack. (Do not inadvertently confuse and reuse the spent battery.) If either the "low" or "low voltage" indicator was illuminated, make a note that the spent battery may be defective.
- Check the sampler for leaks. Remove the pump and timer assembly from the sampler body, start the pump by pressing the On/Auto/Off button, and cover the inlet with palm. The ball should drop to the bottom of the flowmeter. If it does not, check/tighten all tubing, joints, and quick-connect fittings until the sampler is leak-free.
- If the low flow indicator was illuminated, check for crimps or air restrictions in the inlet or tubing.

- In the MINIVOL Monitoring Log, record location, sampler #, battery #, new filter #, operator, and any comments.
- With the sampler running and while holding it vertically, adjust the flow rate to the correct level. Record the beginning flow rate to the nearest tenth of liter/minute in the MINIVOL Monitoring Log.
- Turn the pump off by pressing the ON/AUTO/OFF button.
- Record the hours shown on the elapsed time totalizer in the MINIVOL Monitoring Log.
- Set the programmable timer for a 24-hour period beginning at midnight and ending at midnight the following day.
- Lower the pump and timer assembly into the sampler body and reinsert the bale assembly bar.
- Return the sampler to the mounting cradle, raising it as vertically as possible.

Handling the TSP filter:

- In a sheltered location (to prevent potential sample loss from wind or other activity) unscrew the filter holder ring from the top of the exposed filter holder assembly.
- Locate the petri slide with the filter number which matches the number on the side of the filter holder assembly. This is the original petri slide that the filter came on.
- Unscrew the preseparator adapter from the filter holder assembly. Lift off the anti-twist ring from the base.
- Using tweezers, carefully remove the exposed filter from the drain disk and place it into its original petri slide, replacing the petri slide lid when finished. (Be sure to replace the drain disk back on the filter support grid in the filter holder assembly.)
- Remove the old ID tag from the filter holder assembly base and discard. (Recheck this number to be sure it matches the number on the petri slide.)

Analytical Procedures:

- The laboratory will perform a gravimetric analysis of the MINIVOL filters for mass concentration.
- The laboratory will analyze filters for lead and arsenic using EPA SW-846 Method 6020.
- The average concentration of the constituents over the monitoring period will be calculated by dividing the mass values for TSP, lead and arsenic by the volume of air sampled.
- The reported concentration will be corrected to EPA standard conditions (25°C and 760 mm Hg).

Maintenance and Calibration:

- Before the start of the Project, and then at the beginning and end of each construction season or at 6-month intervals thereafter, each MINIVOL will have a six-point calibration to calculate

the flow rate to local ambient conditions. The six-point calibration/audit will be performed in a manner consistent with the User's Manual.

- The flowmeter should be cleaned or replaced if it indicates no flow, low flow, excessive flow, or erratic flow. The flowmeter should be cleaned per the instruction listed in the Operations Manual.
- If the flow rate becomes irregular or it does not allow the flow rate to be adjusted accurately, the pump valves and diaphragms may need to be cleaned or replaced.
- A single-point calibration will be performed once every month and at the first sign of the following warning lights: low-flow threshold indicator and low-flow cutoff indicator. The single-point calibration will be performed in a manner consistent with the User's Manual. The flow should be within ± 15 percent of 5 liters per minute at current conditions. If the unit fails to operate in this range the sampler must be repaired or recalibrated.
- The rain hat and preseparator/filter holder assembly should be cleaned every 2 to 4 sampling periods, or more frequently if soiling is observed.
- Tubing and fittings must be routinely checked for crimps, cracks, or obstructions. Fittings should be inspected periodically for cross-threading and tightness.
- Since a single AA alkaline battery powers the programmable timer, the battery should be checked periodically and replaced as necessary to prevent failure during operation.
- The 30-hour battery pack used to power the pump, should be emptied after each sampling day before charging.

2.1 Sample Labeling, Handling and Chain of Custody

A Chain-of-Custody Record (COC) will be completed for each sample lot, secured in an plastic bag, and placed into each shipping container for shipment to the laboratory with the samples. Information contained on the triplicate, carbonless COC form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;
- Method of shipment;
- Carrier/waybill number (if any);

- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is transferred;
- Date and time of sample custody transfer; and
- Conditions of samples upon receipt by laboratory.

When custody changes, personnel handling the sample exchange shall sign the record along with the date, time, and company affiliation. A copy of the record will be retained by the field sampler. Signed and completed copies of the records shall be returned by the laboratory with the analytical report.

3.0 ACTION LEVELS AND IMPLEMENTATION OF DUST CONTROL MEASURES

Action levels for more aggressive dust-control measures and possible cessation of activities will be based mainly on the real-time TSP monitoring (see Dust Control Plan and SOP for REAL-TIME DUST MONITORING). Additional alterations to the dust mitigation activities will be based on the action levels for lead (refer to Dust Control Plan). No action levels will be in effect for arsenic.

Dust control measures will be implemented aggressively under arid or windy conditions, whenever dust plumes are observed leaving the Site, or as indicated by the action levels. As described in the Dust Control Plan, dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Additional dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

4.0 DOCUMENTATION

Activities relating to portable dust sampling will be recorded on an MINIVOL Monitoring Log for each day of active soil remediation. Information recorded on the MINIVOL Monitoring Log will include the following for the MINIVOLs:

- the hours shown on the elapsed time totalizer after the sampling event;

- the ending flow rate after the sampling event;
- the location #, sampler #, battery #, new filter #, operator, and any comments at the start of a new sampling event;
- the beginning flow rate to the nearest tenth of liter/minute (should be adjusted to 5 liter/minute, if needed)
- the hours shown on the elapsed time totalizer after the intial flow rate check;
- periodic checks of the rotameter throughout the sampling day; and
- any maintenance procedures.

All daily MINIVOL Monitoring Logs will be maintained on-site and made available to EPA's on-site, oversight representative at his/her request. Copies of the daily logs, and all data print-outs from the monitors will be maintained on file at the Supervising Contractor's office.

MINIVOL MONITORING LOG

Date: ______
Location: ______
Sampler ID: ______
Filter No. ______
Battery No. ______
Operator: ______

Parameters	Start	End	Units
Atm Pressure			(mmHg)
AmbTemp			(°C)
Clock Time			
Elap Time			(hours)
RotoFlow			(lpm)

Comments:

Date: ______
Location: ______
Sampler ID: ______
Filter No. ______
Battery No. ______
Operator: ______

Parameters	Start	End	Units
Atm Pressure			(mmHg)
AmbTemp			(°C)
Clock Time			
Elap Time			(hours)
RotoFlow			(lpm)

Comments:

Date: ______
Location: ______
Sampler ID: ______
Filter No. ______
Battery No. ______
Operator: ______

Parameters	Start	End	Units
Atm Pressure			(mmHg)
AmbTemp			(°C)
Clock Time			
Elap Time			(hours)
RotoFlow			(lpm)

Comments:

Date: ______
Location: ______
Sampler ID: ______
Filter No. ______
Battery No. ______
Operator: ______

Parameters	Start	End	Units
Atm Pressure			(mmHg)
AmbTemp			(°C)
Clock Time			
Elap Time			(hours)
RotoFlow			(lpm)

Comments:

FIELD AUDIT WORKSHEET FOR AN AIRMETRICS MINIVOL SAMPLERS
(Using Bubble or Dry Flow Calibrators)

Project _____
Audit Site _____
Baro. Pressure (P_a) _____ mmHG
Temp. (T_a) _____ (°C) _____ (°K)
[1]Vapor Pressure (P_v) _____ mm Hg
Site Elevation _____
Date/Time _____
Auditor _____

	Make	Model	S/N
Sampler	Airmetrics	MINIVOL	
Barometer			
Thermometer			
Cal. Device			
& Chamber			

	Sampler Flow Indication (Rotameter Setting) [X] (LPM)					
	4.0	4.5	5.0	5.5	6.0	6.5
Flow Meter Readings (Actual LPM)						
Average Flow Rate (Q_u) [2] (uncorrected) (LPM)						
Average Corrected Flow Rate (Q_c) (LPM) [Y]						
Percent Diff. of Indicated from Audit						

[1] P_v: Vapor pressure of water. Use only for soap bubble meters.

[2] For Conditions with relative humidity less than 50%, flows measured by a soap bubble meter must be corrected by the following formula: $Q_c = Q_u (P_a - P_v)$

Sampler Calibration Relationship:

m (slope) = _____ b (y-intercept) = _____
r (corr. Coef.) = _____

Percent Difference = $\frac{\text{(Indicated - Calibration)}}{\text{Calibration}} * 100$

Signature: _____ Date: _____

Tabbed Page: Appendix F

APPENDIX F

CONSTRUCTION QUALITY ASSURANCE PLAN

CONSTRUCTION QUALITY ASSURANCE PLAN
FOR RESIDENTIAL REMEDIATION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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TABLE OF CONTENTS

1.0 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) presents requirements for quality assurance (QA) inspection and testing of remedial action construction at the Off-Facility Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site located in the north-central section of Denver, Colorado.

The United States Environmental Protection Agency (USEPA) is the lead agency responsible for remediation of the VB/I70 site. USEPA will identify an independent third party, possibly the U.S. Army Corps of Engineers or an engineering contractor, to serve as the Supervising Contractor for remediation construction. This CQAP specifies procedures to provide for compliance with the remedial design to be performed by the Supervising Contractor's Field Project Supervisor and Environmental Quality Assurance Official. It also provides a brief summary of Quality Control (QC) procedures to be utilized by the construction contractor(s) to achieve compliance with the plans and specifications. This CQAP is supported by and included as an appendix to the Remedial Design Work Plan.

2.0 PROJECT ORGANIZATION AND SUPPORTING INFORMATION

This section provides an overview of the relationships between the project participants and their respective roles and responsibilities during preparation for and implementation of the remedial action construction at the site. A list of the key participants follows:

USEPA: Overall responsibility for remedial actions at the VB/I70 site.

Supervising Contractor: Represents USEPA during construction and has overall responsibility for management and documentation of remedial actions, to provide for compliance with project requirements and achievement of project objectives.

Construction Contractor: Independent, qualified contractor retained by USEPA or the Supervising Contractor to carry out the remedial actions in accordance with approved designs and work plans.

USEPA's Work Assignment Manager (WAM) is to be determined. The Project Manager (PM) for the Supervising Contractor will be identified prior to construction. The PM for the Supervising Contractor will report directly to the USEPA WAM. A full-time onsite Field Project Supervisor (FPS) for the Supervising Contractor will be determined prior to construction. The FPS will have authority as USEPA's representative onsite, and will report directly to the Supervising Contractor's PM. The FPS will be responsible for day-to-day inspection and management of remediation activities to provide for compliance with the project plans and specifications and will document all inspections and work progress for compliance and for construction contract administration purposes. The FPS will also coordinate all quality assurance (QA) activities performed by third parties to provide for compliance with the project plans and specifications.

All contractor technical submittals and project design changes will be routed through the PM for review and approval, and all design or scope changes will be subject to review and approval by the PM and WAM. All major project change orders will be subject to review by the PM based on recommendations from the WAM.

An Environmental Quality Assurance Official (EQAO) will be identified by the Supervising Contractor prior to construction. The EQAO will be responsible for ensuring that the testing procedures are performed in accordance with this CQAP and will consult with the FPS to confirm that the field procedures are performed in accordance with the design. The EQAO's duties will include reviewing documentation of field sampling procedures, verifying that the laboratory is adhering to project specifications, and working with the laboratory to identify the need for corrective measures and their completion.

3.0 REMEDIAL ACTION CONSTRUCTION

This section describes the procedures and testing frequencies to be used in achieving project quality assurance/quality control (QA/QC) as specified in the Construction Technical Specifications (Appendix G of the Remedial Design Work Plan). In this CQA Plan, quality control (QC) refers to the procedures, methods and tests utilized by the Construction Contractor to achieve compliance with the plans and specifications, and quality assurance (QA) refers to the site inspection, checks and tests performed by the Supervising Contractor to ensure that the substantive requirements and intent of the plans and specifications are met. Quality Control requirements are described herein, because QA activities include inspection of the QC tests and performance of QA tests at a lesser frequency.

3.1 Quality Control (Construction Contractor's Responsibility)

This section describes the Construction Contractor's responsibilities for QC during preparation for and implementation of the remedial actions. The Construction Contractor shall be responsible for all QC requirements specified in this section and the Construction Technical Specifications, including functions delegated to subcontractors.

3.1.1 Pre-Remediation Construction Characterization

The Construction Contractor will not participate in the pre-remediation characterization activities and will not be responsible for any QC functions during this phase of the project. All pre-remediation construction activities will be performed by the Supervising Contractor as described in Section 3.2.1.

3.1.2 Remediation Construction

The primary QC procedures to be utilized by the Construction Contractor during remediation construction include the use of adequately skilled personnel for the work being performed and compliance with the Construction Contract Documents. In addition, the contractor

will be required to perform periodic level and survey controls and material testing to achieve compliance with the plans and specifications. These QC requirements are summarized on Table 3-1 and discussed below.

Pre-and post-excavation construction (elevation) surveys will be required to demonstrate that the minimum excavation depth of 12-inches has been achieved. The Construction Contractor will establish elevation control points within and around the perimeter of each area to be excavated at a minimum frequency of one control point per 500 square feet or a minimum of three points per excavation. Pre- and post-excavation elevations at each control point will be determined to within +/- 0.1 feet and the calculated net difference will be used to demonstrate compliance with the minimum excavation depth.

The Construction Contractor will continuously monitor the active excavation and contaminated material handling areas for visible dust. Additional dust control measures will be implemented if visible dust emissions are observed or as otherwise required by the Supervising Contractor.

Physical and chemical testing of the replacement materials will be required for construction QC. Representative samples of the proposed replacement materials will be tested prior to initial source approval. As shown on Table 3-1, physical tests for the replacement materials will include texture/grain-size by the American Society for Testing and Materials (ASTM) method D422, to demonstrate that the materials meet the minimum material specifications. Chemical tests for the replacement soils will include analyses for metal, pesticide, polychlorinated biphenyl (PCB), semi-volatile and volatile constituents by USEPA-approved methods (see Table 3-1) to demonstrate that the materials meet the replacement material chemical criteria (Table 2-1 in the Remedial Design Work Plan). Chemical tests for the replacement gravel will include analyses for arsenic and lead by USEPA-approved methods.

Following initial material and source approval, on-going quality control testing of the replacement materials will be performed. Samples of each material will be collected at a rate of one sample per 1,000 cubic yards (cy) for arsenic and lead analyses to confirm that the

concentration of these constituents meet the replacement material criteria. These values are listed on Table 2-1 of the Remedial Design Work Plan. Samples for on-going testing of the physical parameters will be collected and analyzed at a rate of one sample per 5,000 cy to demonstrate continued compliance with the material specifications. In addition, the Supervising Contractor may request supplemental quality control samples for physical and chemical testing if changes are observed in the material consistency.

Quality control measures for replacement vegetation will include review and submittal of supplier certificates, material safety data sheets (MSDSs), and manufacturer -provided information regarding material use. These information sources will be reviewed for initial approval of the materials and on-going construction QC.

3.2 Quality Assurance (Supervising Contractor's Responsibility)

The primary QA procedures to be performed by the Supervising Contractor will include full-time inspection of the construction by the FPS with periodic inspections by the PM. All procedures, materials, and equipment used in the construction will be observed and monitored by the FPS on a daily basis. All QC data supplied by the Construction Contractor will be reviewed for testing adequacy and compliance with the plans and specifications. QC data or installed elements that are not in compliance with the plans and specifications will be reworked or replaced by the Construction Contractor so that the element is in compliance. All QC data and information supplied by the Construction Contractor will be documented by the FPS to allow complete project tracking of all components of the construction. Site project meetings will be held as necessary with the Construction Contractor, the FPS and oversight personnel to discuss work progress, QA/QC issues and upcoming work to maintain the overall project quality.

3.2.1 Pre-Remediation Construction Characterization

In preparation for remediation construction, soil samples will be collected to further characterize select gardens and flowerbeds, to identify the composition of existing yard soils, and to characterize the residential yard soils for disposal purposes. Details of the pre-remediation sampling activities are summarized on Table 3-1 and discussed below.

Soil samples will be collected from gardens and flowerbeds identified by the property owners during the initial visit to scope the property remediation activities. Gardens and flowerbeds for which property owners express a strong desire to preserve will be sampled to determine if the soil lead or arsenic concentrations exceed the Site residential action levels. Based on the sampling results, flowerbeds and gardens with soil arsenic and/or lead concentrations at or above the action level will be remediated while those with soil concentrations below the action level will be preserved. The flowerbed and garden characterization samples will be collected and analyzed by the Supervising Contractor in accordance with the procedures specified in Section 4.0.

Soil samples will be collected and analyzed to characterize the existing yard soils and support an evaluation of the composition requirements (i.e., percent clay, silt, and sand) for the replacement soil. A representative subset of yards scheduled for remediation will be sampled to assess the composition of the existing yard soils. Results of these analyses will be used to identify acceptable composition limits for the replacement soil. The yard composition samples will be collected and analyzed by the Supervising Contractor as described in Section 4.0.

Samples of the soil to be removed will be collected and analyzed to assist in identifying suitable disposal alternatives for the materials. Representative in-place composite samples will be collected from yards scheduled for remediation according to the procedures specified in Section 4.0. The samples will be analyzed for leachable metal, pesticide, herbicide, semi-volatile, and volatile constitutes in order to support classification of the material as solid waste. Results of the analyses will be used to identify a suitable disposal site(s) for the materials.

3.2.2 Remediation Construction

As discussed in Section 3.1.1, measurement of the depth of the required excavation areas will be evaluated through construction elevation surveys to be performed as part of the Construction Contractor's QC testing. The Supervising Contractor will review the raw data and calculations generated by the surveys and will visually observe the excavations for compliance

with the extent and depth requirements. The general observations will be supplemented by random spot checks of the excavation sidewall depths by yardstick, tape measure or level. Interior grade stakes may be specified at the discretion of the FPS. Where interior grade stakes are used, the areas around the stake will be excavated to the required depth while preserving the original grade at the stake. The elevation difference between the original and final grades will then be measured by yardstick, tape or level to confirm that the required excavation depth has been achieved. Once the excavation depth has been confirmed, the soil around the grade stake will be excavated flush with the finished grade of the excavation. The Supervising Contractor will record the results of all quality assurance measurements.

The Supervising Contractor will monitor the active work areas for fugitive dust emissions. Monitoring will include use of field instruments and collection and analysis of laboratory samples. Details of the dust monitoring program are specified in Section 4.0 and the Fugitive Emissions Dust Control Plan (Appendix E of the Design Work Plan).

The physical and/or chemical properties of the replacement soils and gravel materials will be identified through quality control testing by the Construction Contractor, as described in Section 3.1.1. The Supervising Contractor will review the laboratory testing reports provided by the Construction Contractor to confirm that the materials meet the replacement materials chemical criteria (Table 2 -1 of the Remedial Design Work Plan) prior to approving the material sources. If the testing results indicate that the materials do not meet project requirements, the Construction Contractor will provide testing results for alternative sources until suitable materials are identified.

Once acceptable material sources have been identified, the Supervising Contractor will routinely monitor the replacement materials as they are brought to work area for changes in consistency. If changes in the material consistency are observed, the Supervising Contractor will direct the Construction Contractor to collect additional samples to confirm the material's physical and chemical characteristics.

As indicated in Section 3.1.1, the Construction Contractor will sample and analyze the replacement materials (soil and gravel) for arsenic and lead at 1,000 cy intervals. The Supervising Contractor will review these results to confirm on-going acceptability and collect its own quality assurance samples for arsenic and lead analyses with every fifth QC sample. In conjunction with the QA samples for arsenic and lead, the Supervising Contractor will also collect samples of the soils for additional metal, pesticide, PCB, semi-volatile and volatile criteria constituent analyses to provide continuing confirmation that the replacement materials meet the replacement material chemical criteria (Table 2-1 of the Remedial Design Work Plan). Further details of the sampling and analysis procedures for the QA samples are discussed in Section 4.0.

Quality assurance for the replacement vegetation will include reviewing the labels, certificates, MSDSs and manufacturer's recommendations submitted by the Construction Contractor to verify that the materials meet the specifications. The Supervising Contractor will also visually observe and confirm that the vegetation materials and procedures meet the project requirements and are conducted in accordance with the manufacturer's recommendations, where applicable. In addition, the restored properties will be inspected by the Supervising Contractor on or shortly before the final day of the post-remediation maintenance/watering period to confirm that all replacement vegetation is in good condition.

