Remedial Design Work Plan
For Soil Sampling and Remediation Program
Operable Unit 1

1552125

Vasquez Boulevard and I-70 Superfund Site
Denver, Colorado

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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 2013

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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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 Shaw Environmental & Infrastructure, Inc., a CB&I Company, 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 without conditions.

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
CDOT	Colorado Department of Transportation
CHC	Colorado Hazard Control, LLC
CRS	Colorado Revised Statutes
cy	cubic yards
db	decibels
DADS	Denver Arapahoe Disposal Site
ER	Environmental Restoration
mg/kg	milligrams per kilogram
OU	Operable Unit
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
ROD	Record of Decision
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

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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 Remedial Design Work Plan was originally prepared by MFG, Inc. and Tetra Tech EM, Inc. Shaw Environmental, Inc, a CB&I company (Shaw) is performing the work and the changes to the Remedial Design Work Plan reflect that in this case. 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 4 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 flowerbeds and gardens in yards scheduled for remediation, requirements for clean replacement materials, and options for disposing of the excavated materials, are discussed in Section 2.0. The

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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.

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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 July 2001 Final Remedial Investigation (RI) report (Washington Group, 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 milligrams per kilogram (mg/kg) arsenic and 400 mg/kg lead to identity properties with yard soils concentration that equaled or exceeded the action levels.

In the fall of 2012, Shaw Environmental, Inc, a CB&I company (Shaw) was tasked under its Rapid Response contract with the U.S. Army Corps of Engineers Omaha District (USACE Rapid) Contract No. W9128F-12-D0003, Task Order 0002 to conduct the final residential property investigations and remedial actions on the outstanding properties. Soil sampling was completed for approximately 63 out of 155 remaining residential yards at the Site. Twenty-two residential yards and one garden site are candidates for remediation.

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 RI 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.

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As described in Section 4.0, the scope of soil removal activities at a given property will be agreed upon with the property owner prior to remediation. USEPA's designated representative during construction will be Shaw. The USACE will perform field oversight and quality assurance activities of Shaw's work. At the initial meeting with the property owner, Shaw will, among other things, identify gardens and flowerbeds that need to be remediated. Environmental Restoration (hereafter termed "ER") will serve as Shaw's general contractor for the project and has experience in residential remediation projects of this type. 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 Worksheet #15, Reference Limits and Evaluation Table in the Quality Assurance Project Plan (QAPP)(Shaw, 2013). 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 containing 2 percent organics and provide suitable drainage, while replacement gravel for unpaved driveways and parking areas will have appropriate gradation. Specific textural requirements for the replacement soil will be established by Shaw and approved by USEPA prior to beginning construction.

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. Section 14.6 of the QAPP details the waste management and disposal actions

during the course of the project. 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 did not have toxicity characteristics of 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 beginning removal action remediation.

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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 D.

3.1 Soil Sampling Program

During the course of the removal action, EPA will continue to gain access to additional properties that will need to be sampled to determine if remediation is necessary. The results of the properties that have been sampled to date are presented in Appendix A.

3.2 General Remediation Design

Each of the candidate properties listed in Appendix A will be remediated. Additional properties may be added to this list during the course of the 2013 construction season. 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 Shaw 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 and gardens to a depth of 24 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 performed 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.).

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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 6 inches) from the trunk to the drip line and a tapering excavation from the drip line outward.

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 performed 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 removed soils will be loaded into trucks and transported to the Denver Arapahoe Disposal Site (DADS). Analytical requirements of waste disposal and transportation will be in accordance with the Waste Management Plan, Appendix B of the QAPP. Soils are expected to be non-hazardous based on existing site data. Excavation areas will be backfilled and restored in kind with clean replacement materials. At a minimum, excavated yards and flowerbeds will be restored with 12 inches of soil (24 inches in gardens) 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 or recycled asphalt. All replacement materials will meet the replacement material chemical criteria specified in Worksheet #15 in the QAPP. Replacement soil will be evaluated according to the parameters discussed in the QAPP. 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 reasonably approximates the 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 authorize giving property owner's replacement certificates to be redeemed at a local nursery 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. Weed barrier will be installed under decorative gravels and mulch in order to manage weeds once restoration has been complete. If necessary, concrete will be replaced if a walkway or sidewalk is damaged during remediation. To facilitate the restoration process, the Shaw will develop a menu of available replacement materials and will work with the property owner to develop a plan for restoring the property. It will be a priority to not disturb any fences or land survey monuments during restoration by the excavation, but they will be replaced and restored if necessary.

In light of Denver's current drought situation and arid climate, special procedures will be necessary during property restoration to minimize water usage. These procedures will include educating the homeowner on 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 from the Denver Water Board may be required. 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 G.

The USEPA will maintain the replacement vegetation after the property restoration is completed for a maximum period of 30 days, or until established. 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 aid in establishment of vegetation.

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3.3 Property-Specific Design Considerations

Specific remediation details will be developed on a property-by-property basis. Individual Property 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. 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, Shaw, ER, USACE and/or USEPA 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 are maintained by the property owner in conjunction with the yard.

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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 will meet with the City of Denver to discuss the project and obtain a blanket authorization for road apron remediation. The City of Denver has requested that an effort be made to install non-vegetative cover to minimize water usage and maintenance requirements.

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4 REMEDIATION CONSTRUCTION

This section describes the construction procedures necessary to implement the remediation design described above. Excavation activities will be planned to minimize physical and chemical hazards to workers and residents. Work practices will include the use of sound 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.

Since any exterior lead-based paint (LBP) present on a property could potentially re-contaminate soils that were remediated and also be a risk factor for current and future child occupants, any property found to contain impacted soils above lead action-levels will also be evaluated and if necessary abated for exterior LBP. The LBP assessment and/or abatement will be completed by Shaw's general contractor, Colorado Hazard Control, LLC (CHC). All exterior LBP assessment and/or abatement will be completed prior to any required soil removal, and conducted in accordance with State of Colorado requirements and by certified LBP inspection/abatement personnel. Documentation of the paint testing will include:

- date of inspection
- address of building
- specific locations of each component tested
- building element
- paint color
- square footage of deteriorated paint
- paint testing results
- photographs

Exterior areas that are deemed to have deteriorating lead-based paint will be measured and placed on property plot plan including all structures and their dimensions. Standard forms may be utilized for test results. Enough information will be provided for accurate cost estimation of a lead abatement.

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Colorado Hazard Company (CHC) will submit a final report within two weeks of the LBP assessment completion that provides sample data tables, laboratory reports, hand-annotated sample location figures, and photographs. The final report will also include a summary regarding finding and on-going management that may be required during renovation, as applicable.

It is currently estimated that remediation will take three to four months to complete. The optimum schedule for remediation would be to complete the program by the end of the 2013 construction season. The current plans are to complete the sampling and any necessary cleanup by the end of 2013 construction season.

