
REGION 5 RAC2

REMEDIAL ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substances in Region 5

FINAL BASIS OF DESIGN REPORT

Remedial Design

**South Minneapolis Residential Soil Contamination Site
Minneapolis, Minnesota**

Milwaukee, Wisconsin

WA No. 047-RDRD-B58Y/Contract No. EP-S5-06-01

May 2009

PREPARED FOR

U.S. Environmental Protection Agency



PREPARED BY

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirements
ARRA	American Recovery and Reinvestment Act
ASTM	American Society of Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CMC	CMC Heartland Partners
FS	Feasibility Study
ft ²	square feet
GIS	geographic information system
HASP	health and safety plan
HHRA	human health risk assessment
HI	hazard index
LCL	lower confidence limit
Lite Yard	CMC Heartland Lite Yard
m ²	square meters
mg/kg	milligrams per kilogram
M-CACES	Micro-Computer Aided Cost Estimating System
µg/m ³	micrograms per cubic meter
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MnDOT	Minnesota Department of Transportation
NaAsO ₂	liquid sodium arsenite
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
PODS	Portable On Demand Storage
ppm	parts per million
PQMP	Project Quality Management Plan
PRG	preliminary remediation goal
psi	pounds per square inch
RA	remedial action
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
Reade	Reade Manufacturing Company
RI	remedial investigation
RG	remediation goal
ROD	Record of Decision
SMRSCS	South Minneapolis Residential Soil Contamination Site
SOW	statement of work

SRV	Soil Reference Value
TAL	target analyte list
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
VE	value engineering
XRF	x-ray fluorescence
yd ³	cubic yards

SECTION 1

Introduction

The U.S. Environmental Protection Agency (USEPA) contracted CH2M HILL to prepare the remedial design (RD) for the South Minneapolis Residential Soil Contamination Site (SMRSCS). This *Final Basis of Design Report* was prepared as part of the RD in accordance with Work Assignment No. 047-RDRD-B58Y under Contract No. EP-S5-06-01. The work will be completed in accordance with the revised Work Plan dated July 28, 2008, and the *Remedial Design/Remedial Action (RD/RA) Handbook*.

1.1 Site Description

The SMRSCS is located in Minneapolis, Hennepin County, Minnesota (Figure 1-1). The SMRSCS consists of the residential properties within the approximate 3/4-mile radius from the CMC Heartland Lite Yard (Lite Yard) property. An aerial dispersion model performed by USEPA serves as the boundary for the SMRSCS. Figure 1-2 illustrates the residential properties within the SMRSCS as well as properties of other use categories.

The SMRSCS encompasses residential, industrial, commercial, and municipal properties, approximately 2 miles southeast of downtown Minneapolis. The SMRSCS is a largely residential area with most commercial and industrial areas to the east of the former Lite Yard property. Most of the residences were built from the early 1900s through 1930s. The residential areas of the SMRSCS consist primarily of residences on grassed lots. Commercial and industrial areas typically have little open ground and consist of mainly asphalt or concrete and buildings.

1.2 Site History

The Lite Yard property was owned by the Chicago, Milwaukee, St. Paul, and Pacific Railroad Company (Milwaukee Railroad) beginning in 1880. The Milwaukee Railroad declared bankruptcy in 1985, and as a result of the bankruptcy, the Lite Yard property was transferred to CMC Heartland Partners (CMC) on November 8, 1993. The Lite Yard property was acquired by 2800 Hiawatha, LLC on August 15, 2005.

From 1938 to 1969, Reade leased the Lite Yard property from the Milwaukee Railroad. From 1938 to 1963, Reade blended, stored, and distributed arsenical herbicides and pesticides at the Lite Yard property. During the 1940s, Reade also produced an arsenic-based grasshopper insecticide (Geomega, 2004). During Reade's operations, arsenic trioxide was unloaded from railroad hopper cars onto an open conveyor belt, resulting in powdered arsenic trioxide being released into the air and onto the Lite Yard property.