4.0 ENVIRONMENTAL SAMPLING AND ANALYSIS

This section describes the environmental sampling and analysis procedures, including quality assurance requirements to support implementation of the remedial actions. Environmental sampling tasks to be performed in support of remedial construction actions will include:

- Sampling and analysis of soil from select gardens and flowerbeds to identify areas that warrant removal and replacement;
- Sampling and analysis of soil from select residential yards to support evaluation of the replacement soil composition requirements;
- Sampling and analysis of materials to be removed from the residential yards to support classification of the materials for disposal;
- Sampling and analysis of the replacement materials to confirm that they meet the Site clean soil criteria and verify the Construction Contractor's quality control sample results; and
- Sampling and analysis of ambient dust collected as part of the air monitoring program to assess air quality.

This plan briefly describes sampling and analysis of dust to assess fugitive emissions. Details are provided in the Fugitive Emissions Dust Control Plan (Appendix E to the Remedial Design Work Plan). Analyses of samples for health and safety purposes will be addressed in the Construction Health and Safety Plan. The Construction Health and Safety Plan will be prepared by the Construction Contractor (see Technical Specifications; Appendix G of the Remedial Design Work Plan).

4.1 Project Responsibilities

Key positions of the environmental quality assurance team are the EQAO, the Project Chemist and the Laboratory Quality Assurance Officer (LQAO). The individuals who will fill the environmental quality assurance team roles will be designated by the WAM or the Supervising Contractor's PM prior to initiating the pre-remediation sampling or remediation construction.

The EQAO will be responsible for ensuring that the analytical procedures are performed in accordance with this CQAP and will consult with the FPS to confirm that the field procedures are performed in accordance with the plan. The EQAO's duties will include reviewing documentation of field sampling procedures, verifying that the laboratory is adhering to project specifications and working with the laboratory if corrective measures are necessary and require resolution. The EQAO may assist the Project Chemist in performing data evaluation or validation, if necessary. The EQAO will discuss any systematic errors or other anomalous data with the Supervising Contractor's PM and FPS. If corrective actions are necessary, the EQAO will be responsible for confirming that they are initiated and completed.

The Project Chemist will be responsible for coordinating with the laboratory regarding analytical requirements and scheduling. Upon receipt of the analytical data, the Project Chemist will perform the necessary data evaluation or validation (refer to Section 4.7); the EQAO may assist the Project Chemist in this function, if necessary. The Project Chemist will also provide support to the FPS and the EQAO regarding issues concerning sample collection, handling and storage.

The LQAO is responsible for all aspects of the sample analyses. The LQAO will be responsible for ensuring that sample holding times and custody requirements are met, overseeing the analyses, confirming that the laboratory QA requirements are met, and reviewing the data packages prior to distribution. The LQAO will coordinate with the Project Chemist regarding any issues related to the sample analyses.

4.2 *Sampling Objectives and Procedures*

This section describes the sampling objectives and procedures for the four types of environmental sampling to be performed to support the remedial action.

4.2.1 Garden and Flowerbed Sampling

At the request of an individual property owner, pre-remediation sampling and analysis of select gardens and flowerbeds will be conducted to determine if the flowerbed and garden soils

contain arsenic and/or lead in concentrations that exceed the Site residential action levels. Sampling will generally be conducted in gardens and flowerbeds that the property owners wish to exclude from the overall yard remediation program. Analytical results for the samples will be used by the PM to determine if the flowerbeds and gardens can be excluded or if they must be removed and replaced during property remediation.

Samples will be collected from the gardens and flowerbeds on a property-by-property basis. One composite sample will be collected from each garden and/or flowerbed identified for sampling. The garden or flowerbed will be divided into two approximately equal -area units and a soil core from the 0-2 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil will then be thoroughly blended and the sample will be collected from the composited material.

The samples will be analyzed using inductively coupled plasma (ICP) atomic emission spectrometry (USEPA SW-846 Method 6010). An analytical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the garden and flowerbed soil samples are provided in Section 4.4.

4.2.2 Yard Soil Composition Sampling

Soil samples will be collected from a subset of the residential yards scheduled for remediation to characterize the existing yard soils and support an evaluation of the composition requirements (i.e., percent clay, slit and sand) for replacement soil.

One soil sample will be collected from ten residential properties to be remediated. To provide for the results to be representative of the site, samples will be collected as follows: 2 from the Cole neighborhood; 2 from the Clayton neighborhood; 3 from the Elyria neighborhood (at least one from north and south of I-70); and 3 from the Swansea neighborhood (at least one from north and south of I-70). Within each neighborhood, the Supervising Contractor will select properties that are spatially distant from each other to provide data across the site. More samples

will be collected from Elyria and Swansea because they are greater in area than Cole and Clayton. At each selected property, soil will be uniformly retrieved over the 0 -12 inch depth interval at a single location near the center of the yard.

Each sample will be analyzed for clay, silt and sand content according to ASTM method D-422, or other suitable method. A geotechnical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the soil samples are provided in Section 4.4.

4.2.3 Disposal Characteristics Sampling

Samples of materials to be removed from the residential yards will be collected and analyzed to support classification of the materials for disposal. The purpose of the sampling is to measure the concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents in sample leachate to determine if the materials may be managed as solid waste.

One composite sample will be collected for every twenty residential properties. The composite sample will be prepared by randomly selecting four of the properties for sampling. At each property, the planned excavation area will be divided into four approximately equal area sampling units. Soil cores from the 0 -12 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil from all four properties will then be thoroughly blended and the sample will be collected from the blended material.

Each sample will be extracted using the appropriate Toxicity Characteristic Leaching Procedure (TCLP) extraction procedure (USEPA SW-846 Method 1311) and analyzed for metals (Method 6010B/7470), pesticides (Method 8081A), herbicides (Method 8150), semi-volatiles (Method 8270) and volatiles (Method 8260). An analytical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the disposal characteristics soil samples are provided in Section 4.4.

4.2.4 Sampling of Replacement Materials

Samples of each type of replacement material (soil and gravel) used in property restoration will be collected and analyzed to confirm that the materials meet the replacement material chemical criteria (Table 2-1 in the Remedial Design Work Plan). The sample results will also be used to verify the Construction Contractor's quality control sample data for arsenic and lead concentrations in the replacement materials.

Samples will be collected from each type of replacement material at a rate of one sample per 5,000 cubic yards of material used. Each sample will be collected as a single grab sample collected from the transport truck carrying the material, a material stockpile or directly following placement during restoration.

The soil samples will be analyzed for the replacement material chemical criteria metals (Method 6010B/7470), pesticides (Method 8081A), semi-volatiles (Method 8270), volatiles (Method 8260), and PCBs (Method 8082). The laboratory will only report the concentrations of the specified replacement material chemical criteria constituents. The gravel samples will be analyzed for arsenic and lead (Method 6010B). An analytical laboratory identified by the *Supervising Contractor and approved by the WAM will analyze the samples.* Specific procedures regarding collection, preparation and analysis of the replacement soil samples are provided in Section 4.4.

4.2.5 Sampling of Ambient Dust

The effectiveness of dust control measures in meeting air quality standards will be evaluated using real-time monitoring equipment and laboratory analysis of dust samples. The real-time monitoring equipment will be used to determine the immediate effectiveness of fugitive dust control measures. Exceedances of the established action levels for PM_{10}, $PM_{2.5}$, lead or arsenic, will trigger the implementation of additional dust control measures or temporary suspension of activities. At the same time, filter samples of the ambient dust will also be collected and analyzed for lead and arsenic. These data will be used to document compliance

with the air quality standards; help identify the source and nature of the dust; and assess the potential for offsite, airborne transport of arsenic and lead.

Sampling objectives for dust monitoring are described in detail in the Fugitive Emissions Dust Control Plan (Appendix E to the Remedial Design Work Plan).

4.3 Quality Assurance Objectives

The project QA objectives are directly tied to the data needs and data uses described in Section 4.2. Prior to and during construction, environmental samples will be collected for the following: (1) identify if select flowerbeds and gardens warrant removal and replacement; (2) support an evaluation of the replacement soil composition requirements; (3) support classification of the materials to be removed for disposal purposes; (4) confirm that the replacement materials meet the project quality requirements and verify the replacement material quality control sample results, and (5) assess ambient dust for comparison to action levels. The QA objectives for these types of data, including acceptable levels of precision, accuracy, representativeness and comparability, are described below. Data that meet their stated QA objectives will be of appropriate quality for use in managing construction-related activities at the site.

4.3.1 Garden and Flowerbed Sampling

Soil samples will be collected from select gardens and flowerbeds to determine if they contain soil with arsenic or lead concentrations at or above the residential action level, and therefore, warrant removal and replacement during the remediation action. A sampling plan has been designed to provide representative samples from each flowerbed and garden sampling unit, as described in Section 4.2.1. The sampling plan provides a sufficient number of samples from which to describe mean arsenic concentration in the flowerbed and garden soils. The arsenic and lead concentrations measured in each flowerbed and garden sampling unit will be compared to the Site residential action levels for arsenic and lead. The sampling plan has been designed to result in collection of samples that are representative of Site conditions using consistent methods to provide comparable results.

The contract laboratory will analyze the soil samples for arsenic and lead by ICP. Table 4-1 provides the precision, accuracy, quantitation limit, and completeness objectives for arsenic and lead analyses of soil samples by ICP. The representativeness of laboratory analyses will be evaluated from analyses of blanks, including equipment blanks and method blanks.

4.3.2 Yard Soil Composition Sampling

Samples of the existing soil in a portion of the yards scheduled for remediation will be collected and analyzed for composition (i.e., percent clay, silt, and sand) to support an evaluation of the composition requirements for the replacement soil. A sampling plan has been designed to provide representative samples of the soil to be removed, as described in Section 4.2.2. The sampling plan provides representative samples that describe the composition of the existing yard soils. Sample results will be plotted on a textural triangle and used by the Supervising Contractor to identify composition requirements for acceptable replacement soil. The sampling plan has been designed to result in collection of samples that are representative of the target material using consistent methods to provide comparable results.

The selected geotechnical laboratory will analyze the samples by the method specified on Table 4-1.

4.3.3 Disposal Characteristics Sampling

Samples of the soils to be removed during property remediation will be collected and analyzed for leachate concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents to support management of the material as solid waste. A sampling plan has been designed to provide representative samples from the areas to be removed, as described in Section 4.2.3. The sampling plan provides representative samples that describe the concentrations of the target leachate constituents in the materials scheduled for removal. The measured leachate concentrations will be compared to the toxicity characteristic concentration thresholds for hazardous waste (40 CFR 261), and materials with leachate concentrations that exceed the

threshold concentrations will be identified as hazardous waste. The sampling plan has been designed to result in collection of samples that are representative of the target materials using consistent methods to provide comparable results.

The contract laboratory will analyze the samples by the specified methods. The precision, accuracy, quantitation limit, and completeness objectives for the analyses are listed on Table 4-1.

4.3.4 Replacement Material Sampling

Samples of the replacement soil used in property restorations will be collected and analyzed for metal, pesticide, semi-volatile, volatile and PCB criteria constituents to confirm that the materials meet the replacement material chemical criteria. Samples of the replacement gravel will be collected and analyzed for arsenic and lead. A sampling plan has been designed to provide representative samples of the replacement materials, as described in Section 4.2.4. The sampling plan provides a sufficient number of samples from which to describe the concentrations of the target constituents in the replacement materials. The constituent concentrations will be compared to the replacement material chemical criteria to confirm that the replacement materials are acceptable. The sampling plan has been designed to result in collection of samples that are representative of each type of replacement material using consistent methods to provide comparable results.

The contract laboratory will analyze the samples by the specified methods. The precision, accuracy, quantitation limit, and completeness objectives for the analyses are listed on Table 4-1.

4.3.5 Sampling of Ambient Dust

Ambient air monitoring will be performed during construction activities to produce two types of data for evaluating the effectiveness of dust control measures:

- Real time TSP concentration data (which will provide estimates of PM_{10} and $PM_{2.5}$ lead and arsenic concentrations); and
- Arsenic and lead concentration data from TSP samples.

These data will be used for direct comparison to action levels for PM_{10}, $PM_{2.5}$, lead and arsenic and to identify when additional dust control measures are necessary. The Fugitive Emissions Dust Control Plan (Appendix E to the Remedial Design Work Plan) provides details of monitoring activities, including quality assurance objectives.

4.4 Sampling Procedures

4.4.1 Garden and Flowerbed Sampling

As discussed in Section 4.2.1, one composite sample will be collected from each flowerbed and garden identified for sampling. The composite sample will be collected by dividing the flowerbed or garden into two approximately equal-area units, and a soil core from the 0-2 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil will then be thoroughly blended and the sample will be collected from the blended material. Specific procedures and protocols to be used to collect the samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A). Information in the SOP includes procedures for delineation of sampling units, sample collection, sample preparation, documentation and equipment decontamination.

4.4.2 Yard Soil Composition Sampling

Samples of the soil in a subset of the yards scheduled for removal will be collected and analyzed to assess its composition of clay, silt and sand. One soil sample will be collected from 10 residential properties across the site. To provide for the results to be representative of the site, samples will be collected as follows: 3 from the Cole neighborhood; 3 from the Clayton neighborhood; 1 from the Elyria neighborhood; and 3 from the Swansea neighborhood (at least

one from north and south of I-70). Within each neighborhood, the Supervising Contractor will select properties that are spatially distant from each other to provide data across the site.

At each selected property, soil for the sample will be uniformly retrieved over the 0 to 12 inch depth interval at a single location near the center of the yard. Specific procedures and protocols to be followed while collecting the samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A).

4.4.3 Disposal Characteristics Sampling

As discussed in Section 4.2.3, samples of the yard soils to be removed will be collected and analyzed for leachate constituents to support management of the material as solid waste. One composite sample will be collected for every twenty residential properties. The composite sample will be prepared by randomly selecting four of the properties for sampling. The four properties will be identified by numbering the properties from one to twenty and using a spreadsheet-based random number generator to select four properties.

At each of the four properties, the planned excavation area will be divided into four approximately equal-area sampling units. Soil cores from the 0-12 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil from all four sampling locations in the four properties will then be thoroughly blended and the sample will be collected from the blended material. Specific procedures and protocols to be followed while collecting the soil samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A).

4.4.4 Replacement Material Sampling

Samples of the replacement materials (soil and gravel) will be collected and analyzed to confirm that the materials meet the Site clean replacement material chemical criteria and verify the quality control sample results.

Samples will be collected from each type of replacement material at a rate of one sample per 5,000 cubic yards of material used. Each sample will be collected as a single grab sample collected from the transport truck carrying the material, a material stockpile or directly following placement during property restoration. Specific procedures and protocols to be followed while collecting the confirmation soil samples are described in the Standard Operating Procedure for Sampling Replacement Materials (Attachment A).

4.4.5 Sampling of Ambient Dust

Details of sampling procedures for ambient dust are provided in the Fugitive Emissions Dust Control Plan (Appendix E to the Remedial Design Work Plan).

4.5 Sample Custody

After samples have been collected, they will be maintained under strict chain-of-custody procedures. The procedures described below document the transfer of custody of the samples from the field to the designated analytical laboratory and the associated documentation requirements. The field sampling personnel will complete a Chain-of-Custody Record and Request for Analysis (CC/RA) form for each shipping container (i.e., cooler or other container) of samples to be sent to the laboratory for analysis. The CC/RA for a shipping container will list only those samples in that shipping container. Information contained on the triplicate carbonless CC/RA form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;

- Method of shipment;
- Carrier/waybill number (if any);
- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is being transferred;
- Date and time of sample custody transfer; and
- Condition of samples upon receipt by laboratory.

The sample collector will cross out any blank space on the CC/RA below the last sample number listed (on the part of the form where samples are listed). A sample label will be affixed to each sample container. The label will be protected with a layer of clear tape, and each container will be sealed using custody seals. Each container will be carefully packaged in a shipping container (typically an ice chest) with Styrofoam peanuts, vermiculite or other packing material, if necessary, to prevent breakage during shipment. Custody seals will be signed and dated by the sample custodian prior to shipment. If the custody seal is broken, the LQAO will immediately notify the Project Chemist.

The sampling personnel whose signature appears on the CC/RA is responsible for the custody of the sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting the sample to the designated laboratory. The sample is considered to be in custody when the sample is: (1) in the direct possession of the sample custodian; (2) in plain view of the sample custodian; or (3) is securely locked in a restricted access area by the sample custodian.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA under "Relinquished by" and "Received by." Signatures, printed names, company names, date and time are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain the third sheet (pink copy) of the CC/RA. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA. Copies, receipts or carbons of Bills of Lading will be retained as part of the permanent documentation in the project file. It is not necessary for courier personnel to sign the CC/RA. When the samples are received by the

laboratory, the CC/RA will be immediately signed along with the date and time of receipt. The top sheet (white copy) of the CC/RA will be returned to the Supervising Contractor with the final analytical report.

4.6 Analytical Procedures and Calibration

4.6.1 Analytical Parameters and Methods

The samples will be analyzed for the specified parameters according to the methods listed on Table 4-1. Sample container requirements, preservatives and holding times for the samples are listed on Table 4-2. The specified methods provide data of appropriate quality for comparison to the respective decision criteria.

Flowerbed and garden samples will be analyzed for arsenic and lead by ICP analysis (Method 6010B) following a complete digestion based on USEPA Method 3052 (microwave or hot plate). Equipment blank samples from flowerbed and garden sampling will also be analyzed for arsenic and lead by ICP (Method 6010B).

Samples of the yard soils collected for composition analysis will be analyzed by ASTM Method D-422, or an equivalent method.

Samples collected to support classification of the materials for disposal will be extracted using the appropriate TCLP extraction procedure (Method 1311) and analyzed for metals (Method 6010B/7470), pesticides (Method 8081A), herbicides (Method 8150), semi-volatiles (Method 8270) and volatiles (Method 8260).

Samples of the replacement soil will be analyzed for the replacement material chemical criteria metals (Method 6010B/7470), pesticides (Method 8081A), semi-volatiles (Method 8270), volatiles (Method 8260), and PCBs (Method 8082). Samples of the replacement road base and gravel will be analyzed for arsenic and lead (Method 6010B).

The filters used to collect TSP dust samples will be weighed by the laboratory prior to and after use in order to perform the gravimetric analysis. The filters will then be digested and analyzed for lead and arsenic by USEPA method 6020 (ICP-MS). Additional information concerning the analysis of the dust samples is included in Fugitive Emissions Dust Control Plan (Appendix E of the Remedial Design Work Plan).

4.6.2 Field Calibration Procedures

Field instruments will be calibrated prior to use and at prescribed intervals while in use. Procedures for calibration of instruments will be the standard operating procedures as outlined in the owner's manuals for the specific field instruments.

4.6.3 Preventative Maintenance

Field equipment will be inspected, visually and functionally, prior to each day's use at a minimum. Preventive maintenance activities will be documented in the field log book, and will identify the equipment and specify the maintenance tasks completed.

4.7 Data Reduction, Validation and Reporting

4.7.1 Field Measurement Data

Field measurements will be obtained from the MiniRAM sampler during remedial construction activities. Details concerning the collection, management, and evaluation of the data obtained from the MiniRAM sampler are provided in the Fugitive Emissions Dust Control Plan (Appendix E of the Remedial Design Work Plan).

4.7.2 Laboratory Measurement Data

Laboratory calculations and data review by the laboratory will be performed in accordance with procedures prescribed by the specific analytical method. The laboratory will

review the results of laboratory QC analyses, instrument calibration and maintenance records, calculations, and the record of sample custody (including holding times) within the laboratory. The laboratory data packages will include:

- Copies of the Chain-of-Custody records;
- Sample results and units;
- Date analyzed;
- Analytical method;
- Quantitation limits;
- Laboratory QC results (laboratory control samples, matrix spikes, etc.); and
- Method blank result.

The data packages from the analyses will be used for validation and will also include back-up information concerning instrument calibration, sample preparation, sample run logs, and analytical raw data. Analytical data packages will be sent directly from the laboratory, in a hard-copy format, to the Project Chemist. The data will be reviewed by the Project Chemist or EQAO, as described below, and will be reported as described in Section 4.7.5.

4.7.3 Data Review and Evaluation

Upon receipt of the analytical results and data packages from the laboratory, the data will be reviewed by the Project Chemist or the EQAO for accuracy, precision, and completeness. The analytical data will be reviewed for the following items:

- Analyses performed and sample identifications conform to the information on the Chain-of-Custody records;
- Sample holding times;
- Specified quantitation limits (Table 4-1);
- Laboratory QC results (laboratory control samples, matrix spikes) meet measurement objectives (Table 4-1);
- Target analyte concentrations in method and equipment blanks; and
- Reproducibility of field duplicate results.

Data that satisfy the quality assurance objectives for this project will be considered usable for comparison to the appropriate standards identified in Section 4.2. If anomalies or nonconformances are discovered, the laboratory will be instructed to review the submitted data and the methods used to obtain the data. Laboratory or field QC sample results that do not meet the QA objectives will be evaluated to determine whether the sample data are usable. Corrective actions, as necessary, will be implemented per the procedures described in Section 4.11.