4.1 Project Team Roles

The remediation project team will consist of the USEPA, CDPHE & City of Denver, U.S. Army Corps of Engineers (USACE), Shaw, and ER and its subcontractors. The USEPA is the lead agency and will be responsible for overall project implementation. The USACE will provide field oversight and quality assurance activities for Shaw's activities. ER will serve as general contractor for the project and will be experienced in residential remediation projects of this type. ER 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 been 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 performed. The USACE, on behalf of USEPA, will perform the initial contact with the property owner and schedule a meeting. At this meeting, Shaw will explain that the property is a candidate for remediation and the nature of the remediation. If the concentrations for lead and arsenic were below the action levels in the garden and flowerbeds, they would not be included in the remediation. Since the property owner has already signed an Access Agreement (see Appendix B), Shaw and ER can work with the property owner to develop the draft 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 Property 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 Shaw will lead all interactions with the property owners. ER will support Shaw as indicated. USEPA will review and approve the final site documentation.

4.3 Supplemental Sampling

This section includes a description of sampling in yards, gardens and flowerbeds and disposal characterization sampling and analyses.

4.3.1 Garden and Flowerbed Sampling

Gardens and flowerbeds were sampled during the 2012-2013 sampling phase. 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 mg/kg arsenic and 400 mg/kg lead) 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 14.3 of the QAPP.

4.3.2 Disposal Characterization Sampling

Shaw collected samples of the materials to be removed during property remediation and the characterization sampling effort in the fall of 2012 and early 2013. The characterization samples collected prior to excavation were analyzed for leachate concentrations of metals, pesticides, herbicides, semi-volatiles and volatiles by the Toxicity Characterization Leaching Procedures (TCLP). The characterization samples collected by Shaw were used to establish baseline data of the disposal characteristics. As noted in Section 3.2, DADS has been identified as a suitable disposal site for the materials.

Further details of the disposal characterization sampling and analysis procedures are described in Section 14.6 of the QAPP.

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 Site Restoration Plan/Agreement and (if different) the intended start date and time of 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, ER will mark the limits of excavation (note: these limits will include any adjacent road apron areas). ER will also note large bushes and trees, where 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 6 inches) from the trunk to the drip line and a tapering excavation from the drip line outward.

ER 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. Priority is to not disturb survey monuments, but if disturbed, the monuments will be reset by a professional land survey following completion of property restoration.

Also prior to construction, ER 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, if possible. 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, ER 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. ER will inspect each excavation area for visible obstacles, and may utilize an

electro-magnetic detector if there is reason to suspect buried obstacles have not been adequately marked. ER will confirm locations of subsurface obstacles by hand digging to trace the orientation of the obstacle and to mark it adequately with spray paint. ER 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 ER 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 recreational vehicles, boats, or automobiles, 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. Shaw and ER will request that property owners remove and store inside their buildings all yard ornaments, personal possessions and keepsakes requiring special care. If homeowner needs assistance with moving larger item that they cannot move themselves, then ER may assist. ER 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 on the homeowner's property or in a designated off-site secure location and replaced at the end of construction.

4.4.2 Excavation Activities

Before any excavation activities begin at a property, an exclusion zone will be determined and clearly marked with construction fencing, caution tape, cones, and signs to alert passerby's not to enter area. ER 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, 24 inches in vegetable gardens), 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, 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., houses, garages, and non moveable sheds). ER will inspect structures and large tree roots during excavation operations, and will take immediate appropriate steps if any are 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. During excavation, the shrubs and tree roots will be watered to minimize damage to vegetation until those areas can be backfilled with the clean material. This will generally result in a shallow excavation (typically 2 to 6 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 two inches or less in diameter will be removed. Replacement certificates will be issued to homeowner to be redeemed at a local nursery

to cover the cost of replacing shrubs or trees removed during the excavation. If homeowner is unable to replant their shrubs or trees, arrangements may be made in advance to have ER assist in the planting. 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 replaced. 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 that 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.

ER will perform field surveys and measurements to confirm that the required excavation extent and depth have been achieved (see Section 6 of the QAPP). ER has verified with Shaw and USACE an excavation meets project requirements, the area will be cleared for backfilling.

If conditions are encountered that are beyond the control of ER, which delay or prevent the performance of the construction at a particular property, ER will stop work at

that location and immediately inform the Shaw and the property owner. Examples of the types of conditions that could delay or prevent construction include but are not limited to:

- Uncovering of artesian well or other subsurface flow phenomena,
- Building or structural impairments,
- Asbestos containing debris, 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 55 decibels (db) (measured at a distance of 25 feet from the property line). Noise levels may periodically increase but not 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 25 feet of the property line from the active work zones using a sound level meter. If noise levels are found to exceed the statute requirements, ER 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 but not result in the generation of mud that could be transported off-site 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 ER and acceptable to USEPA. Water for dust control will be provided from a central, approved metered source (i.e., hydrant) and transported to the work area by tanker truck or trailer.

ER 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;
- During temporary stockpiling and loading of soils at staging areas before transportation to the disposal site; and
- During backfilling operations

Dust control requirements and provisions for periodic air monitoring are discussed in the Fugitive Emissions Dust Control Plan (Appendix F).

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 and pets) 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 performed. Streets, right-of-way, and access routes will be cleaned of visible accumulations of soil, dust, or debris that are attributable to construction activities.

Additional decontamination practices will be specified in the Construction Health and Safety Plan to be prepared by ER as a required submittal under the construction contract.

USEPA and the USACE will review ER'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 DADS site in accordance with the Transportation and Disposal Plan (Appendix E). The disposal location is a licensed solid or hazardous waste disposal facility. USEPA will review the result of the waste characterization analyses and will identify and appropriate disposal location based on these data.

Loading and transport activities will be performed at the same rate of 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 D), 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 and all excavations will be backfilled prior to the weekend. Clean material will not be carried in the same trucks as excavated soils unless the truck bed has been decontaminated 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 2.3. At a minimum, yards and flowerbeds will be replaced with 12 inches of soil. Vegetable gardens will be replaced with 24 inches of soil. Driveways, parking areas, and other areas subject to vehicular traffic will be replaced with 8 inches of compacted soil, 4 inches of aggregate gravel, or material agreed upon at the pre-construction meeting.

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 2.3, before the material sources are approved. Following source material 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 Section 14.5 of the QAPP.

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 or bobcat can transport the material to the excavation. Some handwork using wheelbarrows and shovels may be necessary to backfill areas with difficult access. Following placement, the materials will be graded and shaped to the approximate original conditions and slightly crowned to promote positive drainage, especially away from structure foundations. 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 the 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 finish). Sloped surfaces will be evaluated on a case by case basis in order to provide the best coverage with the least amount of erosion. Produce gardens will not be replanted. USEPA may provide replacement certificates to cover the cost of replacing flower gardens. If homeowner is unable to replant their shrubs or trees, arrangements may be made in advance to have ER assist in the planting. Mulch, decorative gravels and other surface finishes will be installed to reasonably restore 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 condition.

4.7 Post-Construction Maintenance

ER will maintain the replacement vegetation following property restoration, for a maximum of 30 days, unless watering exemptions are limited to less than 30 days. Maintenance will include all necessary vegetation watering but will not include mowing. The homeowner will be encouraged to assist in the initial maintenance to aid in establishment of vegetation. (See Section 3.2 and Appendix G 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 one week after completion to verify that the work performed 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 sidewalks. Photographs and video will be taken by ER immediately prior to construction, during construction, at the completion of backfilling, just prior to sod placement and upon completion of the maintenance period. ER will provide all documentation to Shaw 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 addressed and all disputes associated with the property remediation are resolved, Shaw, ER and USACE will inspect the property with the property owner. At this inspection, the Property Completion Agreement checklist will be finalized and the property owner will sign-off that the work performed meets their satisfaction. If the property owner fails to show after two arranged scheduling attempts 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 final property inspection will be performed one month after the preliminary inspection has been completed and no later than the end of the vegetation maintenance period.

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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 months to complete. A typical construction season will begin in the early spring and extend to late fall, unless unseasonably cold and wet weather shortens the period during which effective construction can be performed. Every effort will be made to limit disruption of normal activities in the neighborhood due to the cleanup. Remediation in the VB/I70 Site may be time consuming because the properties to be remediated are located throughout the site, which may make sequencing and material staging more problematic.

5.2 Material Quantity Estimates

Based on existing Site data, it is estimated that a total of 20 properties will require remediation for action levels of 70 mg/kg arsenic and 400 mg/kg lead (USEPA, 2001). For this number of properties, it is estimated that the remediation activities will produce approximately 4,800 loose cubic yards (cy) of material for disposal. This volume is based on an average property loose soil volume of 240 cy, as determined by the property designs and dimensions taken during the soil sampling investigations. It is estimated that approximately 5,500 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 5,400 cy of soil and 100 cy of gravel.

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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 plans 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 ER 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 assurance and quality control programs are provided in Section 6 of the QAPP.

5.4 Health and Safety

The remedial action activities will be required to comply with the requirements of 29 CFR 1910 and 1926. ER 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, Shaw and ER 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 and Safety Plan prepared by ER.

5.5 Compliance with ARARs

The residential design has been prepared to comply with the Applicable or Relevant and Appropriate Requirements (ARARs) identified in the 2001 Feasibility Study report (USEPA, 2001). 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.

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6 Removal Action Reporting

6.1 Monthly Progress Reports

Construction reporting will include weekly progress reports prepared by the USACE and Shaw 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. In the event that a problem arises, Shaw would notify USEPA immediately, followed up by an email.

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.

6.2 Final Construction Reports

A final construction report will be prepared by Shaw 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.

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7 REFERENCES

CCR, Colorado Code of Regulations, 5CCR 1001-4, Regulation 2 Odor Emissions.

CRS, Colorado Revised Statutes, Section 25-12-103, *Maximum Permissible Noise Levels*.

Shaw, 2013. Final Sampling and Analysis Work Plan/UFP Quality Assurance Project Plan (QAPP). Final Residential Surface Investigation, Revision No. 03, Revised to add Remedial Activities. June 2013.

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

USEPA Region 8. 2003. Record of Decision, Vasquez Boulevard/Interstate 70 Superfund Site, Operable Unit 1 Residential Soils. September 25.

U.S. Environmental Protection Agency, 2001. *Feasibility Study Report for Operable Unit 1 Vasquez Boulevard/Interstate 70 Superfund Site*. Prepared by MFG, Inc. for the USEPA.

URS, 1999, *TCLP Disposal Date for Vasquez Boulevard and I-70 Site*. Letter from Mark Rudolph, URS Operating Services to Peter Stevenson, USEPA.

Washington Group, 2001. *Remedial Investigation Report Vasquez Boulevard/I-70 Site Operable Unit 1*. Prepared by Washington Group International for the USEPA.

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TABLES

Table 4-1

Typical Property Remediation Sequence

Responsible Party	Activity
Supervising Contractor	Schedule meeting with property owner to review remediation schedule and options for property improvements. Prepare Site Remediation Map based on owner input.
Supervising Contractor and Construction Contractor.	Meet with property owner to review final Ste 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 Plan.
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 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 as-built. If acceptable, signs the as-built and issues letter to property owner certifying that the property remediation has been completed.

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	Comment	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 E).
2.Colorado Air Solid waste classification	Yes	--		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 E).
3.Determinatio n of hazardous waste	Yes	--	6 CCR 1007-3 Sec. 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 E).
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 practicable 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 work plan 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 F)

Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
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 F)
6. Air emissions from diesel-powered vehicles associated with	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 states as follows: 1) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor	Applicable to alternatives that include transportation of soil.	Fugitive Emissions Dust Control Plan (Appendix F)

Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
excavation and backfill operations.				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 7,000 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 different 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.		
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

Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
8. Smoke and opacity.	Yes	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 pollutants 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 F)
9. Ambient Air Standard for Total Suspended Particulate Matter.	Yes	--	5 CCR 1001-14	Air quality standards for particulates (as PM10) are 50 µg/m³, annual geometric mean, 150 µg/m³ 24 hour.	Applicable to alternatives that include actions that generate fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix F)
10. Ambient Air Standard for Lead.	Yes	--	5 CCR 1001-10, Regulation 8	Monthly air concentration must be less than 1.5 µg/m³.	Applicable to alternatives that include actions on contaminated soil that generates fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix F)
11. Noise Abatement.	Yes	--	C.R.S., Section 25-12-103	The Colorado Noise Abatement Statue provides that: a. "Applicable activities shall be conducted in a manner so any noise produces 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 — 55 db(A) — 50 db(A) Light Industrial — 55 db(A) — 50 db(A) Industrial — 55 db(A) — 50 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.	Applicable to alternatives that include construction activities.	Noise Control Requirements – Section 4.4.3

Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
				(above) may be increased by ten decibels for a period 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.		
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 E)
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 E)

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Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
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 E)
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 F)

Table 5 – 3 (continued)
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	Comment	Design Component that meets requirements
Hazardous Materials Transportation Regulations	Yes	--	40 CFR Part 107, 171-177	Regulations 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 bases on previous removals – would be addressed in the Transportation and Disposal Plan (Appendix E), if applicable.

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FIGURES

FIGURE 1-1

PROJECT SITE LOCATION

Figure 3-1

Property 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 diagrams (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 the contractor, and the direction North. Indicate distances, depths, material type, 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 are the responsibility of the Owner.

Item:
Item:
Item:
Item:
Item:
Item:
Item:
Item:

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Property Address: _____

Items to be Removed by Contractor during Remediation and <u>Not Replaced</u>
(Use additional sheets as necessary)

Item:
Item:
Item:
Item:
Item:
Item:

Items to be Removed by Contractor during Remediation and <u>Replaced</u>
(Use additional sheets as necessary)

Item:
Item:
Item:
Item:
Item:
Item:

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Property Address: _____

Landscape Inventory

(Use additional sheets as necessary)

Item	Quantity	Unit	Description/Explanation
Total Area of Property to be Excavated		SF	
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		SF	Zones:_____ Heads:_____ Control Valves:_____
Number of and total size of all gardens / flower beds Attach a sketch of the sprinkler layout	# of beds: _____ # of gardens: _____	SF	Ft² of beds:_____ Ft² of gardens:_____
Agreed upon value of plant materials <u>not to be replaced</u> by contractor. Note this value will be used to issue a plant voucher to the property owner.	Total # of beds _____	$	Total Ft² of beds to be replaced with Certificate: Sod:_____ Mulch:_____

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Property Address: _____

Landscape Inventory

(Use additional sheets as necessary)