4.7.4 Data Validation

The data obtained from the analyses will be validated according to the procedures provided in the USEPA Functional Guidelines for Inorganic Data Review (USEPA, 1994) or the USEPA Functional Guidelines for Organic Data Review (USEPA, 1999). If anomalies or nonconformances are discovered, the laboratory will be instructed to review the submitted data and the methods used to obtain the data. Laboratory QC or field QC sample results that do not meet the QA objectives will be evaluated to determine whether the data are potentially biased and whether data qualifiers should be applied. Corrective actions will be implemented, as necessary, per the procedures described in Section 4.11. Unless rejected by the data validator, all validated data will be considered usable for comparison to the applicable standards. Data rejected by the data validator will not be considered usable.

4.7.5 Data Management and Reporting

Field measurements and laboratory analytical results will be presented in the monthly and annual progress reports. The laboratory data will be tabulated to include the following:

- Sample location;
- Sample identification;
- Date of sample collection;
- Analytical method;
- Analytes and measured concentrations;
- Quantitation limits; and

- Laboratory qualifiers.

Copies of field and laboratory reports will be maintained by the Supervising Contractor during the course of the project at the site.

4.8 Internal Quality Control Checks

Internal QC will be achieved by collecting and/or analyzing a series of field and laboratory QC samples to ensure that the analytical results meet the measurement objectives detailed in Section 4.3. Results from analyses of QC samples are used to quantify precision and accuracy and identify any problems or limitations of those data.

4.8.1 Field Quality Control Checks

Field QC will be controlled by compliance with standard sample collection and handling methods and by the periodic collection of field QC samples. QC samples will be collected as blind samples so that the laboratory remains unaware of the nature of those samples and performs analyses identically to the sample analyses. The appropriate types and frequency of field QC samples depend on the sample type, sample matrix and intended data use.

Three types of quality control samples will be collected during construction-related environmental sampling: equipment blanks, field duplicates, and air filter blanks.

Equipment blanks consist of analyte-free reagent water (i.e., ASTM Type II) poured through the sampling device or equipment, collected in a clean sampling bottle, preserved as needed, and analyzed with the samples. Equipment blanks may be used to demonstrate that sampling devices have been adequately cleaned between uses and provide representative samples.

A field duplicate sample is a second sample collected at the same location as the original sample. It is collected simultaneously with or in immediate succession to the original sample using identical recovery techniques, and it is treated in an identical manner during storage, transportation and analysis. Field duplicate sample results may be used to provide a measure of

method variability, including both sampling and analytical precision. Field duplicates will be collected for dust samples, as described in the Fugitive Emissions Dust Control Plan (Appendix E of the Remedial Design Work Plan).

An air filter blank consists of an air filter that has not been exposed to air drawn through the sampler. The filter blank is prepared from an unused filter that has been pre-weighed by the laboratory. The filter blank is submitted for analysis in an identical manner as the filters used for sampling, and it is analyzed for the same parameters as the sample filters. Filter blank results describe the background TSP and arsenic and lead concentrations of filters used to collect ambient dust and may be used to assess bias introduced as a result of measurement error or blank concentrations.

4.8.1.1 Garden and Flowerbed Samples

Equipment blanks will be collected with the flowerbed and garden samples. Equipment blanks will be collected by pouring reagent water through the decontaminated re-usable equipment used to obtain and composite soil subsamples (e.g., soil scoops and mixing bowls). One equipment blank will be collected with every 20 soil samples submitted for laboratory analysis. Equipment blanks associated with flowerbed and garden sampling will be analyzed for arsenic and lead.

4.8.1.2 Yard Soil Composition Sampling

No field QC samples will be collected during the yard composition sampling.

4.8.1.3 Disposal Characteristics Samples

No field QC samples will be collected with the disposal characteristics samples. Given the nature of the sample collection/compositing procedures and subsequent extractions and analyses, it is unlikely that poor equipment decontamination would bias the sample results. Therefore, field audits of the equipment decontamination procedures will be used as the quality check and no equipment blanks will be collected.

4.8.1.4 Replacement Material Samples

No field QC samples will be collected with the replacement material samples. Disposable sampling equipment will be used to obtain the samples. Therefore, no equipment decontamination or quality check (equipment blank) of the decontamination procedure will be needed.

4.8.1.5 Ambient Dust (TSP) Samples

Filter blanks will be collected with the ambient TSP dust samples at a frequency of one for every 20 filter samples. The filter blank will be collected by containerizing an unused, pre-weighed filter and submitting it for the same analyses as the TSP filters (TSP, lead and arsenic). The filter blanks will be blind blanks sent to the laboratory. In addition, field duplicates will be collected once each month (see the Fugitive Emissions Dust Control Plan for details.)

4.8.2 Laboratory Quality Control Checks

Laboratory quality control is necessary to control the analytical process, to assess the precision and accuracy of analytical results and to identify assignable causes for atypical analytical results. The internal QC practices of the contract laboratory will provide quality control for laboratory analyses. Initial calibration will be performed for all analytical methods. The measurement objectives for the QC samples are identified on Table 4-1. The laboratory's other QC practices vary depending on the analysis performed, as described below.

For all constituent analyses, the laboratory will analyze and report the results from method blanks, analytical duplicates and matrix spike samples, as applicable. These data will be used to evaluate data quality relative to the measurement objectives given in Section 4.3. In addition, initial and continuing calibration verifications will be performed. Calibration results must meet the laboratory's acceptance criteria.

The precision and accuracy of gravimetric measurements will be controlled through replicate measurements and instrument calibration. One in 10 measurements will be replicates. The scale used to weigh filters will be calibrated and calibration checks will be performed at least

daily. In addition, LCS and Matrix Spikes will be analyzed to verify the precision and accuracy of the analytical method, as described previously.

4.9 Technical System Audits

The purpose of a quality assurance audit is to provide an assessment of the ability of the measurement system to produce data of a quality commensurate with the project's measurement objectives. In addition to documenting the performance of the sampling, analytical and data management systems, the audit provides a mechanism whereby inadequacies in the measurement systems can be identified and necessary corrective actions implemented in a timely manner.

Internal technical systems audits of field and/or laboratory activities may be performed during construction-related activities. Internal audits will be performed by the EQAO. The USEPA may also perform external systems audits.

An individual audit plan will be developed to provide a basis for each audit. This plan will identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. Checklists will be prepared by the auditors to structure the review process and document the results of the audit.

4.9.1 Systems Audits

A technical systems audit is an on-site, qualitative review of the various aspects of a total sampling and/or analytical system. It consists of observations and documentation of all aspects of the measurement effort, including adherence to approved sampling and analysis plans, quality assurance plans and standard operating procedures. A systems audit also includes review of record keeping and data handling systems, including:

- Calibration documentation;
- Completeness of data forms and notebooks;
- Data review and validation procedures;
- Data storage and filing procedures;

- Sample custody procedures;
- Documentation of QC data;
- Documentation of maintenance activities; and
- Corrective action reporting procedures.

A technical systems audit will include an audit plan, schedule, audit scope and checklists. An audit report will be prepared for the construction oversight manager with recommendations for corrective action, if needed.

4.9.2 Frequency and Scheduling

The necessity for internal systems audits will be determined by the Supervising Contractor's PM or EQAO. Audits will be scheduled at intervals appropriate to assure quality control for the activity type or task in progress and will be planned to coincide with appropriate activities on the project calendar. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QA plan;
- When it is necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit; or
- When requested by the Supervising Contractor's PM or EQAO.

4.9.3 Audit Reports

During an audit and upon its completion, the auditor may discuss the findings with the individuals audited, and discuss and agree on corrective actions to be initiated. Minor administrative findings which can be resolved to the satisfaction of the auditor during an audit may not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit, and findings affecting the overall quality of the project, will be noted on the audit checklists and included in the audit report.

Audit results will be reported to the Supervising Contractor's PM and FPS. The audit report will be retained in the project file, and copies of audit reports will be included in progress reports prepared by the Supervising Contractor for USEPA.

The PM will submit a reply to the audit report addressing each finding cited, the corrective action(s) to be taken and a schedule for implementation. This reply will be sent to the auditor and will be filed in the project file. The findings cited in the audit and addressed in the reply will be treated as nonconformances and will become subject to review at the time of the next audit.

4.10 Calculation of Data Quality Indicators

The parameters that will be used to assess data quality include accuracy, precision, completeness and representativeness. Definitions of these parameters are provided below. Since the environmental sampling data will be used to evaluate and direct construction-related activities, the accuracy and representativeness of the data will be considered the data quality parameters of most importance. The field and laboratory QC samples and methods that will be employed to assess the data quality are discussed in Section 4.8.

4.10.1 Precision

Precision (analytical error) is the level of agreement among repeated measurements of the same characteristic. Data precision will be assessed by determining the agreement among replicate measurements of the same sample and measurements of duplicate samples. As discussed in Section 4.8, these samples will include MS/MSD samples, LCS/LCSD samples, and field duplicates. The comparison is made by calculating the relative percent difference (RPD), given by:

$$RPD(\%) = \frac{|S_1 - S_2|}{(S_1 + S_2)/2} \times 100$$

where: S_1 = measured sample concentration; and
S_2 = known sample or duplicate concentration.

The goals for precision are provided in Section 4.3, Quality Assurance Objectives. When analytes are present at concentrations below or near the quantitation limit, precision will be evaluated using duplicates of a matrix-spike sample (if available).

4.10.2 Accuracy

Accuracy (bias) is the degree of difference between measured or calculated value and the true value. Data accuracy will be evaluated using sample recoveries, expressed as the percentage of the true (known) concentration, from laboratory-spiked samples (including matrix spikes) and from standard reference materials (i.e., laboratory control standards) generated by the analytical laboratory (see Section 4.8). Equipment, field and laboratory blanks will be analyzed to quantify artifacts introduced during sampling, transport, or analysis that may affect the accuracy of the data. The percentage recovery for spiked samples will be used to evaluate the accuracy of analyses as given by:

$$Recovery(\%) = \frac{A - B}{T} \times 100$$

where: A = measured concentration of the spiked sample;
B = concentration of unspiked sample; and
T = amount of spike added.

In addition, the initial and continuing calibration results will be reviewed to verify that the sample concentrations are accurately measured by the analytical instrument. The project goals for accuracy are provided in Section 4.3, Quality Assurance Objectives.

4.10.3 Completeness

Completeness is the percentage of valid measurements (data points) obtained, as a proportion of the number of measurements (data points) planned for the investigation.

Completeness is affected by such factors as sample-bottle breakage, and acceptance/non-acceptance of analytical results. Percentage completeness (C) is given by:

$$C(\%) = \frac{V}{P} \times 100$$

where: V = number of valid measurements (data points) obtained by the investigation; and
P = number of measurements (data points) planned for the investigation.

Completeness goals are provided in Section 4.3, Quality Assurance Objectives.

4.10.4 Representativeness

Representativeness is a qualitative objective, defined as the degree to which data accurately and precisely represent the medium being studied. Representativeness is achieved by collecting a sufficient number of unbiased samples, as determined through the QA objectives. Representativeness will be evaluated based on blank results (field and laboratory), laboratory methods and QC, sampling locations and methods, and sampling frequencies. Samples will be collected in accordance with the methods described in this CQAP to ensure that the samples are representative of the site conditions. The samples will be contained, preserved, and stored appropriately, as discussed in Section 4.5. Laboratory blanks, calibration standards and methods, and QC sample results will be reviewed as described in Sections 4.6 and 4.7 to ensure that analytical results are representative of actual site conditions.

4.11 Corrective Action

Nonconforming equipment, items, activities, conditions and unusual incidents that could affect compliance with project quality assurance goals will be identified, controlled and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate. Project staff, a project subcontractor, or analytical laboratory personnel will inform the FPS or Project Chemist (as applicable) immediately when a nonconformance is identified or suspected. The Project

Chemist or FPS will in turn notify the EQAO to discuss the nonconformance and identify an appropriate response, the "corrective action".

If the analytical results of laboratory control samples fall outside of the project's control limits, the laboratory will initiate corrective actions. The EQAO will also review field data and narrative records related to the samples in question for the potential source of the error. If the laboratory cannot correct the situation that caused the nonconformance and an out-of-control situation continues to occur or is expected to occur, the laboratory will immediately contact the Supervising Contractor's PM or EQAO. Completion of corrective action should be evidenced by data once again falling within prescribed quality control limits. If an error in laboratory procedures or sample collection and handling procedures can not be found, the Supervising Contractor's PM will review the results and assess whether reanalysis or resampling is required.

4.12 Quality Assurance Reports

Effective management of the environmental sampling effort requires timely assessment and review of field activities that in turn requires effective interaction and feedback between the FPS, EQAO and PM.

The FPS will be responsible for documenting any conditions or situations that might adversely affect data quality. These conditions should be communicated in writing to the EQAO and PM. In addition, routine quality assurance reports will be prepared by the FPS for the EQAO and PM. These reports will include elements such as project activities, modifications to or deviations from the CQAP and any corrective actions taken, status of unresolved problems and audit results. These reports may be provided as informal memos or other documented presentations.

Data quality evaluations will be prepared by the EQAO, based on the procedures described in Section 4.7. The usability of data will be determined and described. The impact of any deviations or exceptions to the method protocols or performance indicators will also be described. This information will be provided in data quality reports prepared for the PM and included in the Construction Completion Report.

5.0 CONSTRUCTION DOCUMENTATION & REPORTING

This section presents a summary of the construction documentation necessary for the pre-remediation sampling phase, the construction startup phase, the construction inspection and QA/QC procedures, the construction management and contract administration procedures, and the construction phase closeout.

5.1 Pre-Remediation Sampling Phase

The pre-remediation sampling phase is the time period during which the Supervising Contractor will perform activities necessary to support the remediation phase. The primary activities during this phase will include collection and analysis of the flowerbed and garden samples, collection and analysis of yard soil composition samples and collection and analysis of the disposal characteristics samples. These activities may be conducted in conjunction with or in advance of the construction start-up phase, as applicable.

Reporting requirements during this phase will include the documentation of sample collection and analysis activities as specified in Section 4.0. Required reports will include daily reports associated with field sampling, laboratory analytical reports and data validation reports. These reports will be prepared by the Supervising Contractor's FPS, Project Chemist/EQAO and the contract laboratory. Summaries of these reports will be provided to the USEPA WAM in the form of monthly progress reports prepared by the Supervising Contractor's PM.

5.2 Project Startup Phase

The project startup phase includes the period between the award of the remediation construction contract(s) and mobilization of the construction contractor(s) to the site. The principal item required for planning during this phase of the project is development of a submittal control sheet listing all required contractor submittals in the order in which they appear in the technical specifications. This will be prepared during the construction bidding process. Summaries of the actions accomplished during the project start-up phase will be provided to the USEPA WAM in the monthly progress reports prepared by the Supervising Contractor's PM.

5.3 Construction Phase

The construction phase of the project includes the period between contractor mobilization and substantial completion of the project. The basic reporting required for construction inspection during this phase of the project will include the daily record of work progress (by the FPS), which will include the weather conditions, the contractor's work force, site visitors, the equipment used and the general construction activities. Records associated with air monitoring will be maintained per the requirements of the Fugitive Emissions Dust Control Plan. Additional reporting procedures will include the actual log of contractor submittals including the action taken on each submittal, laboratory analytical reports generated by the contract laboratory, and data validation reports prepared by the Project Chemist/EQAO. Records for QC and QA activities described in this CQAP will be maintained by the FPS with periodic submittal to the USEPA WAM as requested. Construction progress reports, which summarize the activities performed and the data generated, will be prepared by the Supervising Contractor's PM and provided to the USEPA WAM on a monthly basis and at the end of each construction season.

6.0 REFERENCES

U.S. Environmental Protection Agency (USEPA), 1994. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. USEPA 540/R-94/013, Office Emergency and Remedial Response. February.

U.S. Environmental Protection Agency (USEPA), 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. USEPA 540/R-99/008, Office of Emergency and Remedial Response.

Washington Group 2001. Remedial Investigation Report for Operable Unit 1 Vasquez Boulevard/Interstate 70 Superfund Site. Prepared by Washington Group International for USEPA.

TABLES

TABLE 3-1

Summary of Construction Quality Control/Quality Assurance Monitoring & Testing

Item	Construction Element	Parameter	Acceptance Criteria	Construction Quality Control (by Construction Contractor)		Construction Quality Assurance (by Supervising Contractor)	
				Method	Minimum Frequency	Method	Minimum Frequency
I.	PRE-REMEDIATION CHARACTERIZATION						
A.	Gardens & Flower Beds	Arsenic & Lead	Arsenic and Lead concentration below Site residential action level	-	-	EPA 6010B	Each Sampling Unit
						Equipment Blank	1/20 samples
B.	Yard Soil Composition	Texture and particle size	Establish replacement soil requirements	-	-	ASTM D422	10 properties total
C.	Disposal Characteristics	Leachable (TCLP) Metals Pest/Herb SVOCs/VOCs	Meets disposal site requirements	-	-	EPA 1311/6010B/7470 1311/8081A/8150 1311/8270/8260	1/20 properties
II.	REMEDIATION CONSTRUCTION						
A.	Soil Removal	Excavation extent	Remove soil to marked limits shown on Site Remediation Map	Visual observation	Each property	Visual observation	Each property
		Excavation depth	12 inches, min. (4 inches under decks)	Elevation Survey	1 point/ 500 ft^2, min. 3 points/excavation	Visual observation and random spot checks with tape measure; review Contractor's survey data	Each property
		Fugitive dust emissions	No visible dust emissions. Field and laboratory monitoring results confirm compliance with Fugitive Emissions Dust Control Plan	Visual inspection	Continuous	Field and laboratory monitoring as specified in the Fugitive Emissions Dust Control Plan	As specified in the Fugitive Emissions Dust Control Plan
B.	Replacement Soil	Arsenic & Lead	Arsenic & Lead concentrations meet residential soil criteria	EPA 6010B	Source approval + 1/1000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						EPA 6010B	1/5 samples
		Texture and particle size	Meets textural and particle size requirements	ASTM D422	Source approval + 1/5000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
		Metals Pest/PCB SVOCs/VOCs	Meets residential soil criteria	EPA 6010B/7470 8081A/8082 8270/8260	Source approval and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						EPA 6010B/7470 8081A/8082 8270/8260	1/5000 cy
		Replaced Thickness	12 inches, min. 4 inches, min. (under decks)	Grade Stakes	1 stake/ 500 ft^2, min. 3 stakes/excavation	Visual observation and random spot checks with additional grade stakes	Each property

TABLE 3-1

Summary of Construction Quality Control/Quality Assurance Monitoring & Testing

Item	Construction Element	Parameter	Acceptance Criteria	Construction Quality Control (by Construction Contractor)		Construction Quality Assurance (by Supervising Contractor)	
				Method	Minimum Frequency	Method	Minimum Frequency
C.	Replacement Gravel	Arsenic & Lead	Arsenic & Lead concentrations meet gravel criteria	EPA 6010B	Source approval + 1/1000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						EPA 6010B	1/5 samples
		Gradation	Meets gradation requirements	ASTM D422	Source approval + 1/5000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
		Replaced Thickness	4 inches, min.	Grade Stakes	1 stake/ 500 ft^2, min. 3 stakes/excavation	Visual observation and random spot checks with additional grade stakes	Each property
D.	Replacement Vegetation	Vegetation Extent	Install vegetation as specified on Site Remediation Plan	Visual Confirmation	Each Area	Visually observe and confirm vegetation placement	Each Area
		Vegetation Type	Meets vegetation type and quality requirements	Provide labels and certificates provided by supplier	1/source & type	Review submittals for acceptability	1/source & type
		Fertilizer	Applied in accordance with manufacturer's recommendations	Provide MSDSs & manufacturer's recommended application procedures	1/source & type	Review submittals for acceptability. Observe field procedures	1/source & type
		Vegetation Condition	All replacement vegetation shall be in good condition at end of maintenance/watering period	Visual inspection at end of maintenance/watering period	Each Property	Visual inspection at end of maintenance/watering period	Each Property

TABLE 4-1

QUANTITATIVE MEASUREMENT OBJECTIVES FOR ANALYSES SOIL, REPLACEMENT MATERIALS AND WATER SAMPLES

Sample Matrix	Analytical Method Description	EPA Method Reference	Precision	Accuracy	Completeness
Flowerbed & Garden Soil	ICP (Arsenic and Lead)	6010B; 3052 - hydrofluoric acid digestion	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
In-situ Yard Soil	TCLP – Metals	1311/ 6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	TCLP – Mercury	1311/ 7471A	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	TCLP – Pesticides	1311/ 8081A	LCS/LCSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Herbicides	1311/ 8151A	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Semi-volatiles	1311/ 8270C	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Volatiles	1311/ 8260B	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
Soil Composition	ASTM D-422	N/A	N/A	95	Soil Composition

TABLE 4-1 (CONTINUED)

QUANTITATIVE MEASUREMENT OBJECTIVES FOR ANALYSES SOIL, REPLACEMENT MATERIALS AND WATER SAMPLES

Sample Matrix	Analytical Method Description	EPA Method Reference	Precision	Accuracy	Completeness
Replacement Materials	Metals [1]	6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	Mercury	7471A	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	Pesticides [1]	8081A	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	PCBs [1]	8082	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	Semi-volatiles [1]	8270C	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	Volatiles [1]	8260B	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
Water – Equipment Blanks	ICP (Arsenic and Lead)	6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <20%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95

Notes: [1] All replacement materials will be analyzed for the analytes listed on the Replacement Material Chemical Criteria. Only those constituents shall be reported.