Item	Quantity	Unit	Description/Explanation
Agreed upon list of plant materials that will be replaced by contractor. Be specific and detailed. Include a sketch of where each plant will be placed by the contractor.		Each	Only use for plants that are being saved and replanted
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 Ft² 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 Ft²: _____	SF	Sod:_____ Much:_____ Rock:_____
Agreed upon area of property to be replaced with mulch.	Total Ft² of Mulch: _____	SF	Mulch:_____
Agreed upon area of property to be replaced with rock.	Total Ft² of Rock: _____	SF	Large:_____ Medium:_____ Small (pea gravel):_____ Breeze:_____
Agreed upon area of property to be replaced with groundwater.	Total Ft² with no groundcover: _____	SF	

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Property Restoration Agreement

146543 VB/I-70 Property Layout/Sampling Design

Property Address

_____

N

DIRECTIONAL ARROW

Shaw

Replacement Vegetation		**Total Cu. Yds. Removed**	
Number of Plants			
Number of Bushes		Cu. Yd. Back Fill Soil	
Number of Trees		Cu. Yd. Topsoil	
		Cu. Yd. Gravel	
		Cu. Yd. Crushed Gravel	
Number of Replacement Sheds		Cu. Yd. Mulch (color)	
		Sq. Ft Weed Barrier	
		Sq. Ft Sod	

Notes:

Pre-Remediation Property Design			**Post-Remediation Final Property Design**		
Homeowner Signature:	*Signature*	*Date*	**Homeowner Signature:**	*Signature*	*Date*
Design Approved by:	*Signature*	*Date*	**Design Approved by:**	*Signature*	*Date*

Property Address: _____

Additional Comments / Instructions / Drawings:

☐ Check the box if Owner does not want Shaw to document interior foundation walls and possible pre-existing damage. By checking this box, Shaw is not responsible for any damage done to the interior of the 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

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APPENDIX A

List of Candidate Properties for Removal Action

Appendix A

List of Properties Requiring Remediation

This appendix provides a list of residential properties within the Site, which have been sampled as of January 31, 2013. Table A-1 lists the properties to be remediated and their corresponding elevated lead and or arsenic levels. These properties will be remediated during the 2013 construction season.
The database used to generate this list was created in 2013 by Shaw Environmental & Infrastructure, a CB&I Company, the USEPA contractor who performed the Remedial Investigation for the VB/I-70 site

Table A-l

Properties Requiring Remediation and Sampling Results

Property Address	Sample Date	Arsenic Results 70 (mg/kg)	Lead Results 400 (mg/kg)
1225 MARTIN LUTHER KING BLVD	09/17/12	5.35	744.24
1625 MARTIN LUTHER KING BLVD	09/27/12	5.46	705.48
2101 E 37th ST	10/25/12	86.25	193.3
3210 CLAYTON ST	09/13/12	4.52	534.67
3226 CLAYTON ST	09/24/12	28.3	416.24
3246 ELIZABETH ST	09/21/12	5.41	408.62
3307 CURTIS ST	09/10/12	5.99	474.38
3338 RACE ST	6/28/04	258	348
3359 HIGH ST	4/1/13	5.97	427.51
3506 HUMBOLT ST	09/26/12	11.69	652.31
3612 MILWAUKEE ST	09/25/12	7.36	404.15
3630 RACE ST	1/16/13	218	399
4344 STEELE ST	6/28/04	164	130
4419 STEELE ST	09/21/12	15.45	579.7
5194 SAINT PAUL ST	09/19/12	4.88	696.86
3446 MILWAUKEE ST	Pre CB&I	208	147
3705 GARFIELD ST	Pre CB&I	71	133
3750 COOK ST	Pre CB&I	73	77
3785 WILLIAMS ST	Pre CB&I	18	539
4110 SAINT PAUL ST	Pre CB&I	116	229
4815 SAINT PAUL ST	Pre CB&I	237	342
4956 MILWAUKEE ST	Pre CB&I	250	163

APPENDIX B

Sample Documents

APPENDIX B-l

ACCESS AGREEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
1595 Wynkoop Street, Region 8
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

CONSENT FOR ACCESS TO PROPERTY

RIGHT OF ENTRY TO PREMISES:

The Property Owner (the Grantor) consents to and authorizes the United States Environmental Protection Agency (EPA) and its authorized representatives and their contractors collectively the Grantee, to enter and perform certain environmental response activities upon the following premises:

Owner's Name:_____

Address of Property Covered
By this Agreement:_____

Daytime Phone No._____

PURPOSE OF RESPONSE ACTIVITIES:

The EPA is requesting access to collect soil samples and **where necessary** to remove soil that contains elevated concentrations of arsenic and/or lead that may pose a health hazard. If elevated concentrations are found, the soil will be removed and the excavated area will be replaced with clean materials and restored. This work is being performed as part of the Vasquez Boulevard/I-70 Superfund Site remediation program at no cost to the property owner. Soil sampling will be conducted during the summer of 2012 and the soil cleanup (if necessary) will be conducted in 2013.

An EPA representative will contact the Owner in advance of soil sampling. If based on sampling results soil cleanup is necessary, the EPA representative will contact the Property Owner in-person to discuss the cleanup on the property. **The Property Owner will have an opportunity to review and approve the restoration plan before cleanup begins.** Once the work is completed, the Property Owner will be asked to review the work and confirm that it is complete and meets the signed restoration plan. Upon completion, the Property Owner will receive written documentation from EPA that the property has been remediated.

ENVIRONMENTAL RESPONSE ACTIVITIES:

By signing this Access Agreement, the Property Owner is granting EPA, its employees and representatives including the United States Army Corps of Engineers (USACE) and their contractors and the Colorado Department of Public Health and Environment (CDHPE) the right to enter the property, at all reasonable times and with prior notice, for the sole purpose of performing the necessary work. This access shall remain in effect until the work has been satisfactorily completed. As necessary for either the soil sampling or for soil cleanup, the Property Owner also agrees to:

- Remove obstructions including boats, trailers, vehicles, playscape items, wood piles, dog houses, etc.;
- Remove flower bulbs or plants that the Property Owner or Property Owner'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 and/or its representatives;
- 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 of buildings.

AGREEMENT NOT TO INTERFERE

The Property Owner agrees to not interfere or tamper with any of the activities or work being done, or the equipment used to perform the cleanup activities or to allow others to use the property in a conflicting manner.

This written permission is given voluntarily with knowledge of the right to refuse and without compulsion or promises of any kind. The Property Owner understands that if there is any damage to structures such as sidewalks that is caused by the work conducted by EPA or their authorized representatives, contractors, or sub-contractors then EPA or authorized representatives, contractors or sub-contractors shall repair such damage to the extent practicable.

☒ **I grant access to my properties**

Signature / / **Date**

Mailing Address: _____

After signing, please return to:

Paula Schmittdiel, Remedial Project Manager
U.S. Environmental Protection Agency
1595 Wynkoop St.
Denver, Colorado 80202-1129
Mail Code: 8EPR-SR

APPENDIX B-2
REMEDIATION REQUIRED LETTER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

November 6, 2012

Ref: 8EPR-SR

Name
Address
Denver, Colorado 80205-3646

RE: Property Address of Concern

Dear Mr. / Ms:

As part of the on-going activities at the Vasquez Boulevard/Interstate 70 (VB/I-70) Superfund Site, the U. S. Environmental Protection Agency (EPA) recently collected soil samples at your property to determine if there is arsenic or lead soil contamination. The EPA appreciates your cooperation with the sampling activities.

Sampling results for your property showed concentrations of lead in your soil that may pose a risk and require a soil cleanup which the EPA is planning to perform in 2013. The level of arsenic in your soil is below the cleanup level and is not of concern.

Sampling Results	EPA Cleanup Level
Lead 404 parts per million (ppm)	above 400 ppm
Arsenic 7.4 ppm	above 70 ppm

The remediation involves removing the top 12 inches of soil from your yard and replacing it with clean soil. Afterward, the EPA will re-landscape your yard to a condition similar to original**. All work will be performed by the EPA at no cost to you.** To minimize your inconvenience, the EPA will coordinate with you for the soil removal activity. Upon completion of remediation activities, the EPA will issue a letter stating that your property has been cleaned and that no further action is necessary.

Representatives of the EPA will contact you to discuss the removal of contaminated soil from your property starting in late January. In the meantime, if you have further questions regarding the removal of contaminated soil at your property, please contact either myself at (303) 312-6861 or Jennifer Chergo, Community Involvement Coordinator, at (303) 312-6601.

Sincerely,

Paula Schmittdiel
Remedial Project Manager

Printed on Recycled Paper

SAMPLE

APPENDIX B-3
REMEDIATION COMPLETE LETTER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Date, 2013

Ref: 8EPR-SR

Mr. /Ms. Owner_Names
Mail_Address
Mail_City, Mail_State_Mail Zip

Dear Mr. /Mrs. <Owner_Last_Name>:

This letter certifies that soils on the property at Mail_Address, 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 property.

The clean-up actions 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.

This means that the EPA does not believe that further measures are necessary. You and your family are not at risk from lead and arsenic through ordinary contact with soil in your yard while playing, working, gardening, etc.

Thank you for your cooperation in allowing the EPA to conduct the remediation of your property. For further information, please feel free to contact either myself (303) 312-6861 or the EPA Community Involvement Coordinator Jennifer Chergo at (303) 312-6601.

Sincerely,

Paula Schmittdiel
Remedial Project Manager

SAMPLE

Printed on Recycled Paper

APPENDIX C

Construction Quality Assurance Plan

CONSTRUCTION QUALITY ASSURANCE PLAN
FOR RESIDENTIAL REMEDIATION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO

June 2013

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

1595 Wynkoop St.
Denver, Colorado

Originally Prepared by:

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(303) 741-7700
Fax (303) 741-7703

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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. 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.

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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.

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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 D 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 Lead Based Paint Assessment and Abatement

In order to protect against possible recontamination and address another potential exposure pathway, all properties deemed for cleanup built prior to 1978 will be tagged for an exterior lead-based paint (LBP) evaluation, prior to removal activities, planned for 2013. The decision to abate will be made by comparison to the rule 19 removal standard or any other criterion as determined by the inspector. This will ensure that the property soils are not removed until the potential threat from exterior LBP has been eliminated. Soil removal is a performance based activity and the only measurements will be before and after survey to confirm removal depths and completeness. The exterior LBP survey will be performed by a subcontractor using personnel certified to conduct LBP surveys in the State of Colorado. If the subcontractor elects to utilize an XRF it will be set-up for LBP analysis/reporting and the operator will be trained and certified in its use per State of Colorado requirements. All procedures utilized and testing methods will comply with State of Colorado requirements for LBP. Properties where an exterior LBP issue exists will be identified for EPA and if directed, remediated by a certified LBP removal subcontractor prior to soil removal. Any samples

collected by the subcontractor that require analysis will be analyzed by a laboratory certified for LBP analysis by the State of Colorado. All data acquired and activities performed will be reviewed and observed by the Supervising Contractor's EQAO, FPS, and Project Chemist.

3.1.3 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 (24 inches in gardens), has been achieved. The Supervising 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 (See Worksheet #15 in the QAPP). 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 5,000 cubic yards (cy) for arsenic and lead analyses to confirm that the concentration of these constituents meet the replacement material criteria. 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

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 3.1.3, measurement of the depth of the required excavation areas will be evaluated through construction elevation surveys to be performed as part of the Supervising 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 Construction 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 F 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 Supervising Contractor, as described in Section 3.1.1. The Supervising Contractor will review the laboratory testing reports to confirm that the materials meet the replacement materials chemical criteria (Worksheet #15, Reference Limits and Evaluation Table in the QAPP.) 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 the work area for changes in consistency. If changes in the material consistency are observed, the Supervising Contractor will collect additional samples to confirm the material's physical and chemical characteristics.

As indicated in Section 3.1.1, the Supervising Contractor will sample and analyze the replacement materials (backfill soils, topsoils, and other fill materials) for arsenic and lead at the initial source selection and at 5,000 cy intervals. The Supervising Contractor will review these results to confirm on-going acceptability.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

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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 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 F 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 D 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

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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 three types of environmental sampling to be performed to support the remedial action.

4.2.1 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. Four separate VOC samples will be collected 3 inches below the ground surface from the four properties. The samples will be collected using a disposable plug sampler and expelled into a pre-weighed VOC vial.

Each sample will be extracted using the appropriate Toxicity Characteristic Leaching Procedure (TCLP) extraction procedure (USEPA SW-846 Method 1311) and analyzed for metals, pesticides, semi-volatiles and volatiles (see Worksheet #19, Analytical SOP Requirements Table in the QAPP).. Specific procedures regarding collection, preparation and analysis of the disposal characteristics soil samples are provided in Section 4.4.

4.2.2 Sampling of Replacement Materials

Samples of each type of replacement material (backfill soil, topsoil, and other fill materials) used in property restoration will be collected and analyzed to confirm that the materials meet the replacement material chemical criteria. The sample results will also be used to verify the Supervising Contractor's quality control sample data for arsenic and lead concentrations in the replacement materials.

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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,, pesticides, semi-volatiles, volatiles, and PCBs. The CLP laboratory will report the concentrations of the specified replacement material chemical criteria constituents. The fill material samples will be analyzed for arsenic and lead (see Table 3-1 for CLP methods).. Specific procedures regarding collection, preparation and analysis of the replacement soil samples are provided in Section 4.4.

4.2.3 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 PM10, PM2.5, 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) support an evaluation of the replacement soil composition requirements; (2) support classification of the materials to be removed for disposal purposes; (3) confirm that the replacement materials meet the project quality requirements and verify the replacement material quality control sample results, and (4) 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 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 4.2.1. 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.

4.3.2 Replacement Material Sampling

Samples of the replacement topsoil 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 backfill soils and replacement materials 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 14.7 of the QAPP.. 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 CLP laboratory will analyze the samples by the specified methods..

4.3.3 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 PM10 and PM2.5 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 PM10, PM2.5, lead and arsenic and to identify when additional dust control measures are necessary. The Fugitive Emissions Dust Control Plan (Appendix F to the Remedial Design Work Plan) provides details of monitoring activities, including quality assurance objectives.

4.4 Sampling Procedures

4.4.1 Disposal Characteristics Sampling

As discussed in Section 4.2.1, 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 (Worksheet #14 in the QAPP).

4.4.2 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.

The project chemist 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

hardcopy 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.

4.4.3 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 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 ;
- Laboratory QC results (laboratory control samples, matrix spikes) meet measurement objectives ;
- 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.. 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 4.1 (See Worksheets #33 through Worksheet #37 in the QAPP for data review and validation).