TABLE 4-2

ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Sample Matrix	Analytical Method Description	EPA Method Reference	Container and Preservation	Storage Recommendation	Holding Time Recommendations
Flowerbed & Garden Soil	ICP (Arsenic and Lead)	6010B; 3052-hydrofluoric acid digestion	Clean bags or glass jars 50 grams	None	180 days
In-situ Yard Soil	TCLP – Metals	1311/ 6010B	Clean 8 oz. glass jar	Cool	180 days
	TCLP – Mercury	1311/ 7471A			14 days
	TCLP – Pesticides	1311/ 8081A	Clean 8 oz. glass jar	Cool	Extraction = 7days Analysis = 40 days after extraction
	TCLP – Herbicides	1311/ 8151A			Extraction = 7days Analysis = 40 days after extraction
	TCLP – Semi-volatiles	1311/ 8270C			Extraction = 7days Analysis = 40 days after extraction
	TCLP – Volatiles	1311/ 8260B			14 days
	Soil Composition	ASTM D-422	Clean 5-gallon bucket	N/A	N/A

TABLE 4-2 (CONTINUED)

ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Sample Matrix	Analytical Method Description	EPA Method Reference	Container and Preservation	Storage Recommendation	Holding Time Recommendations
Replacement Materials	Metals [1]	6010B	Clean 8 oz. glass jar 50 grams	Cool	180 days
	Mercury	7471A			14 days
	Pesticides [1]	8081A	Clean 8 oz. glass jar 100 grams	Cool	Extraction = 7days Analysis = 40 days after extraction
	PCBs [1]	8082			Extraction = 7days Analysis = 40 days after extraction
	Semi-volatiles [1]	8270C			Extraction = 7days Analysis = 40 days after extraction
	Volatiles [1]	8260B	Clean 8 oz. glass jar 50 grams	Cool	14 days
Water – Equipment Blanks	ICP (Arsenic and Lead)	6010B	Plastic or glass bottle 500 mL Preserve to pH < 2 with nitric acid	N/A	180 days

Notes: [1] All replacement materials will be analyzed for the analytes listed on the Replacement Material Chemical Criteria. Only those constituents shall be reported.

ATTACHMENTS

ATTACHMENT A

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE FOR SOIL SAMPLING

1.0 PURPOSE AND SCOPE

The procedures included herein apply to all investigative soil sampling performed during remedial actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for collecting soil samples from residential properties are provided. Samples will be collected from: 1) garden and flowerbed areas for analysis of arsenic and lead content; 2) yards scheduled for removal for soil composition analyses; and 3) yard excavation areas for analysis of leachate metal, pesticide, herbicide, semi-volatile and volatile constituent concentrations (disposal characteristics).

2.0 TRAINING AND QUALIFICATIONS

All personnel performing these procedures will be trained in the use of these procedures, have significant relevant sampling experience as approved by the project manager and be experienced in sample handling, documentation and shipping.

3.0 EQUIPMENT AND SUPPLIES

The following equipment and supplies will be used to collect investigative soil samples:

- Coring probes, 2-inch minimum diameter, lead-free. The probes must be capable of being forced into hard ground to a depth of up to 6 inches without being damaged. A number of devices can be utilized as a coring probe. Examples include: plastic or steel pipe and a professional stainless steel coring probe equipped with plastic liners, cross T-bar, and hammer.

- Stainless steel bowls, two gallon size or larger.

- Stainless steel spoon, large serving size.

- Shovel, standard size.

- Sample collection container, new containers of the size and type specified in the project Construction Quality Assurance Plan (CQAP) for the sample.

- Steel or plastic measuring tape or ruler, divisions to at least 1/8 inch.
- Field notebooks, bound with individually numbered pages, see Section 4.
- Indelible ink marker, black or blue.
- Ink pens, black or blue.
- Packaging tape, used for sealing shipping containers.
- Plastic bags, trash bags with ties.
- Plastic gloves, powderless. Gloves with powder should not be used to avoid potential contamination of samples from powder material.
- Preprinted field forms (Exterior & Sample Location Map forms) preprinted with sufficient entry lines to address documentation needs presented in subsection.
- Shipping containers, cardboard or plastic for interim storage and shipment of sample collection containers.

4.0 SAMPLE COLLECTION PROCEDURES

The objectives of the residential sampling program and procedures for identifying properties to be sampled are described in the project CQAP. Soil samples will be collected from gardens and flowerbed areas and from yard excavation areas according to the following procedures.

4.1 Garden and Flowerbed Sampling

Soil samples will be collected from each garden or flowerbed sampling unit by subdividing the sampling unit into two approximately equal-sized sub areas. One soil sample will then be collected from the 0 to 2 inch depth interval at the approximate center of each sub area and composited according to the following procedure:

1. At the subsample location, begin by clearing a circular area approximately 4 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).

2. Advance the decontaminated coring probe into the underlying soil to the required 2-inch depth. Retrieve the coring probe and remove the collected soil into a decontaminated bowl. Verify with the tape measure or ruler that soil has been collected over the full 0 to 2 inch depth interval.

3. Repeat steps 1 and 2 at the center of the second sub area.

4. Thoroughly homogenize the soil in the bowl using a decontaminated stainless steel spoon. Then scoop soil from random locations in the bowl into the sampling container until the sampling container has been filled. If any large rock fragments or large foreign materials (e.g., paper or plastic trash, nails, etc.) are present, these may be removed from the sample container. Seal and label the container.

5. Fill the probe holes with the left over soil from the bowl, tamp down fill and replace vegetation or sod over fill surface.

Equipment used to collect the soil samples will be decontaminated after each sampling unit. However, it will not be necessary to decontaminate the sampling equipment between sub areas that comprise a single sample. Decontamination procedures are provided in the SOP for Sampling Equipment Decontamination.

4.2 Yard Composition Sampling

A soil sample will be collected from each yard selected for soil composition sampling. The soil sample will be collected from the 0 to 12 inch depth interval near the center of the yard according to the following procedure:

1. At the sample location, begin by clearing a circular area approximately 18 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).
2. Using a shovel that is free of accumulated solids, retrieve soil evenly from the 0 to 12 inch depth interval and place it into a clean 5 gallon bucket. Repeat until bucket is approximately ¾ full. Cover the bucket with a clean lid.
3. Fill the soil hole with commercially available topsoil or potting soil and tamp down.

Shovels used to collect the soil shall be cleaned by scraping off any accumulated soil and leaving the soil at the sampling location. It will not be necessary to decontaminate the sampling equipment used to collect the yard composition samples.

4.3 Disposal Characteristics Sampling

One composite sample will be collected from every twenty properties scheduled for remediation. The composite sample will be prepared by randomly selecting four of the properties for sampling using a spreadsheet-based random number generator routine. One composite sample will then be collected from the four properties according to the following procedure:

1. At each selected property, the exposed soil areas (yards, unpaved driveways and unpaved parking areas) will be subdivided into four approximately equal-sized sampling units (sub areas). One soil sample will then be collected from the approximate center of each sub area as follows:

    - Begin by clearing a circular area approximately 4 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).

    - Advance the decontaminated coring probe into the underlying soil until it is full. Retrieve the coring probe and remove the collected soil into a decontaminated bowl. Repeat this procedure until soil has been collected over the full 0 to 12 inch depth interval, as verified with the tape measure or ruler.

    - Repeat this procedure to collect samples from the center of the three remaining sub areas.

    - Thoroughly homogenize the soil in the bowl. Then remove a volume slightly greater than ¼ of the sample container by scooping soil from random locations in the bowl into a second decontaminated bowl.

    - Fill the probe holes with soil from the original bowl, tamp down fill and replace vegetation or sod over fill surface.

2. Repeat the procedures in Step 1 at the three remaining properties to produce four bowls of homogenized soil.

3. Next combine and thoroughly homogenize the four bowls of soil in a single decontaminated bowl. Scoop soil from random locations in the final bowl into the sampling container until the sampling container has been filled. If any large rock fragments or large foreign materials (e.g., paper or plastic trash, nails, etc.)

are present, these may be removed from the sample container. Seal and label the container.

Equipment used to collect the soil samples will be decontaminated after the final composite sample is collected. However, it will not be necessary to decontaminate the sampling equipment between yards that comprise a single sample. Decontamination procedures are provided in the SOP for Sampling Equipment Decontamination.

4.4 Documentation

The sampling team will maintain field notes describing date and time of sampling, weather conditions, personnel present, special instructions, property contact information and sample numbers and sample storage or shipping information. The following information will also be recorded on the Soil Sampling Form:

- Date
- Property block and lot number (if available)
- Property address
- Sampling team members
- Sample numbers
- Location description, including depth
- Soil description

In addition, a site map will be prepared to show the location of the main residence, garage, and significant outbuildings, approximate property boundaries, garden and flowerbed areas, and sample locations. The sub sample locations will be clearly labeled, and the areas represented by each composite sample will be delineated on the site map. This information will be recorded on an Exterior & Sample Location Map form (attached). The Exterior & Sample Location Map form will be forwarded to the Supervising Contractor's Project Manager for inclusion in the hard copy property file.

Sample custody procedures (sample delivery and pick-up information) will be followed in accordance with the SOP for Sample Handling and Documentation. A copy of chain-of-custody form will be included in the hard copy property file.

5.0 EQUIPMENT CALIBRATION AND MAINTENANCE

Soil sampling equipment will be inspected for damage or wear after each sampling day. Worn or unusable equipment will be replaced immediately.

6.0 REFERENCES

U.S. Environmental Protection Agency, 1995. Residential Sampling for Lead: Protocols for Dust and Soil Sampling, EPA Doc. No. 747-R-95-001, March.

Exterior & Sample Location Map

Date: _____ Technician(s): _____

Property No.: _____

Property Address: _____

Notes: _____

_____

_____

Diagram of the Property Exterior

STANDARD OPERATING PROCEDURE FOR SAMPLING REPLACEMENT MATERIALS

1.0 PURPOSE AND SCOPE

These procedures apply to sampling of replacement materials used in remedial actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for collecting samples of the replacement soil are provided. Samples of the replacement soils will be collected and analyzed for: 1) physical properties, 2) arsenic and lead content and 3) selected metals, pesticides, herbicides, semi-volatiles, volatiles and PCBs. Samples of replacement road base and gravel will be collected and analyzed for: 1) physical properties and 2) arsenic and lead content.

2.0 TRAINING AND QUALIFICATIONS

All personnel performing these procedures must be trained in their use and experienced in soil sampling, sample handling and sample shipping, as approved by the project manager.

3.0 PROCEDURES

Grab samples of clean replacement materials will be collected from transport trucks, material stockpile or directly following placement.

3.1 Equipment

The following is a list of equipment needed to collect the replacement samples.

- Sample collection container: new containers of the size and type specified in the Construction Quality Assurance Project Plan (CQAP)
- Plastic or stainless steel spoon, trowel or shovel
- Field notebook
- Clipboard
- Indelible ink marker
- Plastic bags for trash

3.2 Sample Collection Procedures

Each sample will be a single grab sample. Grab samples will be collected by directly

scooping materials from the transport truck, stockpile or final placement location. The sampler will randomly select sampling locations. Sampling will be performed at the frequency specified in the CQAP.

3.3 Documentation

The following information will be recorded on the sample label and in a field notebook for each fill sample:

- Date and time of sampling
- Sampler name
- Sample location
- Original source of fill
- Notes from visual inspection of material, including size, type of materials, etc.
- Sample number identifier
- Analyses requested
- Laboratory

This information will be retained by the Supervising Contractor's Field Project Supervisor in hard copy files.

STANDARD OPERATING PROCEDURE FOR SAMPLING EQUIPMENT DECONTAMINATION

1.0 PURPOSE AND SCOPE

These procedures apply to investigation and replacement material sampling performed during remedial actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for decontaminating soil sampling equipment are provided.

2.0 PROCEDURES

Equipment used to collect samples will be decontaminated prior to each use, but decontamination will not be required between collection of sub samples of a single composite sample. The equipment requiring decontamination includes the soil scoops or coring devices used to collect the samples and the bowls/buckets and spoons that may be used to contain or homogenize samples. Soil samples will be collected according to the procedures described in the SOPs for Soil Sampling and Replacement Material Sampling.

2.1 Equipment

The following is a list of equipment needed to decontaminate sampling equipment.

- Non-phosphate detergent such as Alconox
- Tap water – several gallons probably necessary
- Deionized water
- Chemical-free towels or paper towels
- Cleaning containers – plastic and/or galvanized steel pans or buckets
- Stiff cleaning brushes
- Aluminum foil, plastic wrap or plastic bags.
- Plastic bags for trash
- Powderless plastic gloves

2.2 Equipment Decontamination Procedures

1. Add the non-phosphate detergent to the appropriate amount of tap water in one of the clean plastic or stainless steel containers. Stir to mix.
2. Put on a pair of powderless plastic gloves.

3. Using the stiff brush, scrub all sampling equipment with the detergent/tap water solution. Scrub the equipment until all visible remnants of the sampled material are removed. During the decontamination process, do not lay any equipment being decontaminated on a surface other than a clean piece of plastic or aluminum foil.
4. Rinse each piece of equipment with clean tap water.
5. Rinse each piece of equipment with deionized water.
6. Place the cleaned equipment on clean aluminum foil or plastic wrap and allow to air dry of dry with clean chemical-free paper towels.
7. If not using the equipment immediately, place the clean dry equipment in plastic bags or wrap in aluminum foil for storage.
8. Contain and dispose of all decontamination water by pouring used solutions onto the ground surface at the sampling location.
9. Clean the container that had the detergent/tap water solution and the brush for future use.

2.3 Documentation

Field notes will describe the procedure used and the frequency of sampling equipment decontamination (this SOP may be referenced). Any procedure not in accordance with this SOP should be documented in the field notes.

STANDARD OPERATING PROCEDURE FOR SAMPLE HANDLING AND DOCUMENTATION

1.0 PURPOSE AND SCOPE

These procedures apply to sample handling and documentation performed for remedial actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for soil, replacement material and water sample handling and documentation are provided.

2.0 SAMPLE HANDLING PROCEDURES

Soil, replacement material and water samples will be collected during property remediation activities. Samples will be collected according to the procedures described in the respective sampling SOPs.

2.1 Sample Identification

Each sample will be assigned a unique sample identification number. Each identification number assigned to an environmental sample will identify the property from which the sample was collected (if applicable), the sample matrix, the date of sample collection and sample sequence or depth (if applicable). Sample identification numbers will have several components, as explained using the following example:

VB/I70B138L101DC031029-1

The first character string, VB/I70, represents the site name. This is followed by the letter "B" and the block number for the property (138) and then the letter "L" and the lot number for the property (101). [Note: the block and lot numbers will only be used for flowerbed and garden samples because the remaining samples are not tied to a specific property] The next letters, DC, indicate the sample type (G = garden, F= flowerbed, DC = disposal characteristics, RT = replacement topsoil/garden soil, RS = replacement subsoil, RR = replacement road base, RG = replacement gravel, and EB = equipment blank). Following the sample matrix letter will be the sample collection date (year, month, day).

Additional information pertaining to the sample sequence may follow the date. For example, a "-1" or "-2" would indicate the sample sequence. A description of any additional information included in the sample identification number will be documented in the field records.

QC samples will follow the same convention. For example, an equipment blank may be

called VB/I70EB031029-1 to indicate it is the first (-1) equipment blank (EB).

2.2 Sample Containers and Preservation

Proper sample preparation practices will be observed to minimize sample contamination and avoid repeat analyses due to anomalous analytical results. Sample containers will either be commercially cleaned bottles or other appropriate sample containers provided by the analytical laboratory or, for soil samples, clean unused plastic bags. Bottles for samples that require preservation will either be pre-preserved by the laboratory or the preservative will be shipped separately for addition to the samples in the field. Sample preservation will be performed immediately upon collection to ensure that laboratory results are not compromised by improper preservation.

2.3 Sample Chain-of-Custody

After samples have been collected, they will be maintained under strict chain-of-custody procedures. The procedures described below will be used to document the transfer of custody of the environmental samples from the field to the designated analytical laboratory. The field sampling personnel will complete a Chain-of-Custody Record and Request for Analysis (CC/RA) form or similar form supplied by a laboratory for each shipping container (i.e., cooler or other container) of samples to be sent to each laboratory for analysis. The CC/RA for a shipping container will list only those samples in that shipping container. Information contained on the triplicate carbonless CC/RA form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;
- Method of shipment;
- Carrier/waybill number (if any);
- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is being transferred;
- Date and time of sample custody transfer; and

- Condition of samples upon receipt by laboratory.

The sample collector will cross out any blank space on the CC/RA below the last sample number listed (on the part of the form where samples are listed). A sample label will be affixed to each sample container and filled out using indelible ink. Labels will be protected with a layer of clear tape. Each container will be carefully packaged in a shipping container (typically an ice chest) and shipped to the appropriate laboratory, as described below (Section 2.4).

The sampling personnel whose signature appears on the CC/RA is responsible for the custody of the sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting the sample to the designated laboratory. The sample is considered to be in custody when the sample is: (1) in the direct possession of the sample custodian; (2) in plain view of the sample custodian; or (3) is securely locked in a restricted access area by the sample custodian.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA under "Relinquished by" and "Received by." Signatures, printed names, company names, date and time are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain the third sheet (pink copy) of the CC/RA. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA. Copies, receipts or carbons of Bills of Lading will be retained as part of the permanent documentation in the project file. It is not necessary for courier personnel to sign the CC/RA. When the samples are received by the laboratory, the CC/RA will be immediately signed along with the date and time of receipt. The top sheet (white copy) of the CC/RA (or a copy of it) will be returned with the final analytical report.

2.4 Sample Shipping

All samples collected for laboratory analysis will be labeled and placed in an insulated cooler or other appropriate shipping container. If necessary for sample preservation, bags of ice will be placed around the samples to maintain a temperature of approximately 4°C. The ice in the cooler will be double-bagged. The coolers will be filled with packing material such as vermiculite or styrofoam to prevent sample breakage during shipment. The chain-of-custody forms (Section 2.3) will be placed in a sealed plastic bag and taped to the inside top of the cooler. The cooler will be taped shut and chain-of-custody seals will be attached to the outside of the cooler to ensure that the cooler cannot be opened without breaking the seal. Samples will be delivered or shipped via express delivery to the appropriate laboratory.

3.0 FIELD DOCUMENTATION

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, and a permanent record of field activities. Field observations and data collected during routine testing, monitoring, and sampling activities will be recorded with waterproof ink in a permanently bound weatherproof field log book with consecutively numbered pages or on field data sheets.

Field notebook and data sheet entries will include the information listed below, at a minimum. Additional information to be documented may be specified in the SOPs related to each type of sample collection.

- Project name
- Date and time of entries
- Data (i.e. field XRF measurements, soil descriptions)
- Sample identification numbers
- Date and time samples collected
- Sample location/description
- Comments and variances from the Work Plan/QAP
- Signature of field representative

CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

MFG, INC. COC No. _____

Austin Office
8900 Business Park Dr.
Austin, TX 78759
TEL: (512) 338-1667
FAX: (512) 338-1331

Boston Office
500 W Cummings Park
Suite #1050
Woburn, MA 01801
TEL: (781) 937-0500
FAX: (781) 937-0578

Boulder Office
4900 Pearl E. Circle
Suite #300W
Boulder, CO 80301
TEL: (303) 447-1823
FAX: (303) 447-1836

Missoula Office
215 S. 3rd St. West
Missoula, MT 59801
TEL: (406) 728-4600
FAX: (406) 728-4698

Osburn Office
809 E. Mullan Avenue
Osburn, ID 83849
TEL: (208) 556-6811
FAX: (208) 556-7271

Port Lavaca Office
320 E. Main
Port Lavaca, TX 77979
TEL: (512) 552-8839
FAX: (512) 553-6115

San Francisco Office
71 Stevenson St. #1450
San Francisco, CA 94105
TEL: (415) 495-7110
FAX: (415) 495-7107

Seattle Office
19203 36th Avenue W
Suite #101
Lynnwood, WA 98036
TEL: (425) 778-8252
FAX: (425) 771-8842

PROJECT NO.: _____ PROJECT NAME: _____ PAGE: _____ OF: _____

SAMPLER (Signature): _____ PROJECT MANAGER: _____ DATE: _____

METHOD OF SHIPMENT: _____ CARRIER/WAYBILL NO.: _____ DESTINATION: _____

SAMPLES														ANALYSIS REQUEST						
		Sample Collection			Preservation					Containers				Constituents/Method					Handling			Remarks
Lab No.	Field Sample Identification	DATE	TIME	Matrix*	HCl	HNO_3	H_2SO_4	COLD	FILTRATION*	VOLUME (ml/oz)	TYPE*	NO.							HOLD	RUSH	STANDARD	
					TOTAL NUMBER OF CONTAINERS									LABORATORY COMMENTS/CONDITION OF SAMPLES					Cooler Temp:			

RELINQUISHED BY:			DATE	TIME	RECEIVED BY:		
SIGNATURE	PRINTED NAME	COMPANY			SIGNATURE	PRINTED NAME	COMPANY
							LABORATORY

*KEY: Matrix: AQ - aqueous NA - nonaqueous SO - soil SL - sludge P - petroleum A - air OT - other Containers: P - plastic G - glass T - teflon B - brass OT - other Filtration: F - filtered U - unfiltered

DISTRIBUTION: PINK: Field Copy YELLOW: Laboratory Copy WHITE: Return to Originator

FIGURE SOP-2-1. CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

Tabbed Page: Appendix G

APPENDIX G

CONSTRUCTION TECHNICAL SPECIFICATIONS

DRAFT-FOR GUIDANCE PURPOSES ONLY

TECHNICAL SPECIFICATIONS WITH CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE FOR OPERABLE UNIT 1 VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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Denver, Colorado

Prepared by:

MFG, INC.

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Boulder, CO 80301
(303) 447-1823
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TETRA TECH EM INC.

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Denver, CO 80202
(303) 295-1101
Fax (303) 295-2818

Specification Number	Description
01010	Summary of Work
01060	Regulatory Requirements
01300	Submittals
01505	Mobilization, Preparatory Work and Demobilization
01510	Temporary Facilities
01548	Preservation of Historical and Archeological Data
02020	Subsurface Conditions
02100	Site Clearing
02130	Surface Water and Sediment Control During Construction
02205	Yard Remediation Earthwork
02900	Vegetation Establishment – Trees and Shrubs
02920	Vegetation Establishment – Sod Installation

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes a general summary of the work to be performed under this Contract, as part of the remediation for the Residential Yard Operable Unit 1 of the Vasquez Boulevard/Interstate-70 (VB/I-70) Superfund Site in Denver, Colorado. The general work activities to be completed under this Contract include, but are not limited to: removal of contaminated soils from the residential yards, placement of backfill soils at removal areas, disposal of removed contaminated soils at approved facility or facilities, and vegetation establishment as necessary.

1.2 RELATED SECTIONS

A. All Contract Documents

1.3 SCOPE OF WORK

A. The project consists of residential yard remediations at the VB/I-70 Superfund Site in Denver, Colorado including:

1. Prepare: a) a site-specific Health and Safety Plan (HASP) in accordance with specific requirements of 29 CFR 1910.120 and general requirements of 29 CFR 1910 and 1926; b) a Construction Contractors' Work Plan (CCWP) that provides a step-by-step description of the work to be performed, a construction quality control plan; a schedule of the construction activities; and c) a Construction Storm Water Management Plan.

2. Mobilize and prepare for the Work including installation of all temporary facilities;

3. Install temporary sediment, diversion and stormwater control structures at the work areas in accordance with the specifications and a Storm Water Management Plan, to be developed by the Contractor;
4. Provide dust control, as necessary, during all excavating, hauling and placing operations;

5. Excavate contaminated soils from residential yards along with all associated work;

6. Haul and dispose contaminated soils at EPA-approved disposal facility or facilities in accordance with the approved Transportation and Disposal Plan;

7. Following removal of contaminated soils from the residential yards as directed, place backfill soil and regrade the areas to achieve pre-removal grades;

8. Place compacted soil and gravel in driveways or other gravel areas where removals were performed;

9. Perform temporary removal, replacement and repair/rehabilitation of existing fences, sheds, swing sets or other items as necessary following placement of backfill soils and replacement of all landscaping features in accordance with Site Remediation Plans;

10. Perform revegetation work at the residential yard removal areas as necessary including replacement of flowerbeds, sod installation, and watering;

11. Provide all necessary post-remediation documentation and perform site cleanup and demobilize.

1.4 ADDITIONAL REQUIREMENTS OF CONTRACTOR

A. In the conduct of the construction work described above, Contractor shall:

1. Comply with all applicable local, State and Federal health and safety rules and regulations; and

2. Satisfy the requirements of the property owners to the extent practicable in restoring properties, and perform additional work as requested by, and at the expense of, property owners as needed.

END OF SECTION

SECTION 01060
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 CODES

A. Contractor shall comply with the most recent edition of all codes and regulations of applicable regulatory authorities, including:

1. Applicable U.S. Environmental Protection Agency regulations and other Federal regulations pertaining to solid and hazardous wastes and air quality (40 CFR Parts 50, 107, 171-177, 260-264, and 257);

2. Colorado Department of Public Health and Environment (CDPHE) regulations including air emission control (5CCR 1001) and solid and hazardous waste regulations (6CCR 260-264 and 1007);

3. Applicable Occupational Safety and Health Administration (OSHA) Regulations (29 CFR Parts 1910 and 1926);

4. Applicable City and County of Denver Regulations for construction and transportation;

5. Applicable State of Colorado Department of Transportation and Federal Department of Transportation Regulations;

6. National Pollutant Discharge Elimination System (NPDES) requirements of the Federal Clean Water Act for storm water discharges and the Colorado Water Quality Control Act requirements for storm water discharges associated with construction activity.

7. Applicable Denver Regional Urban Storm Drainage Guidelines for construction activities;

8. Federal and State Historic and Archeological Resources and Data Preservation Acts,

9. State of Colorado Noise Abatement Statute (C.R.S., Section 25-12-103);

10. National and Local Electrical and Fire Protection Codes; and

11. Colorado Undesirable Plant Management Act (C.R.S., Section 35, Article 5.5).

B. In the event of conflicts between the requirements of various codes and regulations, Contractor shall comply with the more stringent code or regulation.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for all submittals associated with and required by the Project. The submittals include a brief Construction Work Plan, a construction Storm Water Management Plan, Health and Safety Plan, construction progress schedules, material certifications, samples and test specimens.

1.2 RELATED SECTIONS

A. All Sections

1.3 GENERAL SUBMITTAL REQUIREMENTS

A. Transmit each submittal to the Supervising Contractor who will review each submittal and return to contractor with resubmittal requirements or approvals within 20 working days. Submit the number that the Contractor requires, plus two copies to be retained by the Supervising Contractor.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Each submittal shall include a statement certifying that review, verification of products required, field dimensions, procedures and coordination of information, is in accordance with the requirements of the Contract Documents.

1.4 CONTRACTOR'S CONSTRUCTION WORK PLAN

A. Within 15 days after receipt of Notice of Award and prior to beginning work, Contractor shall submit a CCWP that will contain the following:

1. Plans for Mobilization, Preparatory Work and Demobilization as described in Section 01505.

2. A construction quality control plan detailing the contractor's proposed QC tests, surveys and other procedures required for the work prepared in accordance with the Construction Quality Assurance Plan.

3. Plans for soil excavation, and disposal, and clean soil backfill as described in Section 02205.

4. A detailed construction schedule for the residential yard remediation work in electronic format and hard copy.

1.5 CONSTRUCTION STORM WATER MANAGEMENT PLAN

A. Within 15 days after receipt of Notice of Award and prior to beginning work, Contractor shall submit a CSWMP that will contain the following:

1. A description of Storm Water and Erosion Pollution Prevention Best Management Practices (BMPs) that will be implemented during construction.

2. Materials handling, spill prevention, inspection and maintenance procedures and other site controls.

3. All other information required by the NPDES and Colorado regulations for construction storm-water pollution prevention.

1.6 HEALTH AND SAFETY PLAN

A. Within 30 working days prior to commencing the work, Contractor shall submit a site Health and Safety Plan (HASP) that includes a construction safety program. The HASP shall be in accordance with provisions in 29 CFR 1910.120; other federal, state, and local regulations; and Contractor guidelines. The HASP shall be submitted and reviewed by the Supervising Contractor prior to the start of the job. Also, as part of the contractor safety program, the Contractor shall establish the procedure for the immediate removal to a hospital or doctor's care of any person who may be injured on the job site. Contractor shall submit First Aid and/or EMT certifications for a minimum of one person per field crew.

B. The HASP shall include identification of an air monitoring program for worker protection, equipment decontamination, and other items required by 29 CFR 1910-120. Disposal of personal protection equipment, and potentially contaminated soils and water shall be included and the cost for disposal of these items shall be included in the bid.

C. The duty of the Supervising Contractor to conduct construction review of the Contractor's performance is not intended to include a review or acceptance of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

D. All workers working with arsenic- and lead- contaminated materials must comply with the training requirements of OSHA 1910.120. Workers engaged in property restoration following removal of the arsenic- and lead- contaminated material are not required to have OSHA 1910.120 training.

1.7 DOCUMENTATION OF PRE-CONSTRUCTION CONDITION OF PROPERTIES

A. Contractor shall thoroughly document pre-remediation conditions at each property to be remediated by means of a checklist together with supporting documentation such as VHS video recordings and/or 35 mm photographs. This checklist shall include the condition of the ground cover, grading, vegetation, erosion control, paving, sidewalks, existing sprinkler systems, fences, buildings, or other improvements. For sprinkler systems that are being replaced, the pre-remediation checklist should provide, to the extent feasible, sufficient information to document the quality and condition of the existing materials. The pre-remediation checklist shall note any planned changes between pre- and post-remediation conditions. Contractor shall complete the checklist of pre-remediation conditions for each property to be remediated and perform post construction documentation using similar procedures. The documentation shall be provided to the Supervising Contractor within one week of completing each pre- and post- construction inspection.

1.8 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule along with the CCWP within ten (10) days after Notice of Award. The schedule shall be shown in weekly increments at a minimum.

B. Submit revised schedules as appropriate.

C. Show complete sequence of construction by activity identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration. Schedule shall provide for winter shutdown periods, as necessary.

D. Provide a summary of remediation progress at the end of each construction season and submit to Supervising Contractor along with the annual summary report.

END OF SECTION

SECTION 01505
MOBILIZATION, PREPARATORY WORK AND DEMOBILIZATION

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification covers the requirements for mobilization, preparatory work, temporary facilities, and demobilization. Temporary diversion and sediment control facilities are specified in Section 02130.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01510 - Temporary Construction Utilities and Facilities

C. Section 02100 - Site Clearing

D. Section 02130 - Surface-Water and Erosion Control During Construction

E. Section 02205 - Yard Remediation Earthwork

F. Transportation and Disposal Plan - attached

1.3 SUBMITTALS

A. As noted in Section 01300 1.4A, within 10 days after receipt of Notice to Proceed, Contractor shall submit a Construction Contractor's Work Plan (CCWP). The CCWP will include appropriate drawings, identifying all proposed preparatory work including, as applicable, site access and traffic control; truck wheel cleaning methods; construction plan layout; temporary offices and other structures; storage buildings and yards; temporary water supply and distribution; temporary power supply and distribution; re-contamination prevention procedures; and temporary sanitary and personnel decontamination facilities.

PART 2 PRODUCTS AND EQUIPMENT

A. Contractor shall utilize appropriate and sufficient products and equipment in the conduct of all preparatory work and the establishment of all temporary facilities, consistent with the nature and requirements of the project and the health and safety of workers and the public.

B. Use water trucks and/or approved dust suppressants on haul roads and in work areas, as necessary during hauling operations.

C. Haul trucks and equipment shall be properly maintained to avoid excessive noise during hauling operations within Denver.

D. Use appropriate "Truck Crossing" or "Trucks Turning" signs on public roads, where required at work areas, and use appropriate signage and traffic cones where required on public roads.

E. Use a truck wheel cleaning area if necessary at the disposal site to minimize spreading of contamination.

PART 3 EXECUTION

3.1 MOBILIZATION

A. Following receipt of the Notice of Award and approval of all pre-construction submittals, Contractor shall mobilize to the Site all labor, materials, equipment, and construction facilities necessary for the proper performance of the Work.

3.2 INSTALLATION OF FACILITIES

A. All preparatory work and installation of temporary facilities shall be done in accordance with applicable codes and regulations and shall utilize available locations as approved by the Supervising Contractor.

B. Because of the areal extent of the residential yard remediation work, various set-up locations for equipment may be required depending upon work location. Contractor shall plan accordingly and obtain all necessary approvals required.

3.3 WORK AREA SECURITY AND TRAFFIC CONTROL

A. Contractor shall provide caution tape, temporary fencing, gates, and signs, as necessary, to limit public access to the work area and shall be responsible for the safety of all individuals on the work area.

B. Contractor shall conduct its operations so as not to significantly interfere with the normal flow of traffic on local roads near the work area. Where required by City/County of Denver or State of Colorado regulations, flag persons and signage shall be provided to ensure public safety.

C. Haul trucks at the Site, traveling on public roads, shall be limited to speeds of 25 mph in residential areas, and shall comply with all posted speed limits in Denver and adjacent counties/municipalities through which waste materials are hauled.

D. Haul trucks and equipment shall comply with the requirements of the Colorado Noise Abatement Statute, as follows:

1. Applicable activities shall be conducted in a manner so any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Noise is defined to be a public nuisance if sound levels radiating from a property line at a distance of twenty-five feet or more exceed the sound levels established for the following time periods and zones:

Zone	7:00 am to Next 7:00 pm	7:00 pm to Next 7:00 am
Residential	55 db (A)	50 db (A)
Commercial	60 db (A)	55 db (A)
Light Industrial	70 db (A)	65 db (A)
Industrial	80 db (A)	75 db (A)

2. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in Requirement a (above) may be increased by ten decibels for a period of not to exceed fifteen minutes in any one-hour period.

3. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five decibels less than those listed in Requirement a (above).

4. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.

5. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

E. Comply with all requirements of the Transportation and Disposal Plan.

3.4 MAINTENANCE AND PROTECTION OF EXISTING DRAINAGE

A. Contractor shall take all necessary precautions to limit disturbance to natural drainageways in the vicinity of the Work, and shall install temporary culverts and other drainage works, as required, to maintain drainageways during construction.

B. Contractor shall control erosion along access roads and provide sedimentation control structures downstream of temporary access roads, and all Work areas to prevent discharge of sediment to the Denver storm drainage system, as specified in Section 02130.

3.5 ACCESS AND HAUL ROADS

A. Contractor shall properly maintain all access and haul roads necessary for the conduct of the Work. Remove all spilled or tracked waste materials from the public roads immediately, and clean public roads as necessary at the completion of hauling. Contractor shall repair any damage to permanent roads, curbs/gutters, sidewalks, and bridges and restore them to a condition equal to or better than that found at the outset of the project, and in accordance with city specifications.

B. Contractor shall comply with all posted load limits for local roads and bridges used in transporting materials.

C. Contractor shall apply water and/or approved dust suppressants to access roads between the work areas, if necessary.

D. Comply with access requirements of Asarco, if disposal at the Globe Plant is performed, or with operators of a municipal solid waste disposal landfill, as applicable.

3.6 WORK AREA MAINTENANCE

A. Contractor shall keep work areas free from any unnecessary accumulation of waste materials and rubbish and shall maintain the work areas in a safe and tidy condition at all times

B. Contractor shall prevent leaks from all equipment and haul trucks and shall clean up any releases should they occur.

3.7 TEMPORARY WINTER SHUTDOWN

A. Contractor shall provide for temporary winter shutdown of the construction as necessary by completing components of the work prior to shutdown, and performing any other work necessary to provide for a safe and orderly temporary shutdown period and subsequent spring start-up.

3.8 CLEANUP AND DEMOBILIZATION

A. Following completion of the Work, Contractor shall thoroughly clean all equipment that has come into contact with contaminated material, and remove from the site all equipment, materials and temporary facilities not incorporated into the Work.

B. Remove temporary culverts if any, at the end of the construction, and restore areas, as directed.

C. Maintain the sedimentation control features as necessary during construction. If directed by the Supervising Contractor, leave sediment controls in-place at the

end of construction to provide sediment control during the vegetation establishment period, otherwise, remove all temporary sediment/erosion control devices at the completion of remediation in an area or yard.

D. Waste materials, debris and rubbish generated by the Contractor shall be properly collected and disposed of offsite, in accordance with local, state, and federal laws and regulations.

E. Contractor shall leave all areas of the Site, including all remediated properties, in a clean, stable condition.

END OF SECTION

SECTION 01510
TEMPORARY CONSTRUCTION UTILITIES AND FACILITIES

PART 1 GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for temporary construction utilities and facilities required by the Project. These include but are not limited to water service, electric power, telephone service, sanitary facilities and office space.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01505 – Mobilization, Preparatory Work and Demobilization

C. Section 02900 – Vegetation Establishment – Trees and Shrubs

D. Section 02920 – Vegetation Establishment – Sod Installation

1.3 SUBMITTALS

A. Within 10 days after receipt of Notice of Award, Contractor shall submit a written final CCWP. The CCWP, mentioned in Section 01505 - 1.4A and elsewhere, will include appropriate drawings, identifying all proposed preparatory work including, as applicable, temporary offices and other structures; storage buildings and yards; temporary water supply and distribution; temporary power supply and distribution; and temporary sanitary and personnel decon facilities.

PART 2 PRODUCTS

2.1 TEMPORARY WATER

A. Provide potable water for contractor's workers at the Site. Contractor may be able to arrange domestic water service with Denver Water.

B. Water for dust control, moisture control for compaction and watering of replacement vegetation will be acquired as necessary by contractor, and shall be used in accordance with any special-use permits for the project as acquired from Denver Water by USEPA.

C. Temporary water line installation(s), if necessary, shall meet the requirements of all governing agencies.

2.2 TEMPORARY ELECTRIC POWER

A. Temporary electric service shall be established by the Contractor.

B. Temporary electric power installation shall meet the requirements of all applicable codes and regulatory agencies.

2.3 TEMPORARY TELEPHONE SERVICE

A. Temporary phone service shall be established by the Contractor. A minimum of two lines will be required with one line each for the Contractor and Supervising Contractor. Installation shall meet the requirements of all applicable codes and regulatory agencies.

B. Contractor shall provide for two-way radio and cellular phone service necessary to maintain continual contact between site crews/haul trucks and the Construction Office and Construction Superintendent.

2.4 SANITARY FACILITIES

A. Contractor shall provide temporary sanitary facilities at the Site, as required, for all work crews, Supervising Contractor, and visitors.

2.5 OFFICE/TESTING TRAILER

A. Contractor shall provide for an office space of at least 12' by 20' for use by the Supervising Contractor, plus space required for Contractor's use. Office trailer(s) shall be equipped with heating, air conditioning, electrical supply, and telephone service.

B. Contractor shall provide a separate trailer for QA/QC testing and storage of testing equipment.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY

A. Schedule delivery of products or equipment as required to allow timely installation and to avoid excessive on-site storage. No inside storage is available unless provided by Contractor. Contractor should provide for suitable storage of equipment and materials and arrange for storage/staging and construction personnel, visitor and Supervising Contractor parking.

B. Delivery of products or equipment to be in manufacturer's original unbroken cartons or other containers, clearly and fully marked and identified as to

manufacturer, item, location where to install, and instructions for assembly, use and storage.

C. The Contractor shall inspect all products or equipment delivered to the site prior to their unloading and shall reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on project.

3.2 STORAGE AND HANDLING

A. Store products or equipment off ground and protected from weather. Provide additional protection as required by manufacturer until the time that the item is to be installed. While storing, take care to avoid damage from water or humidity.

B. Store products or equipment in location to avoid physical damage to items while in storage, and to facilitate prompt inspection.

C. Handle products or equipment in accordance with manufacturer's recommendations and instructions.

D. Delicate instruments and materials subject to vandalism or theft shall be placed under locked cover and, if necessary, provided with temperature control as recommended by manufacturer.

E. Spill control measures shall be implemented as necessary.

END OF SECTION

SECTION 01548
PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL DATA

[Note: this section may be deleted, depending on the ARARs identified in EPA's Record of Decisions]

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Section 02205 – Earthwork for Yard Remediation

1.2 LEGISLATION

A. Federal legislation (Public Law 93-291); National Historic Preservation Act; The Archeological Resources Protection Act of 1979; and Historic/Archeological Data Preservation Act of 1974 provides for the protection, preservation, and collection of scientific, prehistoric, historic, and archaeological data (including relics and specimens) that might otherwise be lost due to alteration of the terrain as a result of any construction project.