4.4.4 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 4.1. 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. (See Worksheets #33 through Worksheet #37 in the QAPP for data review and validation)

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4.4.5 Data Management and Reporting

Field measurements and laboratory analytical results will be presented in the monthly progress reports and final deliverables. 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.

4.5 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.

4.5.1 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 F 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.

4.5.1.1 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.

4.5.1.2 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.

4.5.1.3 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.)

4.5.2 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 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.

4.6 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.

4.6.1 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;

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- 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.

4.6.2 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.

4.6.3 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.

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4.7 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.

4.7.1 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: where: S1 = measured sample concentration; and S2 = 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).

4.7.2 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{%) = x 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.

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4.7.3 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/nonacceptance of analytical results. Percentage completeness (C) is given by:

$$C(\%) = V/P x 100$$

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.

4.7.4 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.

4.8 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

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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 cannot be found, the Supervising Contractor's PM will review the results and assess whether reanalysis or resampling is required.

4.9 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.

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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 disposal characteristics samples, and replacement material sampling. 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 contractors) 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

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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.

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6.0 References

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TABLES

Table 3-1
Summary of Construction Quality Control/Quality Assurance Monitoring and Testing

Remediation Construction							
Item	**Construction Element**	**Parameter**	**Acceptance Criteria**	**Construction Quality Control**		**Construction Quality Assurance**	
				Method	**Minimum Frequency**	**Method**	**Minimum Frequency**
A.	**Lead Based Paint**	Paint Chips	XRF Measurements	TCLP, SW-846 1311 Lead, SW-6010B, Co regulation 19 certified	Each Property	Review test results for acceptability and inspect for consistency.	Each Property
B.	**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. 24 inches in gardens and 4 inches under decks.	Elevation survey.		Visual observation and random spot checks with survey device (laser level).	Each Property
		Fugitive Dust Emissions	No visible dust emissions. Field and laboratory results confirm compliance with the Fugitive Emissions Dust Control Plan.	Visual Inspection	Continuous	Field and laboratory results confirm compliance with the Fugitive Emissions Dust Control Plan.	As specified in the Fugitive Emissions Dust Control Plan.
C.	**Replacement Soil**	Fill Dirt:	Meets residential soil criteria	CLP SOW for Inorganics-2010-selected lab SOP.	Source approval,observed material change, or per 5000cy.	Review test results for acceptability and inspect for consistency.	Continuous
		Topsoil: Metals, VOCs-low/medium SVOCs, PAHs-trace Pesticides/PCBs Herbicides	Meets residential soil criteria	CLP SOW for Inorganics-2010-selected lab SOP CLP SOW for Organics, Modifications for PAHs(SIM) and Herbicides as a modification,, selected lab specific.	Source approval,observed material change, or per 5000cy.	Review test results for acceptability and inspect for consistency.	
		Topsoil:Hexavalent Chromium Agricultural	Meets residential soil criteria	CSU-Soil, Water and Plant Testing Laboratory procedures.	Source approval,observed material change, or per 5000cy.	Review test results for acceptability and inspect for consistency.	

Table 3-1 (continued)
Summary of Construction Quality Control/Quality Assurance Monitoring and Testing

Remediation Construction							
Item	**Construction Element**	**Parameter**	**Acceptance Criteria**	**Construction Quality Control**		**Construction Quality Assurance**	
				Method	**Minimum Frequency**	**Method**	**Minimum Frequency**
		parameters					
		Replaced Thickness	12 inch min. in yards and 24 inches in gardens. 4 inches under decks.	Grade stakes		Visual observation and random spot checks.	Each Property
D.	**Fill materials-rock, mulch, gravel**	Metals-As and Pb	Meets residential soil criteria	CLP SOW for Inorganics, selected lab specific.	Source approval,observed material change, or per 5000cy.	Review test results for acceptability and inspect for consistency.	Continuous
		Gradation	Meets gradation requirements	Visual Confirmation	Grade Stakes	Visual observation and random spot checks.	Continuous
		Replaced Thickness	4 inches minimum	Grade stakes.		Visual observation and random spot checks.	Each Property where applicable.
E.	**Replacement vegetation**	Vegetation Extent	Install vegetation according to remediation site plan.	Visual Confirmation	Each Area	Visual Confirmation	Each Area
		Vegetation Type	Meets vegetation type and quality requirements	Provide labels and certificates provided by supplier.	1/source and type	Review submittals for acceptability.	1/source and type
		Fertilizer	Applied in accordance with manufacturer's specifications.	Provide MSDSs and manufacturer's recommended application procedures.	1/source and type	Review submittals for acceptability and observe application.	1/source and type
		Vegetation Condition	Replacement vegetation shall be in good condition at the end of the 30 day maintenance/watering period	Visual inspection at the end of the 30 day maintenance/watering period.	Each Property	Visual inspection at the end of 30 day maintenance/watering period.	Each Property

EPA = U.S. Environmental Protection Agency
MSDS = Material Safety Data Sheet
PCB = polychlorinated biphenyl
VOC = volatile organic compound
SVOC = semivolatile organic compound

Table 4-1

Quantitative Measurement Objectives for Analyses
Soil, Replacement Materials and Water Samples

Sample Matrix	Analytical Method	EPA Method Reference	Precision	Accuracy	Completeness
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% recovery 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% recovery 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% recovery Lab Blank = <MDL	95
	TCLP-	1311/8260B	LCS/LCSD or MS/MSD	LCS = 75-125% recovery	95

Table 4-1 (continued)

Quantitative Measurement Objectives for Analyses
Soil, Replacement Materials and Water Samples

Sample Matrix	Analytical Method	EPA Method Reference	Precision	Accuracy	Completeness
	Volatiles		RPD = within lab control limits Analytical duplicate RPD = <30%	Lab Blank = <MDL	
Soil Composition	ASTM D-422	N/A	N/A	95	Soil Composition
Replacement Materials	Metals	CLP-Inorganic SOW	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80% - 120% recovery MS =75 – 125% recovery Lab Blank = <MDL	95
	Mercury	CLP-Inorganic SOW	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80% - 120% recovery MS =75 – 125% recovery Lab Blank = <MDL	95
	Pesticides	8081A	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75-125% recovery Lab Blank = <MDL	95
	PCBs	8082	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75-125% recovery Lab Blank = <MDL	95
	Semi-Volatiles	8270C	LCS/LCSD or MS/MSD RPD = within lab control limits	LCS = 75-125% recovery Lab Blank = <MDL	95

Table 4-1 (continued)

Quantitative Measurement Objectives for Analyses
Soil, Replacement Materials and Water Samples

Sample Matrix	Analytical Method	EPA Method Reference	Precision	Accuracy	Completeness
			Analytical duplicate RPD = <30%		
	Volatiles	8260B	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75-125% recovery Lab Blank = <MDL	95
Water Equipment Blank	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

ASTM = American Society for Testing and Materials
ICP = inductively-coupled plasma
LCS = laboratory control sample
LCSD = laboratory control sample duplicate
MDL = mL = milliliter
MS = Matrix Spike
MSD = Matrix Spike Duplicate
N/A = not applicable
PCB = polychlorinated biphenyl
RPD = relative present difference
TCLP = toxicity characteristic leaching procedure