1.3 CHANGES TO THE CONTRACT TIME AND/OR PRICE

A. Where appropriate, by reason of an historic or archaeological discovery, the Supervising Contractor or USEPA may order delays or alterations in the Project Schedule, or changes in the Work, or both. Where such delays, alterations or changes are ordered, the EPA may adjust the time of performances and/or the Contract Price in accordance with the applicable clauses of this Contract.

PART 2 PRODUCTS

2.1 MATERIALS

A. The Contractor shall use appropriate and sufficient materials to preserve historical and archaeological data, as required, or as directed by the EPA.

PART 3 EXECUTION

3.1 COMPLIANCE

A. If the Contractor, Contractor's employees and/or subcontractors, in the performance of this Work, discover evidence of possible scientific, prehistoric, historic, or archaeological data, the EPA or its Representative shall be notified immediately of the location and nature of the findings, and written confirmation shall be forwarded within two days. Contractor shall exercise care so as not to

damage artifacts, fossils or other evidence uncovered during construction operations. Contractor shall provide such cooperation and assistance as may be necessary to reserve the findings for removal or other disposition by the EPA. Title to materials found on the site will reside with the EPA or landowner.

B. Contractor agrees to insert Paragraph 3.1 A in all subcontracts which involve the performance of Work on the Site.

END OF SECTION

SECTION 02020
SUBSURFACE CONDITIONS

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Section 02130 – Surface-Water and Sediment Control During Construction

B. Section 02205 – Yard Remediation Earthwork

1.2 DATA

A. Very limited general subsurface data have been compiled for the project site and include only shallow soil sampling at various properties. These data will be provided at Contractor's request and represent best available information only; the Contractor shall satisfy itself as to the value of this information and obtain additional information if it deems necessary. EPA and the Supervising Contractor make no warranty as to the quality or completeness of this information.

1.3 QUALITY CONTROL

A. Make no deviations from the Contract without specific and written approval of the EPA or its Representative.

B. Obtain approval from the Supervising Contractor before performing any exploratory excavations or borings.

C. Contractor shall verify the location of *all* underground utilities and other permanent features prior to excavating at a property.

END OF SECTION

SECTION 02100
SITE CLEARING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers the requirements for removal of existing surface debris and clearing of designated vegetation in preparation for yard remediation.

1.2 RELATED SECTIONS

A. Section 02205 – Yard Remediation Earthwork

1.3 REGULATORY REQUIREMENTS

A. Contractor shall comply with the requirements of all applicable Local, State, or Federal codes regarding clearing and disposal of related debris.

PART 2 PRODUCTS AND EQUIPMENT

A. Contractor shall use appropriate and sufficient products and equipment in the conduct of all site clearing work.

PART 3 EXECUTION

3.1 PREPARATION

A. Contractor shall verify the extent of clearing necessary for the conduct of the Work and shall ensure that existing plant life and features designated by the Supervising Contractor or property owner to remain are clearly tagged or otherwise identified.

3.2 PROTECTION

A. Contractor shall take all necessary precautions to ensure that existing facilities and structures, designated vegetation, and survey control points are protected against damage or displacement. Contractor shall repair or replace damaged survey control points and other site features designated to remain as required by state law and at its own expense.

3.3 PERMITS

A. Contractor shall obtain all necessary permits and pay any applicable fees for removal and/or disposal of cleared materials.

3.4 CLEARING AND GRUBBING

A. Contractor shall clear only those areas required for access to site and execution of Work, and shall minimize disturbance to adjacent land and large, healthy trees and bushes, subject to the approval of EPA.

B. Remove dead trees and shrubs and small trees (less than 2-inch diameter) and bushes from areas with consent of the property owner and dispose of such materials as required.

C. Stumps and root systems shall be removed to a depth of 12 inches below the existing surface where required.

END OF SECTION

SECTION 02130
SURFACE WATER AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification section covers the requirements for controlling surface water drainage and sediment during yard remediation work.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01505 - Mobilization, Preparatory Work and Demobilization

C. Section 02205 - Yard Remediation Earthwork

1.3 QUALITY CONTROL

A. Contractor shall be fully responsible for complying with all provisions of the applicable Colorado storm water control regulations of the Colorado Water Quality Control Act including construction-related storm-water discharges and the NPDES requirements for construction-related storm-water discharges.

1.4 SUBMITTALS

A. A Storm Water Management Plan shall be included with the Contractor's initial submittals which shall include information on materials and methods proposed for drainage and sediment control measures at the site as specified in Section 01300, Part 1.5 and in accordance with the applicable State and Federal regulatory requirements.

PART 2 EQUIPMENT AND PRODUCTS

2.1 EQUIPMENT

A. Contractor shall ensure that sufficient sediment-control Best Management Practices (BMPs) and other appropriate equipment and materials are available on site, prior to commencement of work, such that operation of the surface water and sediment control systems can be continuously maintained. All equipment shall be of good quality and in good working order.

2.2 MATERIALS

A. Straw bales, silt fences, filters, sediment traps/basins or other materials used to control erosion and sediment transport from excavations and other work areas shall be new and appropriately sized to serve the intended purpose.

B. Use certified weed-free straw bales, as necessary.

C. Use 30- to 36-inch high silt fences including slats for stability, as necessary.

PART 3 EXECUTION

3.1 STORM WATER AND SEDIMENT CONTROLS

A. Provide sedimentation control BMPs in the Work areas as required, and as directed, to prevent inflow of sediment to Denver's storm sewer system and to prevent sediment loading to adjacent streams and adjacent properties. Install straw bale, sod filter strips, silt fence sediment barriers or other BMPs as required in the work areas as directed.

B. If required, install silt fences with suitable posts and proper anchorage along the entire length of the silt fence, with support stake spacing and burial of geotextile in accordance with the manufacturer's recommendations.

C. Remove and dewater silt or sediment buildup behind silt fences and sedimentation control dams as necessary during construction and near the end of the work, prior to shutdown, and dispose of sediments as with excavated soil.

D. Construct small sedimentation traps at the discharge of the diversion lines, if necessary and as directed.

E. If necessary, maintain the diversion pipes or systems and sediment control structures as applicable throughout the performance the work, as necessary. Remove sediments in sedimentation ponds or collection structures as necessary during construction.

F. Provide all necessary vehicle tracking controls to minimize tracking of sediment or mud onto public roadways, sidewalks or alleys.

3.2 VEHICLE TRACKING CONTROLS

A. Provide all necessary vehicle tracking controls to minimize tracking of sediment or mud onto public roadways, sidewalks or alleys.

B. Wherever construction vehicles enter onto paved public roads, provisions must be made to prevent the transport of sediment (mud and dirt) by runoff or by vehicles tracking onto the paved surface. For sites greater than two (2) acres, a

stabilized vehicle tracking control must be constructed. Whenever deemed necessary by the City/County of Denver, and as approved by Denver Water, wash racks shall be installed to remove mud and dirt from the vehicle and its tires before it enters onto public roads.

C. Whenever sediment is transported onto a public road, regardless of the size of the work area, the road shall be cleaned at the end of each day. Sediment shall be removed from roads by shoveling or sweeping and be transported to a controlled sediment disposal area. Street washing shall not be allowed until after sediment is removed in this manner and only if authorized by Denver Water. If washing is not permitted, the streets shall be cleaned by a street sweeper truck. Storm sewer inlet protective measures should be in place at the time of street washing.

3.3 DEWATERING METHODS – IF NEEDED

A. Contractor shall perform dewatering, as necessary, during all construction at the site, such that water levels are maintained below the bottom of excavations.

B. Contractor shall select methods of dewatering and arrangement of related piping systems that minimize direct discharges to adjacent streets and storm drains, and do not cause erosion or instability of the work site or adjacent areas.

END OF SECTION

SECTION 02205
YARD REMEDIATION EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers the construction procedures necessary to remove soil and remediate specified residential properties and adjacent areas, including road aprons, as necessary.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 021300 – Surface Water and Sediment Control during Construction

C. Section 02900 – Vegetation Establishment – Trees and Shrubs

D. Section 02920 – Vegetation Establishment - Sod Installation

E. Transportation and Disposal Plan - Attached

F. Summary of Construction Quality/Quality Assurance Monitoring and Testing, Table 3-1 of Construction Quality Assurance Plan – Attached

G. Replacement Soil Composition Requirements, Table 2-1 of Remedial Design Work Plan - Attached

1.3 SAFETY

A. Contractor shall comply with the applicable safety and health requirements of OSHA.

B. Contractor shall exercise particular caution during excavation, handling and placement of soils, which may exhibit elevated concentrations of arsenic and lead and could present a potential health hazard to Contractor's site personnel, if not properly protected.

C. Comply with the requirements of the Contractor's Health and Safety Plan for Construction Activities.

D. Provide visual safety barriers (e.g., caution tape, safety fence, etc.) around work sites.

E. Provide all other safety requirements stipulated in the Transportation and Disposal Plan.

1.4 QUALITY CONTROL

A. Contractor shall use adequately experienced personnel in performing yard remediation earthwork.

B. Perform quality control tests using the methods and at the frequencies identified in Table 3-1 of the Construction Quality Assurance Plan.

C. Supervising Contractor will perform periodic quality assurance monitoring sampling and observations. Provide assistance and cooperation as needed for QA.

PART 2 PRODUCTS

2.1 RESIDENTIAL YARD REPLACEMENT SOIL

A. Use locally available, approved native backfill material for soil replacement as required. Soil shall meet the project composition requirements (clay, silt, and sand content) for replacement soil.

B. Constituent concentrations shall not exceed limits specified in Table 2-1 of the Removal Design Work Plan.

C. Contractor shall identify borrow source(s) for residential yard replacement soil. Borrow sources shall be approved by Supervising Contractor before materials are transported to the Site.

2.2 GRAVEL MATERIALS

A. For gravel surfacing use a cover coat aggregate consisting of crushed stone, crushed or natural gravel, Type IV, as specified in CDOT Standard specifications for Road and Bridge Construction.

B. Contractor shall identify borrow sources for base course and gravel. Borrow sources shall be approved by EPA before materials are transported to the Site.

C. Constituent concentrations shall not exceed limits specified in Table 2-1 of the Removal Design Work Plan.

2.3 ORGANIC AMENDMENTS

A. If required, soils shall be amended using humus compost, dried and pulverized poultry manure, or aged treated and pulverized manure. Apply at a maximum rate of 3 cubic yards per 1,000 square feet of topsoil.

2.4 MISCELLANEOUS YARD REPLACEMENT MATERIALS

A. If miscellaneous yard replacement materials are required such as fencing sprinkler heads, paving stepping stones or other items, provide materials of the same type and equal or better quality to the materials removed or damaged during yard remediations.

PART 3 EXECUTION

3.1 AREAS OF REMOVAL

A. Site plans identifying specific details of remediation will be provided by the Supervising Contractor, which Contractor shall utilize for its soil removal and replacement operations. In general, the following areas will typically be excavated: sod, open yard and landscaped areas to asphalt or pavement and to lateral extension of property lines; gardens and flowerbeds; unpaved driveways; areas under temporary structures (such as storage sheds, landscape timbers, stepping stones, etc.), road aprons (strips between sidewalks and streets), and beneath decks higher than 18 inches above ground level.

B. Excavation is not required in areas that are paved or otherwise covered (such as concrete pads, patios, sidewalks, paths, driveways, and crawl spaces), or in areas where permanent structures are present (such as houses, garages, and wooden decks lower than 18 inches). Larger trees and shrubs shall be left in place.

3.2 PREPARATION

A. Yard preparation will commence with final notification to the property owners of the intended action, date, and start time. This notification will be made by the Supervising Contractor at least one week prior to the start of remediation. Contractor shall immediately notify Supervising Contractor of any anticipated delays that may result in work not being performed on the notified start date.

B. Immediately prior to beginning work, a Site inspection will be arranged by the remediation contractor with the local utility companies to locate electrical, water, sewer, gas, cable, television, and phone lines. Affected residents will be notified of this Site inspection and asked to participate, if needed, to provide information on subsurface obstacles such as septic systems and abandoned lines. The utility company will be requested to mark these utilities on the ground with

colored spray paint. The remediation contractor shall inspect each yard for visible obstacles, and may utilize an electromagnetic detector if there is reason to suspect buried obstructions have not been marked. Locations of subsurface obstacles shall be confirmed by hand digging to locate and uncover the obstacle. The type and location of the obstacle shall be placed on a site plan of the residential property, which shall be issued to the work crew prior to remediation startup.

C. Surface obstacles to be removed prior to remediation actions shall be identified by the Supervising Contractor in consultation with the Contractor. The property owners will be asked to discuss any concerns or special requests they may have in removing surface obstacles or in preparing their yard for remediation. Supervising Contractor shall request that the property owners remove and store personal possessions and keepsakes requiring special care inside their buildings. Woodpiles, walkway stepping stones, and other miscellaneous landscape articles shall be relocated on-site by contractor, if possible. Large obstructions such as fences and gates shall be removed by contractor if necessary and stored onsite to allow for ingress of equipment and access for the work crews.

D. Permanent fixtures, other building structures connected to, or separate from, primary buildings, and footings near buildings will be marked, photographed and/or videotaped and identified as to their condition by Contractor. Detailed photo and video documentation shall be performed by the Contractor to identify and record the existing conditions of the property prior to remediation. The Supervising Contractor will provide a checklist of the minimum photo documentation requirements. The Construction Contractor will provide the required photo documentation to the Supervising Contractor prior to beginning property remediation.

E. Large possessions, such as RVs, boats, or vehicles, will be relocated by the property owner. In special cases, where the property owner is physically unable, the Contractor shall assist them with the transport of possessions. Shields for subsurface pipelines left in place or support members to retaining walls and siding shall be installed prior to the start of excavation activities as required.

3.3 DUST SUPRESSION

A. Dust suppression water mist sprays shall be used to minimize the potential for fugitive dust emissions if authorized by Denver Water. Application rates shall be regulated to control dust during excavation without contributing to the development of mud. The objective is to minimize airborne dust and, at the same time, minimize production of mud which could be transported off-site on haul trucks and other mobile equipment. Dust suppression equipment will consist of standard garden hoses and spray regulators connected to a tanker truck or trailer. All equipment shall be provided by Contractor.

B. The Contractor shall provide the following water applications during the course of remediation operations and on an as-needed basis:

- During soil removal operations by heavy equipment and by hand crews;
- At work intervals where wind and/or dry weather require such actions to prevent airborne emissions; and
- During stockpiling and loading of soils into staging areas before off-site transportation.

C. Work area shall be broomed to remove any spilled soils and may be washed down if authorized by Denver Water. After washing down sidewalks, streets, alleys and other paved areas, accumulated soil materials shall be collected and transported along with the removed soils to disposal area(s). Excavated soils shall be removed from the residential areas at the earliest opportunity. If these soils cannot be removed by the end of daily work, they shall be covered with tarpaulins. Under no circumstances shall any soils be allowed to wash into storm drains or drainage ditches.

3.4 EXCAVATION

A. Contractor shall perform surveying or provide an alternate means acceptable to Supervising Contractor to verify the adequate removal of the specified depth of soil. Contractor shall provide survey data, inspection reports or other appropriate records to the Supervising Contractor to document removal as specified.

B. Soil shall be removed to the specified depth (12 inches) minimum in open areas throughout the yard and from below portable sheds that may be moved without damaging the shed. Soil shall be removed to a depth of 4 inches below the deck located 18 inches or greater above ground. Soil shall not be removed below decks lower than 18 inches. During excavation, take care to hand excavate next to buildings, sidewalks, and other structures to maintain support and prevent damage. When necessitated by extremely unstable conditions, soil shall be sloped slightly away from the edges of sidewalks, rock structures, or weak concrete foundations or other supporting structures to prevent loss of support and potential weakening of these features.

C. Where utilities will be encountered at depths within the scope of excavation, soil around these utilities shall be hand excavated. Where interruptions to any services occur as a result of removal activities, utility companies shall be contacted as soon as possible, and no later than ½ hour from initial interruption.

D. Excavation around shrubs and tree roots shall be performed by hand and equipment, and removed and disposed with other debris. Excavations shall be tapered around trees from the trunk to the drip zone to avoid damage to roots.

E. Sprinkler systems encountered shall be either excavated by hand or removed and disposed with other debris. Generally the sprinkler heads shall be removed and saved along with major components such as manifolds, valves and controllers. The pipes shall be removed and disposed. Upon backfill the pipes shall be replaced and the components re-installed.

F. Fences shall be removed (if required), salvaged, and replaced upon completion of backfill. Where feasible to leave in place during excavation, hand work around posts etc. shall be performed to maintain fence stability and prevent damage.

3.5 EQUIPMENT OPERATIONS

A. Ingress areas for equipment travel shall be secured, and adequate materials shall be placed on sidewalks or other heavy traffic areas to protect them from damage during excavation work. Travel over sidewalks shall be limited to the extent practicable.

B. Work crews shall not utilize procedures which result in damage to buildings and structures. Spotters shall communicate the zones of heavy equipment

operations to hand crews at all times. Hand signals and communication plans for equipment operators and work crews shall be developed and used.

C. Excavated materials shall be loaded into haul tracks at or near excavation areas. If it is not possible to back haul trucks onto the site, adjacent to the excavation areas, an intermediate soil stockpile may be required prior to loading trucks. Stage such material hauling to avoid contamination of adjacent areas.

3.6 PROTECTION OR STRUCTURES AND PLANTS

A. Hand excavation is required for all areas susceptible to potential damage from equipment operations. Areas of concern include structures (i.e., houses, garages, sheds, paved driveways and sidewalks, septic systems), as well as any other areas that would require hand excavation as identified on the site plan determined by Supervising Contractor and the property owner. The Contractor shall inspect structures and large tree roots during excavation operations and take immediate and appropriate steps if either are damaged.

B. Based on the site plan, and photos from the access agreements, structures and buildings shall be inspected for evidence of deformation or changes resulting from remediation activities. The remediation contractor shall contact the Supervising Contractor and homeowners when conditions are discovered that warrant such notifications.

C. Care shall be taken to not interfere with overhead utility lines in the work areas. Provide safeguards as necessary to protect such overhead lines.

3.7 TEMPORARY WORK STOPPAGES AND WINTER SHUTDOWN

A. If conditions are encountered which are beyond the control of the remediation contractor that delay or prevent the performance of the remediation, the remediation contractor shall stop work and immediately inform the Supervising Contractor and the property owner. These conditions include: uncovering of artesian wells or other subsurface flow phenomena, building or structural impairments and, unknown utilities or subsurface features such as abandoned septic systems.

B. Plan yard remediation work accordingly for winter shutdown periods. No yard remediation earth work or property restoration shall be left partially completed at any property during winter shutdown periods, including sodding.

3.8 ACCESS FOR PROPERTY OWNER

A. Clear and clean access shall be provided to residents at all times during remediation activities such that residents will not have to walk through soil prior to entering their homes. Sidewalks shall be thoroughly brushed and washed off with water (if authorized) after each work day to provide as clean an entry as possible to the residence. If there is no sidewalk to the residence, a clean

pathway shall be provided to the resident by laying down plywood, pallets, plastic, or using some other means to prevent exposure and tracking of soil containing contaminants.

3.9 DECONTAMINATION PROCEDURES

A. Equipment and tools used in the remediation process shall be decontaminated prior to leaving the work area. Decontamination shall first involve a brush down of remediation equipment in the yard to remove visible accumulation from machinery, tires, shovels, etc. Use of water shall be avoided whenever possible. Water shall be used if visible contamination is evident after dry brushing, prior to leaving the site for any reason. In these cases, equipment shall be washed while on the premises to minimize the migration of mud and water to the streets. Soil removal during equipment decontamination shall be contained, removed and transported to the disposal area(s).

B. Workers are required to decontaminate daily, or whenever leaving a site where soil removal activities are being performed. Decontamination protocols shall be included in the Contractor's Health and Safety Plan and instituted by the Contractor. Streets, rights-of-way and access routes shall be cleaned of noticeable accumulations of soil, dust, or debris that are attributable to yard remediation activities.

3.10 SOIL DISPOSAL

A. Disposal of removed soil, wash down materials and other debris shall be at an EPA-approved municipal solid waste (MSW) landfill facility or facilities, or the Asarco Globe Plant. No materials shall be transported to a disposal site without prior approval to EPA.

B. Excavated soil and debris shall be transported to the disposed facility in covered trucks. Access to the disposed area(s) will involve transport on public roads or possible limited constructed temporary haul routes. Soil-transport operations shall be limited to daylight hours and shall be performed in a safe and controlled manner. Loads shall be kept below the upper edges of the truck bed and shall be covered prior to transport to minimize the dispersal of excavated soils through airborne emission or spillage. Truck liners shall be used if free water is present in the excavated material or if soils are flowable. Spillage that occurs on public roads shall be cleaned and removed as quickly as possible by picking it up or by brushing it into an area that is planned for cleanup, but has not yet been cleaned up.

C. Follow the requirements of the Transportation and Disposal Plan in all loading, hauling and disposal operations, for disposal at a MSW landfill(s) or the Globe Plant.

3.11 BACKFILL AND GRADING

A. Each residential yard remediated shall be backfilled to the approximate original grade with approved clean replacement soil. Place a minimum of 12 inches of soil in excavated yard, flowerbeds, and vegetable gardens, where required. Overfill flowerbeds and gardens as directed by Supervising Contractor to compensate for settling. Perform hand work for the fine grading as necessary to achieve pre-removal grades and promote drainage away from houses. Fine grading shall include allowance for vegetation installation, as necessary, and shall provide a top elevation approximately 1 to 1 ½ inches below tops of drainage inlets, as necessary.

B. Gravel driveways, parking areas, and other residential areas subject to vehicular traffic shall be backfilled to approximate original grade with a minimum of 8 inches of compacted soil followed by 4 inches of clean gravel.

C. Where access allows, the trucks may drive onto the yard or road and deposit their load while driving slowly to spread the material. Where access is limited, the trucks shall dump their load at a staging area adjacent to the yard from which equipment can transport the material around the yard. Some handwork using wheelbarrows and shovels may be necessary to rough grade the yards. Rough grading of areas requiring gravel (e.g., driveway, roads, and road shoulders) shall be performed using the same methods.

3.12 COMPACTION

A. Compaction of the residential backfill material shall be accomplished using plate compactors, hand tamping or other measures approved by the supervising contractor. Compaction shall be performed as directed by the Supervising Contractor. Further compaction of backfill material may be required in areas where walkways and egress/ingress will occur.

B. Compact gravel surfacing with plate compactor or equipment travel as directed. At a minimum, gravel surfacing shall be placed and compacted to pre-removal conditions, and to promote drainage as necessary.

3. 13 Post-Construction Photodocumentation

A. The Construction Contractor shall thoroughly document the condition of each remediated property at the end of the maintenance period, and shall provide such documentation to the Supervising Contractor within one week after the maintenance period expires.

3.14 REPAIR ACTIVITIES

A. Soil removal and replacement activities shall be conducted to minimize damage to property, to the extent possible. Any damaged structures (e.g., buildings, sidewalks, fences, etc.) shall be repaired or replaced at Contractor's cost upon discovery and determination that the damage was caused by remediation efforts.

Landscape features (trees, shrubs, etc.) damaged during the removal and replacement procedure shall be repaired or replaced to equal or better conditions.

B. Damaged utilities (including water, electric, gas, telephone and cable) shall be repaired or replaced to current building code requirements.

C. If doubt exists whether damage was caused during the soil removal process, video and/or photographic documentation taken before initiation of activities shall be reviewed on a case-by case basis. The decision to repair dispute damages shall be made by the Supervising Contractor. Once any necessary repair work has been completed additional photographs and/or videos will be taken to document the final condition of each remediated property.

3.15 ADDITIONAL WORK

A. Additional work may be performed at the properties beyond restoration to pre-removal conditions, at the request of property owners and as approved by EPA such that the remediation schedule is not impacted.

B. EPA approved additional work, beyond pre-removal restoration, will be at the expense of the property owner.

END OF SECTION

SECTION 02900
VEGETATION ESTABLISHMENT –TREES AND SHRUBS

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section describes the requirements for tree and shrub establishment in the Residential Yard work areas.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02205 – Yard Remediation Earthwork

C. Section 02920 – Vegetation Establishment – Sod Installation

1.3 QUALITY CONTROL

A. Growth medium shall comply with Specification Section 02205, Part 2.1. The Supervising Contractor shall have the right to sample the growth medium material and conduct confirmatory analyses, prior to acceptance of the material, and periodically during placement of growth medium.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver compost and other accessories in containers recommended by the manufacturer(s) and store as directed. Protect synthetic erosion control materials prior to installation as recommended by the manufacturer.

1.5 SUBMITTALS

A. Submit information on proposed material supplier(s) at least 5 days prior to delivery.

PART 2 PRODUCTS

2.1 ACCESSORIES

A. Mulching Material: Dry oat or wheat straw, free from weeds and foreign matter detrimental to plant life. Chopped cornstalks are acceptable. Also acceptable is approved wood cellulose fiber; chip form and free of ingredients that could inhibit growth or germination. Use all certified weed-free material.

2.2 COMPOST

A. "EKO" compost as provided by Pioneer Sand and Gravel, or equal, shall be aged organic matter meeting the following minimum requirements.

1. Minimum Requirements

a. Organic matter: 45% minimum
b. Specific conductivity: 4.0 mmhos/cm maximum
c. PH range 4.3 to 7.5

Sphagnum peat shall contain at least 95 percent organic matter determined on an oven-dry basis and shall have a pH of 4 to 6.5. Ground native mountain peat may not be used unless otherwise approved by the Supervising Contractor. If approved, native mountain peat shall be furnished in bulk, shall contain at least 50 percent organic matter determined on an oven-dry basis, and shall have a pH of 6.5 or less.

2. Organic material may be:

a. Dried, pulverized poultry manure.
b. Humus.
c. Compost.
d. Aged, treated, pulverized manure.
e. Treated sewage sludge.

3. Aspen humus may not be used as a soil amendment.

4. Mountain peat may not be used as a soil amendment on properties owned by the City and County of Denver

5. If peat is used, it will be thoroughly mixed into the soil.

2.3 TREES AND SHRUBS

A. General. Where tree or shrub replacement is required, plants shall be of the species or variety designated, in healthy condition with normal, well-developed branch and root systems, and shall conform to the requirements of the current "American Standard for Nursery Stock" (American National Standard Institute ANSI Z60.1-1980). The Contractor shall obtain certificates of inspection of plant materials that are required by Federal, State, or local laws, and submit the certificates to the Supervising Contractor.

1. All plants shall be free of plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine

regulations of the State of origin and destination, and the Federal regulations governing interstate movement of nursery stock.

2. The minimum acceptable sizes of all plants, measured before pruning, with branches in normal position, shall conform to the measurements specified on the red-lined design drawings signed by the property owner.

3. Plants hardy in hardiness zones 2,3,4 and 5, as defined in U.S. Department of Agriculture publications, only shall be accepted.

4. All nursery grown plants shall be those plants that have been growing in a nursery for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.

5. Trees and shrubs shall have been root-pruned during their growing period in a nursery in accordance with standard nursery practice.

B. Not Recommended Trees. Trees with excessive fruit or flowers such as western catalpa, tree of heaven, Kentucky coffee tree, and cotton-bearing may create a maintenance problem or pedestrian hazard and should not be planted within public right of way. Trees with marginal success in this area, such as Ohio buckeye, sycamore, and pin oak, should not be planted within public right of way.

C. Prohibited Trees. Unless specifically authorized by the Denver City Forester, the following species of trees are prohibited form being planted within right of way belonging to the City and County of Denver.

1. Any of the poplar species (Populus sp.)
2. Any of the willow species (Salix sp.)
3. The box elder tree (Acer negundo)
4. The Siberian (Chinese) elm (Ulmus pumila)
5. The silver maple (Acer saccharinum)
6. Any weeping or pendulous type of tree.
7. Any tree with bushy growth habit which cannot be maintained to a single leader or trunk.
8. Any shrub which could obstruct, restrict, or conflict with the safe use of the right of way.
9. Any artificial trees, shrubs, turf or plants.

D. Substitution. In the event that plants of acceptable quality and the specified variety or size are not available locally, the contractor shall notify the property owner and request that the property owner suggest acceptable alternatives such as:

1. Replacement with acceptable plants that are larger than specified,

2. Replacement with smaller plants,

3. Replacement during the following planting season with plants that are not available in the trade in suitable sizes this season,

4. Replacement with plants of a different genus, species, or variety.

5. Replacement with any additional quantity of plants if smaller than the existing size.

The contractor shall notify the Supervising Contractor of tree, shrub or flower substitution.

E. Handling and Shipping. Plants shall be dug, properly pruned, and prepared for shipping in accordance with recognized standard practice. The root system shall be kept moist and the plants shall be protected form adverse conditions due to climate and transportation, between the time they are dug and actual planting. Deciduous plants may be furnished bare root, balled and burlapped, or in containers used in standard nursery practice. Balling and burlapping shall conform to the recommended specifications in the "American Standard for Nursery Stock". The call of the plant shall be natural, not made, and the plant shall be handled by the ball at all times.

2.4 WATER

A. Water used for irrigating newly-seeded lawns shall be free from oil, salt and other contaminants and shall be free from excessive suspended sediment and debris.

3.1 TREE AND SHRUB PLANTING

A. If required, plant trees and shrubs in suitably-excavated areas with placement, fertilization, backfill, mulching, and watering as recommended by the nursery for the tree or shrub being planted.

END OF SECTION

SECTION 02920
VEGETATION ESTABLISHMENT – SOD INSTALLATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section describes the requirements for sod installation during Residential Yard remediation.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02205 – Yard Remediation Earthwork

C. Section 02900 – Vegetation Establishment - Seeding

1.3 QUALITY CONTROL

A. Soil material shall comply with the requirements of specification Section 02205.

B. Contractor shall provide sod on pallets or in rolls, with roots protected from dehydration until the time of installation. Sod shall be identified clearly with source location, grass species, age and date/time of harvest from source.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 18 hours of delivery.

1.5 SUBMITTALS

A. Submit sod certification for grass species and location of sod source.

1.6 MAINTENANCE SERVICE FOR SODDED AREAS

A. Maintain sodded areas immediately after placement for 30 days to ensure grass is well established and exhibits a vigorous growing condition.

B. Immediately replace sod in areas which show deterioration or bare spots.

C. Replace or repair any damaged lawn irrigation component (e.g., sprinklers, pipes) to ensure a working system upon completion of sod installation.

PART 2 PRODUCTS

2.1 SOD SUPPLIER

A. Sod producer must be company specializing in sod production and harvesting with a minimum of five (5) years experience, and certified by the State of Colorado.

2.2 SOD CHARACTERISTICS

A. Sod shall have a minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically be holding the upper two corners and shall have a soil thickness of ¾ - inch, minimum to 1 ½-inch, maximum.

B. Sod shall be ASPA approved or certified and may be field grown, with a strong fibrous root system, free of stones, burned or bare spots and shall be 99 percent weed free. The one percent allowable weeds shall not include any undesirable perennial or annual grasses or plants described as noxious by current State statute or regulation. (The "Colorado Undesirable Plant Management Act" Title 35, Article 5.5, CRS, defines the following four plants as "noxious": Leafy Spurge, Difuse Knapweed, Russian Knapweed, and spotted Knapweed. The counties are responsible for enforcing the Undesirable Plant Management Act and may have declared other plants, such as Purple Loosestrife, to be "noxious".

C. Sod shall consist of species appropriate to growing conditions in local areas and may include the following:

Baron	Nassau	Nugget
Fylking	Touchdown	America
Majestic	Parade	A-34
Ram 1	Glade	Adelphi
Midnight	Columbia	

Other sod types may be used if approved by the Supervising Contractor.

D. Sod shall be harvested from the field source area by machine cutting in accordance with ASPA guidelines in minimum widths of 18 inches and minimum lengths of 48 inches.

2.3 ACCESSORIES

A. Wood pegs made of softwood, with sufficient size and length to ensure anchorage of sod on steep slopes, as necessary.

B. Edging shall be made of galvanized steel or plastic consistent with original material.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that prepared soil base is ready to receive the work of this section. The upper 4 inches of soil shall be free from rocks and debris, shall be rototilled and fine graded to ½ inch below adjacent walks, driveways and patios.

B. Beginning of installation means acceptance of existing site conditions.

3.2 LAYING SOD

A. Place 200 pounds per acre of 18-46-0 fertilizer or starter commercial seed fertilizer and moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately on delivery to site, and within 24 hours after harvesting, to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces. No gaps greater than 1 inch shall exist between sod and adjoining fixed features.

D. Lay sod in smooth sections. Place top elevation of sod even with adjoining edging, paving, or curbs. Where sod abuts drainage inlets, adjust subgrade soils such that the top of the sod will be 1 ½ inches below the top of the drainage inlet.

E. On slopes 2:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of 2 feet on center. Drive pegs flush with soil portion of sod.

F. Water sodded areas immediately after installation. In accordance with Denver Water requirements. Unless otherwise specified, saturate sod to 4 inches of soil depth.

G. After sod and soil have dried, roll sodded areas with an approximately 150 pound roller to ensure good bond between sod and soil and to remove minor depressions and irregularities.

H. If sod manufacturer recommends application of fertilizer to installed sod, apply at the recommended rate.

I. Install sod between April 1 and August 31 each year.

3.3 MAINTENANCE

A. Maintain and water sodded areas for a period of 30 days following installation.
B. Immediately replace sod in areas which show deterioration or bare spots.

C. After the initial watering at installation, apply approximately 1 inch of water to sod every third day until end of maintenance period, or as recommended by the sod manufacturer. Account for natural precipitation in water applications using neighborhood rain gauges.

END OF SECTION

Tabbed Page: Appendix H

APPENDIX H

WATER CONSERVATION/MANAGEMENT PLAN

1.0 INTRODUCTION

This document presents the water conservation/management plan for the Off Facilities Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site located in Denver, Colorado. The purpose of this water conservation/management plan is to identify work practices the construction contractors will be required to follow in order to conserve water during remediation given the current drought situation in the city of Denver. This plan was specifically developed to address water conservation practices for this project.

1.1 Project Description

The VB/I70 site covers an area of approximately four square miles in north-central Denver, Colorado (see Figure 1-1). The site was divided into three separate areas for remediation purposes. This plan deals with the residential soils portion of the project referred to as Operable Unit 1 (OU1). OU1 is composed of a number of neighborhoods that are largely residential, including Swansea/Elyria, Clayton, Cole, and portions of Globeville.

The objectives of the OU1 remediation project are to remove, dispose, and replace soils in residential yards having lead and arsenic concentrations above the site remediation levels. It is currently estimated that approximately 850 properties will require remediation. All of these properties are scheduled to be remediated over the next four to five years. Most residences at the site are single-family dwellings, but there are also some multi-family homes and apartment buildings.

During remediation, the top 12 inches of soil will be excavated, and loaded into trucks for transportation to either a municipal solid or hazardous waste disposal facility or the ASARCO Globe Plant, located at 52nd and Washington. Clean replacement soil will then be hauled in and placed back in the excavation to restore the yard to its original contours. Once the clean soil is in place, the soil will be revegetated or otherwise restored.

This plan was developed to outline the water uses that will be required as part of this remediation, and identify work practices to limit water use wherever possible. As with any remediation project

associated with metals-impacted soils, some degree of water use is required. However, with careful consideration, overall water use during the project can be minimized. Required water uses for this project will consist of limited water sprays for dust control during removal of metal-contaminated soil for health and safety purposes, some limited decontamination of equipment, and watering to establish replacement vegetation. These activities are further discussed in detail in Section 2.

1.2 Summary of Denver Water Drought Response Actions

Denver is currently faced with a drought situation that hasn't been seen in the last 50 years, and 2002 could be the driest year on record. Denver's reservoirs are currently at 45 percent of capacity and dropping, when last year at this time they were at 80 percent. On October 1, 2002, the Denver Water Board, emphasizing the severity of the current drought situation, issued the water use restrictions listed on Table 1. These restrictions are currently enforceable and will remain so until further notice.

Drought response programs have been developed by the Denver Water Board based on different stages of severity. In April, the Denver Water Board will forecast the expected reservoir storage on July 1. The July 1 levels are the key parameter used by the Board in establishing drought stage. Three stages of drought exist. Stage 1 being the mildest, and Stage 3 the severest. The April forecast will essentially determine if Denver will be in a Stage 2, or Stage 3 drought in 2003. The primary threshold between Stage 2 and Stage 3 is whether the forecast July 1 storage is above or below 40 percent.

Under Stage 2, watering of established lawns is restricted. Under Stage 3, watering of established lawns is prohibited. Installation of new seed or sod lawns is prohibited under both Stage 2 and Stage 3. Trees that are currently established may be watered by hand with positive shut off or drip irrigation under either Stage 2 or Stage 3. Restrictions for watering flowers, perennials, vegetable gardens, and shrubs are currently under review. Drought surcharges are currently being imposed to help control excessive and wasteful use of water, and may be increased as a measure to heighten awareness of the current problem. No watering is allowed between the hours of 10 a.m. and 6 p.m., and watering frequencies and durations are being reviewed. Use of fountains and waterfalls is prohibited unless they support aquatic life. If the drought worsens, the aquatic life in these features may be at risk.

1.3 Request for Special Use Permit

The residential remediation program is being implemented to protect human health by reducing resident exposure to arsenic- and lead-contaminated soils. As discussed in Section 1.1, limited water use will be required to implement the remedy. However, certain water uses necessary for property remediation, such as washing of equipment and watering of replacement vegetation, are or will most likely be prohibited. Therefore, USEPA will request a special use permit from Denver Water to allow limited water usage so that the project may go forward.

The request for a special use permit will include provisions for limited water use for the following purposes:

- Dust control during excavation and handling of metals-impacted soil for worker and resident protection,
- Decontamination of equipment associated with the handling of impacted soil, and
- Watering of replacement vegetation for a period of one month, conducted for fifteen to twenty minutes three times a day.

In order to minimize the overall water use, property restoration plans will be developed for each remediated property. These plans will be prepared in conjunction with the owner and will be designed to promote property restoration using non-vegetative surfaces. For planning purposes, USEPA will set a project goal that, on average, less than 50 percent of the original yard area will be restored as lawn. In addition, all excavated City-owned road aprons (areas between sidewalks and streets) will be restored with a non-vegetated, recreational trail-type colored soil and gravel mixture.

The work practices associated with these activities are further discussed in Section 2.

2.0 WATER CONSERVATION WORK PRACTICES

This section presents a summary of work practices to be used during construction activities for the soil remediation project. A more detailed description of all construction activities is presented in the Remedial Design Work Plan to which this Plan is an appendix. The work practices listed below will be required of the Construction Contractor.

The project team will consist of the USEPA, a Supervising Contractor, a Construction Contractor, and its subcontractors. This project is being lead by the USEPA. The USEPA is responsible for overall project implementation. The USEPA will in turn select a Supervising Contractor who will manage the Construction Contractor and perform field oversight and quality assurance activities. The Construction Contractor will perform the remediation work and will hire specialty subcontractors as necessary.

2.1 Excavation and Backfill

The Construction Contractor will perform all excavation and backfill activities in such a manner as to prevent any off site migration of soils. Excavation techniques will require both powered equipment and hand tools depending on the proximity to existing structures. Accessible soils will generally be excavated to a depth of 12 inches, with care being taken not to generate any dust during construction activities. Water will be used only if absolutely necessary to control visible dust emissions and to meet Total Suspended Particulate Air Quality Standards established by USEPA for this project. If water is used to control dust, care will be taken to insure no excess water is used resulting in runoff or the transportation of sediments. Any water used for dust control measures must be measured and recorded by the contractor, and the quantities will be submitted on a daily basis to the Supervising Contractor. Transported materials will be tarped to control the generation of dust. Any material that spills onto work or staging areas will be vacuumed up without the use of water, and disposed with the excavated soils. Limited decontamination of equipment and work areas may require the use of water. If so, this water use will be documented in the same manner as the dust control water use. Care will be taken to insure that no material leaves the work area, or enters the storm sewer system.

Backfill activities will be conducted in a similar manner to excavation activities. Excavated areas will be backfilled with clean replacement materials. Any water used for dust control will be kept to a minimum, and reported daily to the Supervising Contractor. Any material spilled outside of the work area will be vacuumed up without the use of water. In the event clean material is stockpiled prior to placement, the stockpiled material will be stored on a tarp in order to ease in cleanup, and minimize the potential for material to migrate. If stockpiled material is to be left overnight, or for any length of time, the material will be tarped to eliminate the use of water to control dust coming off the pile.