Table 4-2
Analytical Methods, Sample Containers, Preservation and Holding Times

Sample Matrix	Analytical Method	EPA Method Reference	Container	Storage Recommendation	Holding Time
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 = 7 days Analysis = 40 days after extraction
	TCLP-Herbicides	1311/8151A			
	TCLP-Semi-volatiles	1311/8270C			
	TCLP-Volatiles	1311/8260B			14 days
Soil Composition	ASTM D-422	N/A	Clean 5 gallon bucket	N/A	180 days
Replacement Materials	Metals	6010B	Clean 8 oz. jar 50 grams	Cool	180 days
	Mercury	7471A			14 days
	Pesticides	8081A	Clean 8 oz. jar 100 grams	Cool	Extraction = 7 days Analysis = 40 days after extraction
	PCBs	8082			
	Semi-Volatiles	8270C			
	Volatiles	8260B	Clean 8 oz. jar 50 grams	Cool	14 days
Water Equipment Blank	ICP (Arsenic and Lead)	6010B	Plastic or glass bottle 500 mL Preserve pH < 2 with nitric acid	N/A	180 days

ASTM = American Society for Testing and Materials
ICP = inductively-coupled plasma
mL = milliliter
N/A = not applicable
oz = ounce
PCB = polychlorinated biphenyl
TCLP = toxicity characteristic leaching procedure

APPENDIX D

Construction and 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

June2013

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DRAFT-For Guidance Purposes Only

Revision No. 2

March 2003

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

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 positive drainage away from foundations and structures. 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

Summary of Work

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 (5CCR1001) 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). Regulatory Requirements

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. Submittals

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 video recordings and/or digital 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 were in working order prior to remediation or 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. Mobilization, Preparatory Work and Demobilization

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 setup 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:

    - 7:00 am to 7:00 pm to
    - Zone Next 7:00 pm 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 80db(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 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 Mobilization, Preparatory Work and Demobilization 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 decontamination 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 Temporary Construction Utilities and Facilities 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.

1.2 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 Preservation of Historical and Archaeological Data 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.

1.2 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

Site Clearing

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 USACE.

B. Remove dead trees and shrubs and small trees (less than 2-inch diameter) and bushes from areas with consent of the property owner as indicated on the property remediation plan 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. 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, Appendix C 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. Yard Remediation Earthwork

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 swept with a broom 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 at a 45 degree angle 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 1 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. This will generally result in a shallow excavation (typically 2 to 6 inches) from the trunk to the drip line and a tapering excavation from the drip line outward 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. During excavation, the shrubs and tree roots will be watered to minimize damage to vegetation until those areas can be backfilled with the clean material.

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. No materials shall be transported to a disposal site without prior approval from USACE or USEPA.

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).

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. The backfill will be carefully loosened so over compaction

does not impact vegetation or sod. 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 but will be carefully loosened so over compaction does not impact vegetation or sod and will be 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 USACE and 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 USACE/USEPA such that the remediation schedule is not impacted.

B. USACE/USEPA approved additional work, beyond pre-removal restoration, will be at the expense of the property owner.

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.

1.3 RELATED SECTIONS

A. Section 01300 - Submittals
B. Section 02205 - Yard Remediation Earthwork
C. Section 02920 - Vegetation Establishment - Sod Installation

1.4 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.

1.5 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.

1.6 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. Vegetation Establishment - Sod Installation

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 for the region, 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.

   Vegetation Establishment - Sod Installation 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 from 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 that cannot be maintained to a single leader or trunk.
8. Any shrub that 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 from 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. Contractor will water still water the sod using hydrant water.

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 American Sod Producers Association (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, Diffuse 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
Flyking	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 slope of 2:1 or greater, 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 not over compacted and 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.
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. Apply fertilizer to installed sod at recommended rate.

I. Install sod.

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 30 day watering at installation, homeowners should 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.

APPENDIX E

Transportation and Disposal Plan

TRANSPORTATION AND DISPOSAL PLAN
FOR RESIDENTIAL REMEDIATION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO

June 2013

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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 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. 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 remedial 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 Section 14.6; QAPP). 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.

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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 OU1 are shown on Figure D-l 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 may be removed from residential properties within two 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 for transport to the disposal site. Dump trucks will be operated by a licensed carrier. Dump trucks 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 two residential property soils removals will occur within a neighborhood. 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, a flagger will be required to keep pedestrian and vehicular traffic

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away from the loading zone. When haul trucks are loaded within or near public traffic-ways such as streets, alleys or sidewalks, traffic cones and flaggers will be required to direct traffic away from the loading zone.

Trucks 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.

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 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.. 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

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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.

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 Transportation Haul Routes to MSW Disposal Facilities

Trucks traveling to MSW disposal facilities will exit the OU1 neighborhoods onto major highways (1-70 initially and 1-25, 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 1-70 east to Pena Boulevard north to Tower Road, or 1-25 north to 1-76 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 1-25 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 1-70 west to Colorado 58 through Golden to Highway 93 north to the facility. Alternatively, the haul route could utilize Colorado Highway 72 from 1-70 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 1-70 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 and USACE. 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.

2.3.2 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.

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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.

2.3.3 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.

2.3.4 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, USACE 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.

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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 Region 8 Emergency Response of any emergency response events and the subsequent response actions.

2.3.5 Truck and Driver Requirements

Transport trucks and drivers shall comply with all applicable federal, state and local regulations. Drivers and equipment operators shall be licensed to operate the equipment under their control and the drivers and equipment operators will be subject to safety record checks and random drug tests. If an accident were to occur on the job, a drug test can be requested. 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 at a licensed MSW disposal facility, as described above in Section 1.0 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 Construction Contractor will select the disposal site with the approval of USACE and USEPA. The selection of disposal site(s) will be dependent upon a number of factors including 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 laboratory analytical results and 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.

4.0 REFERENCES

Colorado Department of Transportation (CDOT), 1999. Standard Specifications for Road and Bridge Construction.

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LANDFILLARVADA
POTENTIAL
HAUL ROUTES

ATTACHMENT A
Example Documentation Forms

Load Tracking Form
VASQUEZ BOULEVARD/INTERSTATE 1-70
SUPERFUND SITE

Load Tracking Form

Vasquez Boulevard/Interstate 70
Superfund Site

Date: ________________________

Load Number	Time	Truck/Container ID	Volume (cy)	Comments

Total Volume:

APPENDIX F

Fugitive Emissions Dust Control Plan

FUGITIVE EMISSIONS DUST CONTROL PLAN
FOR
REMEDIATION OF RESIDENTIAL PROPERTIES
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
DENVER, COLORADO

June 2013

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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 OSHA standards (29 CFR 1910 Subpart Z) and 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.

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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 (PM10) and less than 2.5 microns (PM2.5) in diameter. Those standards require that PM10 concentrations not exceed 150 $\mu g/m^3$ and PM2.5 concentrations not exceed 65 $\mu g/m^3$ based on a 24-hour average. Average annual PM10 and PM2.5 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 PM10 and PM2.5 to the air at levels that approach the NAAQS. Therefore, use of TSP as a direct measure of PM10 and PM2.5 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, PM10, and PM2.5 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 not allow remedial activities to continue if background air quality is believed to be the major problem.

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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/m3. 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 PM10 and PM2 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 PM2.5 and PM10 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 5 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 PM10 and PM2.5 and TSP.