2.2 Restoration

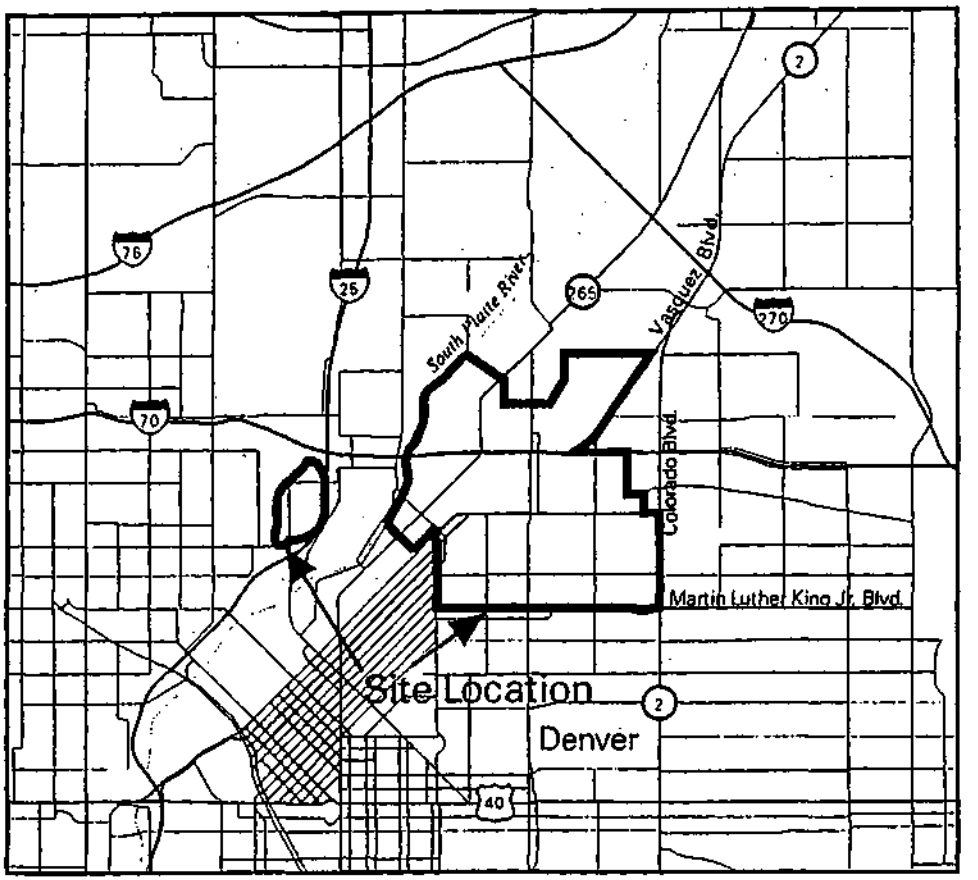
Following backfilling, the excavated areas will be restored in accordance with a restoration plan developed by the Supervising Contractor and the property owner. The Supervising Contractor will develop a menu of alternatives for yard restoration and will discuss these options with the property owner. In developing this menu, the Supervising Contractor will focus on materials and plants that result in water efficient yards. Water efficient yards will be achieved by the following practices:

- Limiting the restored yard to no more than 50% sod or other high water consumption vegetation,
- Recommending drought tolerant plants, if practicable,
- Emphasizing the use of larger mulched areas around replacement trees, and
- Installing decorative gravels, mulch or asphalt pavement in areas previously used for lawn, or bare.

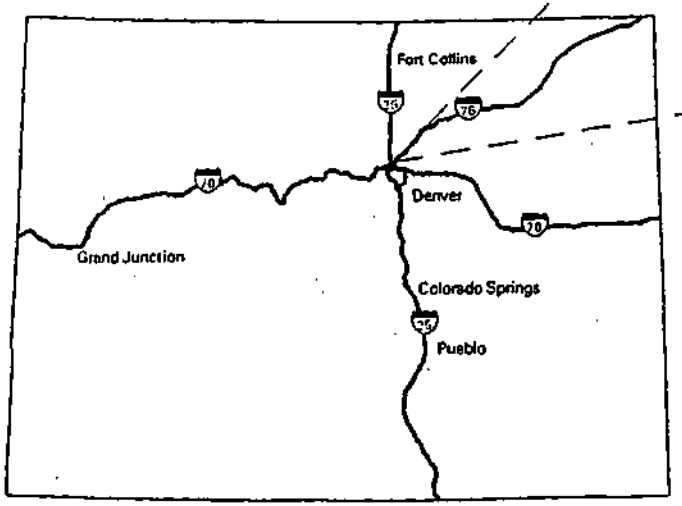
Following property restoration, the Construction Contractor will perform all recommended watering for the establishment of the replacement vegetation for a period of one month. Several quality control actions will be implemented during this watering period. The Construction Contractor will keep track of the amount of water used for each yard, and submit this information daily to the Supervising Contractor for review. Water use monitoring will be tracked by the use of a flow meter on the watering truck. In addition, the Construction Contractor will perform periodic quality checks of its watering applications by placing rain gauges around the vegetation area to verify that the amount of water actually applied does not significantly exceed the amount required. Watering for restoration will not be done between the hours of 10 A.M., and 6 P.M.

USEPA will also work with Denver Water to determine if access to recycled water is available near the project boundaries. If recycled water is reasonably available and is of acceptable quality for residential yard application, USEPA will require the Construction Contractor to use recycled water during property restoration.

31-JUL-2002 GRA: N:/ARCPRJ2/010107/GRA/LOC_8X11.GRA * AML: N:/ARCPRJ2/010107/AML/LOC_85X11.AML



VB/I70 OU1 VICINITY



COLORADO

N

U.S. EPA REGION 8
VASQUEZ BOULEVARD/
INTERSTATE 70 SITE OPERABLE UNIT 1

Figure 1 –1

Site Location Map

PROJECT: 01-0107x-1	DATE: JULY 31, 2002	
REV: 0	BY: ALB	CHECKED:

DENVER WATER

1600 West 12th Avenue
Denver, Colorado 80204
Phone: 303-628-6000
Fax: 303-628-6349
http://www.denverwater.org

DENVER WATER'S WATERING RESTRICTIONS EFFECTIVE OCTOBER 1, 2002

1. NO OUTDOOR WATERING OF TURF AND LAWNS, with the exception of athletic or playing fields, and golf course tees and greens.

2. HAND-WATERING OF VEGETABLE AND FLOWER GARDENS, TREES, AND SHRUBS PERMITTED AT ANY TIME (with positive shutoff nozzle or drip irrigation only).

3. PERSONAL VEHICLES MAY BE WASHED AT HOME ONLY WITH A BUCKET OF WATER. (No time or day restrictions).

4. FLEET VEHICLES MAY BE WASHED ONCE-A-WEEK ONLY BY CARWASHES CERTIFIED BY DENVER WATER.

5. FOUNTAINS AND WATERFALLS ARE PROHIBITED UNLESS THE OPERATION IS ESSENTIAL TO SUPPORT EXISTING FISH LIFE.

6. RESTAURANTS SHALL NOT SERVE WATER AUTOMATICALLY WITH MEALS, BUT MAY SERVE WATER UPON THE CUSTOMER'S REQUEST.

7. LODGING ESTABLISHMENTS SHALL NOT CHANGE SHEETS MORE OFTEN THAN EVERY FOUR DAYS FOR GUESTS STAYING MORE THAN ONE NIGHT.

8. WASHING IMPERVIOUS SURFACES (SIDEWALKS, DRIVEWAYS, ETC.) IS PROHIBITED EXCEPT FOR HEALTH AND SAFETY REASONS.

9. A DROUGHT SURCHARGE WILL BE IMPOSED UNTIL RESERVOIRS REACH 80% FULL.

10. VIOLATIONS WILL CONTINUE TO BE ISSUED: (1st violation is a warning; 2nd is $100; 3rd is $300; and 4th and subsequent are $500, plus a flow restrictor may be installed.)

FOR IMMEDIATE RELEASE ON SEPTEMBER 30, 2002

For details, contact:

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CONSERVE

Chemical Sampling and Analysis Plan
For Non-Time-Critical Removal Action
Operable Unit 1
Vasquez Boulevard / Interstate 70
Superfund Site
Denver, Colorado

July 2003

Prepared for:

U.S. Army Corps of Engineers
Rapid Response Program Office
Omaha District
Fort Crook Area
Offutt AFB, Nebraska 68113

Prepared by:

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San Diego, California 92111
(858) 505-1000
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1 Introduction

This Chemical Sampling and Analysis Plan (CSAP) present the quality assurance (QA) and quality control (QC) requirements for the non-time-critical removal action at the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site in the north-central section of Denver, Colorado.

The United States Environmental Protection Agency (USEPA) is the lead agency responsible for this non-time-critical removal action. The United States Army Corps of Engineers (USACE) is the Supervising Contractor for this action, and has contracted Project Resources Inc. (PRI) as its construction contractor. PRI will carry out the non-time-critical removal action for USACE, and consequently will implement this CSAP.

This CSAP was written as an adjunct to the Construction Quality Assurance Plan (CQAP) prepared for the USEPA by MFG, Inc. and Tetra Tech EM Inc. The CQAP provides procedures to demonstrate compliance with the removal action, as well as a summary of QC procedures used by PRI to achieve compliance. The CSAP provides additional details to the QA/QC procedures and plans. Both the CQAP and CSAP are supported by and included as appendices to the Removal Action Work Plan, dated March 2003.

2 Project Organization

This section gives an overview of the primary project participants, with emphasis on the Construction Contractor (i.e., PRI). Also discussed are the roles and responsibilities of these participants during the implementation of the non-time-critical removal action at VB/I70.

The USEPA has overall responsibility for remedial and removal actions at the VB/I70 site. Representing USEPA during construction is the USACE as Supervising Contractor. The USACE also has overall responsibility for management and documentation of the removal action, and for compliance with project requirements and meeting project objectives. Supporting USACE is PRI as its Construction Contractor. PRI will carry out the removal action in accordance with the Non-Time-Critical Removal Action Work Plan (March 2003), and the CQAP and CSAP.

Key staff from PRI includes the Quality Control Manager (QCM). The QCM will:

- be responsible for the day-to-day inspection of removal action activities
- provide and demonstrate compliance with the CQAP and CSAP
- document inspections and work progress for contract administration purposes.

3 Sampling and Analysis

This section discusses the activities related to the non-time-critical removal action that resulted in sampling, sampling requirements, and sample analysis requirements. Further discussion and information can be found in the CQAP.

3.1 Activities

Table 3-1 gives a summary of activities associated with PRI's project work at the VB/I70 site that will require sampling and laboratory analysis. In general, there are three major project phases that contain activities requiring sampling and laboratory analysis: 1) pre-remediation characterization; 2) remediation construction; and 3) disposal characterization.

The pre-remediation phase includes the sampling of soils at those sites that wish to maintain their gardens and/or flower beds. Those gardens and flower beds that show acceptable concentrations of contaminants of concern (i.e., arsenic and lead) will be remain undisturbed while the remaining soils at the site are remediated. Those sites whose gardens and flower beds have unacceptably high contaminant concentrations will not be remediated. Also sampled during this phase are the soils at ten sites; these soils will be characterized using their geotechnical properties, to help in selecting in-kind soils for replacement

The remediation phase includes the sampling of soils that will be used as replacement soils at sites that were remediated, to demonstrate that the new soils are not contaminated with arsenic, lead, metals, pesticides, or semi- and volatile organic compounds. Replacement gravels are also sampled and assessed for their arsenic and lead concentrations. The soils and gravels are also sampled to assess their geotechnical properties, again to demonstrate acceptability relative to replacement criteria (viz., particle size and gradation).

The disposal characterization phase will sample the removed soil and characterized as to disposal criteria (i.e., leachable metals, pesticides and herbicides, and semi- and volatile organic compounds).

Table 3-1 Summary of Sampling Requirements for Chemical Analysis

Phase	Sampled Material	Parameter	Acceptance Criteria	Frequency
Pre-remediation	Soils from gardens and flowerbeds	As, Pb	< residential action concentrations	Each garden or flowerbed which will be left undisturbed
	Soils being removed from yards	Texture and particle size	None: establishes replacement criteria	10 sites total
Remediation	Replacement soils	As, Pb	< residential action concentrations	Source; every 1,000 yd^3; when there's an observed materials change
		Texture and particle size	Similar to removed soils	Source; every 5,000 yd^3; when there's an observed materials change
		Metals, pesticides, PCBs, SVOCs, VOCs	< residential action concentrations	Source; every 5,000 yd^3; when there's an observed materials change
	Replacement gravel	As, Pb	Meets gravel criteria	Source; every 1,000 yd^3; when there's an observed materials change
		Gradation	Meets gradation requirements	Source; every 5,000 yd^3; when there's an observed materials change
Disposal	Soils removed from yards. Sampling from staging area stockpile.	TCLP metals, pesticides, herbicides, SVOCs, VOCs	Meets disposal site requirements	Every 3,500 CY of excavated soils (~ every 20 properties)

3.2 Sampling Requirements

Table 3-2 gives a summary of sampling requirements associated with PRI's project work at the VB/I70 site. Five types of samples are planned:

1. Soils from flower beds and gardens
2. Soils removed from yards as part of the removal action
3. Replacement soils for yards
4. Replacement gravels for driveways and parking areas
5. Water used to demonstrate no cross-contamination from equipment.

The table summarizes the type of sampling containers, sample volumes, and holding times required for each type of sample. Because sampling requirements are driven by the type of analysis and specific USEPA laboratory method, these are also given in the table.

Chain-of-custody records should comply with requirements found in the CQAP. Preservation of samples should be accomplished using an ice-chilled cooler; chilling is not needed for soil and gravel samples being analyzed for particle gradation, or for flower bed and garden soils being analyzed for arsenic and lead. The water-equipment blanks also do not require chilling.

3.3 Analytical Requirements

Table 3-2 also gives a summary of the USEPA and American Society for Testing and Materials (ASTM) methods to be used in analyzing sampled materials. For samples requiring lead (Pb) and arsenic (As) analysis, sample preparation using acid digestion

(USEPA Method 3052) is followed by sample testing using atomic emission spectrometry (USEPA Method 6010B). For samples being characterized for disposal purposes, sample preparation using leaching procedures (USEPA Method 1311) is followed by testing using either gas chromatography (USEPA Methods 8081A, 8151A, 8082, 8270C, and 8260B), or atomic emission spectrometry (USEPA Methods 6010B and 7471A).

3.4 Sampling Locations

Garden/Flower-Bed Sampling

Soils sampled from gardens or flowerbeds will be on a property-by-property basis, and will consist of one composite sample per residence. The composite is taken by:

- Dividing garden or flowerbed into two equal areas
- Sampling the center of each area by coring to a depth of 0 to 2 inches
- Blending the two sub-samples and retrieving a composite from the blend.

These samples will be analyzed for arsenic and lead.

Soil Texture Sampling for Backfill Criteria

Removed yard soils will be sampled as a subset of all yards remediated, and will consist of one sample from each of ten spatially representative properties. The ten properties will be selected as follows:

- Three from the Cole neighborhood
- Three from the Clayton neighborhood
- One from the Elyria neighborhood
- Three from the Swansea neighborhood (at least one from either side of I-70).

The selected properties should be spatially distant from each other. Each soil sample should be from the center of the yard, at a depth of 0 to 12 inches. These samples are used for geotechnical (i.e., particle gradation) characterization.

Clean Backfill Material Sampling

Replacement soils and gravels are sampled at a frequency of one grab sample for every 5000 cubic yards of material. The samples are taken from truck-loads, stockpiles, or already placed materials. These samples are analyzed for metals, pesticides, polychlorinated biphenyls (PCBs), semivolatile organics, and volatile organics, as well as for geotechnical (i.e., gradation) characterization. In addition, one grab sample for every 1000 cubic yards will be taken for assessing the arsenic and lead concentrations in replace
Materials.

Waste Disposal Characterization

Excavated materials will be sampled for disposal characteristics as a stockpile composite from every 3,500 CY yards of excavated soils (~ every 20 properties) [**Note: This is a change from the procedure outlined in the VB-I70 Workplan**]. The materials excavated will be transported to a temporary staging area, located on the ASARCO property, and placed in a stockpile. The stockpile(s) will be sampled as follows:

- The stockpile (~ 3,500 CY in size or less) will be divided into four equal units.
- Each of the four units will be sampled randomly at four points (1 from the top, 2 from mid-height, and 1 near the toe of the pile).

- The four soil samples from each respective unit will be blended, with a composite sample taken from the blend for analysis.

The samples will be utilized for waste characterization purposes, and will be analyzed via TCLP for metals, pesticides, herbicides, semivolatile organics, and volatile organics.

3.5 Sample Identification

Samples will be identified using a number and letter scheme, as follows:

a) For residences, the property identification number (assigned by a designee of the Construction Contractor), with a prefix of "P" (for "property")
b) For bulk imported materials, the source identification number (assigned by a designee of the Construction Contractor), with a prefix of "M" (for "Materials")
c) Sequential sample number (001, 002, 003, etc.)
d) Sample matrix code letter:
    a. S = soil
    b. G = gravel
    c. W = water
e) Sample type code letter:
    a. C = composite
    b. G = grab
f) Sample use code letter:
    a. P = primary
    b. D = duplicate

Disposed soils also will need equipment blanks because samples will be composited and analyzed via TCLP at relatively high threshold concentrations. Replacement materials will be sampled with disposable, pre-cleaned sampling equipment.

4 Reporting

This section describes the reporting content, format, and frequency for chemical data resulting from samples collected per this CSAP.

4.1 Chain-of-Custody

Samples will be maintained under strict chain-of-custody procedures. Each shipping container will include a Chain-of-Custody Record and Request for Analysis (CC/RA) form, to be prepared by the Sampling/Analysis Team member responsible for sample collection. The CC/RA form includes:

- Project identification ("VB/I70 Project")
- Date and time of sampling
- Sample identification (per Section 3.5)
- Sample preservation, if any
- Number and types of sample containers
- Sample hazards, if any
- Analysis requested
- Turn-around time
- Method of shipment
- Carrier or waybill number (if any).

The sampler should sign the CC/RA form, as should the carrier and laboratory upon receipt. Transfer dates and times should also be included with signatures. The lab should also record the condition of samples upon receipt.

4.2 Laboratory Report

Laboratory calculations and data review by the laboratory should follow the procedures specified by the USEPA methods listed in Table 3-2. The laboratory should summarize and compile a data package that includes:

- Copy of CC/RA form
- Results of analyses for each sample, along with units of measurement
- Date received, extracted, and analyzed
- USEPA or ASTM methods used for analysis
- Quantitation limits (i.e., detection limits)
- Laboratory QC results (e.g., controls, spikes, duplicates, blanks).

Data packages should be sent directly from the laboratory to the USACE Project Chemist.

4.3 Data Acceptance

The USACE Project Chemist should review all data packages for completeness, and its results for accuracy and precision. In particular, the following should be reviewed:

- CC/RA form is complete
- Holding times comply with those is Table 3-2
- Detection limits are below action levels
- Lab QC results are acceptable
- Equipment blanks are not contaminated.

Acceptable Lab QC is defined as:

- Precision:
  - Ratio of lab control duplicates has a relative percent difference (RPD) of <20%
  - Ratio of matrix spike duplicates has a RPD of <20%
  - Ratio of analytical duplicates has a RPD of <30%
- Accuracy:
  - Lab control sample has an 80 to 120% recovery
  - Matrix spike has a 75 to 125% recovery
  - Lab blanks <minimum detection concentrations.

Corrective actions, as necessary, will be implemented per the steps described in Section 5.

4.4 Data Management and Reporting

Data will be reported by the Construction Contractor in monthly and annual progress reports. In these reports, the laboratory data will be tabulated to include:

- Sample location and identification
- Date of sampling
- Analytical method
- Analytes and measured concentration (or value)
- Detection limits

5 Laboratory qualifiers (if any). Non-conformance and Corrective Actions

Assessments are made by the QCM, the Sampling/Analysis Team Leader, and the USACE Project Chemist throughout the project to help ensure that appropriate procedures have been implemented. In the event that situations arise that affect the procedures presented in this CSAP, an assessment will be made as to the impact this would have on the project objectives. If corrections or modifications are required, the documentation of such actions will be detailed by procedures presented below. All non-conformances will be reported to the Project Manager within 24 hours of detection.

Corrective actions may be required for two classes of problems: 1) analytical and equipment problems, and 2) non-conformance problems. Analytical and equipment problems may be detected during sampling and sample handling, sample preparation, laboratory instrumental analysis, and data review.

For non-conformance problems, a formal corrective action program will be developed and implemented once the problem is identified. The person who identifies the problem is responsible for notifying the QCM or Sampling/Analysis Team Leader. If the problem is analytical in nature, supportive information will be promptly communicated to the USACE Project Chemist. Implementation of corrective action will be confirmed in writing through the same channels by completing a corrective action report (CAR).

Any non-conformance with the quality control procedures in this CSAP will be identified and corrected, as necessary. The Project Manager or his designee will issue a CAR for each non-conformance condition.

Corrective actions will be implemented and documented in the field record book for any non-conformances associated with field activities. No staff member will initiate corrective action without prior communication of findings through the proper channels.