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During the initial monitoring period three MiniVol samplers will be co-located to provide data on TSP, PM10 and PM2.5. At least 20 co-located samples will be collected and a linear correlation developed to allow for estimation of PM10 and PM2.5 levels based on TSP concentrations. Using these data a linear correlation will be developed for PM10 and PM2.5 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 PM10 and PM2.5 concentrations and TSP concentrations. For example, for PM 2.5:

PM2.5 concentration = B1 * TSP concentration + b0

Where B1is the slope of the correlation at the upper 90 percent prediction interval (i.e., 90 percent of measurements will be below the predicted value) and b0 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 PM2.5 NAAQS (65 $\mu g/m^3$): TSP Action Level (PM2.5) = (65 -b0) / B.

The same approach would be taken for PM10 and the TSP action level implemented would be the lower of the two calculated for PM2.5 and PM10.

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 during the course of the workday. 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-datalogging 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

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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, such as laying sod or replacing fences.

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 monitor 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 PM10 and PM2.5 NAAQS and to provide information about arsenic concentrations. The MiniVol samplers will be calibrated, operated, and maintained in

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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 properly 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 F). 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 done as an audit at the beginning and end of the construction season. The six-point calibration/audit will be performed in a manner consistent with the MTNTVOL 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, which 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 $\mu g/m^3$ for lead, and 21 $\mu g/m^3$ 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 and at the program's conclusion.

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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 15minute 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 will be evaluated daily at individual properties and 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.

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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 USACE and USEPA.

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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 National Ambient Air Quality Standards (NAAQS) 24-hour PM2.5 and PM10 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).

The MiniRAM PDR-1000 or equivalent 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 and potential worker exposure. The action levels below were derived using the maximum lead (744 ppm) and arsenic (86 ppm) concentrations identified in soil and applying a protection factor of four times the respective TLV for arsenic and OSHA action level (0.03 ug/m3) for lead.

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. If necessary, the Contractor will provide dust control on an as needed basis, including weekends.

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 µg/m3. 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. $\mu g/m^3$ (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 a 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.

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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 PM2.5 and PM10), then a request for less frequent monitoring may be made to USACE and 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 USACE and USEPA.

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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 1-70 Denver Colorado. Prepared for the USEPA.

Washington Group, 2001. Remedial Investigation Report Vasquez Boulevard/I-70 Site Operable Unit I. Prepared by Washington Group International for the USEPA.

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TABLES

Table 1

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES FOR 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 Programs (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.

CCR = Code of Colorado Regulations
NAAQS = National Ambient Air Quality Standard
OU1 = Operable Unit 1
VBI70 = Vasquez Boulevard/Interstate 70

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Table 2

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARs					
Action	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment
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 practicable 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.

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Table 2

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARs					
Action	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment
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 states 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 7,000 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 different 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.

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Table 2

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARs					
Action	Potentially Applicable	Potentially Relevant and Appropriate	Citation	Description	Comment
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.	Yes	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 pollutants 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	--	5 CCR 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 generates fugitive dust.

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Table 2

SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES

FEDERAL ARARs					
Standard, Requirement or Criteria	Potentially Applicable	Potentially 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. 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.

CCR = Code of Colorado Regulations
$\mu g/m^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standard
NESHAP = National Emissions Standards for Hazardous Air Pollutants
OU1 = Operable Unit 1
VBI70 = Vasquez Boulevard/Interstate 70

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Table 3

NAAQS 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.

$\mu g/m^3$ = micrograms per cubic meter
TSP = total suspended particulate

ATTACHMENTS

ATTACHMENT A

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.

The MiniRAM has an audible alarm that will be set to go off at a 15-minute average of 100 $\mu g/m^3$. 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 $\mu g/m^3$, 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 $\mu g/m^3$, the added mitigation measures will cease.
- If mitigation measures are unsuccessful resulting in higher concentrations in excess of 150 $\mu g/m^3$ 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 $\mu g/m^3$ 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 a 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., southwest 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.

ATTACHMENT B

STANDARD OPERATION 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-inch 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 pre-separator/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 pre-separator/filter holder assembly at the quick-connect and place it in clean plastic bag for transport back to the building.
- Attach a new pre-separator/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 pre-separator 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 pre-separator/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 a 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.

APPENDIX G

Water Conservation/Management Plan

WATER CONSERVATION/MANAGEMENT PLAN FOR OPERABLE UNIT 1 VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE DENVER, COLORADO

June 2013

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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 20 properties will require remediation. All of these properties are scheduled to be remediated over the 2013 construction season. The residences consist of single-family dwellings and one vacant property..

During remediation, the top 12 inches of soil will be excavated, and loaded into trucks for transportation to a municipal solid or hazardous waste disposal facility. 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's drought situation has greatly improved since Stage 2 drought restrictions were put in place April 1, 2013. On June 26, 2013, , the Denver Water Board adopted a resolution declaring a Stage 1 drought, removing the Stage 2 drought restrictions, which removed the two-day-per-

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week assigned watering schedule. These restrictions are currently enforceable and will remain so until further notice.

Under Stage 1, there are no assigned watering days, but watering is permitted to no more than three days a week. Exemptions must be obtained to install new seed or sod lawn areas greater than 250 square feet.. With an exemption, new turf sod may be watered up to 21 days and new seed may be watered up to 30 days when the property displays a sign from Denver Water that indicates the expiration date of exemption. Drought patrol teams will still monitor and enforce Denver Water's rules to help control excessive and wasteful use of water. No watering is allowed between the hours of 10 a.m. and 6 p.m..

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 in accordance with the City and homeowners preferences.

The work practices associated with these activities are further discussed in Section 2.

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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 offsite 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 NAAQS 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 stockpiled in a secure location and tarped to eliminate the use of water to control dust coming off the pile.

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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 parking areas.

Following property restoration, the Construction Contractor will perform all recommended watering for the establishment of the replacement vegetation for a period of 21 – 30 days, depending on seed or sod. 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.

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VB/I70 OU1 VICINITY
U.S. EPA REGION 8
VASQUEZ BOULEVARD/
INTERSTATE 70 SITE OPERABLE UNIT 1

Figure 1 -1
Site Location Map

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 June 28 , 2013 through October 1, 2013

1. OUTDOOR WATERING OF TURF AND LAWNS is permitted three days a week., but not between 10 a.m. and 6 p.m.

2. WATERING OF VEGETABLE AND ANNUAL FLOWER GARDENS IS PERMITTED AT ANY TIME.

3. HAND-WATERING OF TREES, SHRUBS, AND PERRENIALS IS PERMITTED (with positive shutoff nozzle or drip irrigation only).

4. PERSONAL VEHICLES MAY BE WASHED AT HOME ONLY WITH A BUCKET OF WATER OR HAND HELD HOSE WITH A POSITIVE SHUTOFF NOZZLE. (No time or day restrictions).

5. WASHING IMPERVIOUS SURFACES (SIDEWALKS, DRIVEWAYS, ETC.) EXCEPT FOR HEALTH AND SAFETY REASONS IS PERMITTED BUT NOT BETWEEN THE HOURS OF 10 A.M. AND 6 P.M.

6. VIOLATIONS WILL CONTINUE TO BE ISSUED: (1st violation is a warning; 2nd is $50; 3rd is $100.

FOR IMMEDIATE RELEASE ON For details, contact:

Jeff Terjal
Manager of Water Conservation
Denver Water
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