From 1963 to 1968, U.S. Borax subleased the Lite Yard property from Reade. U.S. Borax manufactured, shipped, and stored borate-based herbicides. In January 1968, a storage tank containing liquid sodium arsenite (NaAsO_2) ruptured, releasing approximately 3,000-gallons of liquid sodium arsenite from a 25,000-gallon storage tank onto an area

approximately 1,000 square meters (m²) in size which was subsequently covered with approximately 6 inches of sand (Geomega, 2004). Activities at the Lite Yard property during U.S. Borax's sublease are believed to have contributed to air dispersion of arsenic contamination (Geomega, 2004). In the period after 1968, the Lite Yard property was occupied by Rollins Oil Company, and subsequently, Bituminous Roadways, an asphalt road construction company.

Arsenic contamination was discovered by the Minnesota Department of Transportation (MnDOT) in 1994 during reconstruction of the Hiawatha Avenue corridor adjacent to the Lite Yard property. After the arsenic contamination was identified in 1994, an additional investigation was performed at the Lite Yard property. By 1996, Bituminous Roadways had placed 1 to 2 feet of crushed asphalt over the Lite Yard property to prevent dust from blowing offsite and to minimize human exposure to surface soil (Geomega, 2004). The Lite Yard Property was a state Superfund site and remedial actions were performed at the Lite Yard property in 2004 and 2005. The site has since been redeveloped. At present, the Lite Yard property is owned by 2800 Hiawatha, LLC and occupied by the Hiawatha Business Center, an approximately 60,000-square foot (ft²) light industrial building (Peer, 2005).

As a result of the investigations at the Lite Yard property, the Minnesota Department of Health (MDH) recommended in 1999 that soil sampling be performed in residential areas near the Lite Yard property due to the potential for elevated arsenic concentrations. It was determined that the prevailing summer winds were from the southeast toward the northwest; therefore, the residential area located directly downwind of the Lite Yard property became the focus of the sampling effort (USEPA, 2005a). Investigations in the residential neighborhood performed by the MDH and Minnesota Department of Agriculture (MDA) identified arsenic impacts in the shallow soils. The MDA requested assistance from USEPA in 2004 after sampling efforts in the residential neighborhood identified properties with elevated arsenic concentrations. USEPA subsequently performed investigations of the residential properties, schools, and parks in the SMRSCS in 2004 and 2005, undertook removal actions at the most highly contaminated properties, and initiated a remedial investigation (RI) in 2006. Through the RI and previous investigations, over 3,500 residential properties, schools, daycares, and parks were sampled within the SMRSCS.

Removal actions were performed at the most highly contaminated residential properties where surface soil concentrations were greater than 95 milligrams per kilogram (mg/kg). The removal actions consisted of excavation of 12 inches of soil in yards and 18 inches in gardens. Samples were collected from the bottom of the excavation and sent to the lab for analysis to document the remaining arsenic concentration. The excavation was backfilled to the original grade and restored.

As a part of the RI, a human health risk assessment (HHRA) was performed to evaluate the health risks to residents. The HHRA presented in the *RI Report* calculated a risk-based preliminary remediation goal (PRG) of 25 mg/kg for arsenic in soil, which correlates to a 1×10^{-4} risk level and hazard index (HI) of 1. A feasibility study (FS) for the SMRSCS was completed in 2008 to develop and evaluate remedial alternatives for addressing human health risks from arsenic in soils at the SMRSCS. On September 5, 2008, USEPA, working with the MDA and MDH, selected a remedy for the SMRSCS that was finalized in the Record of Decision (ROD).

1.3 Selected Remedy and Remedial Action Objectives

The major components of the selected remedy, as presented in the ROD, include the following:

- Inventory and documentation of the existing conditions of the areas requiring the remedy.
- Excavation of soil (to a depth of 12 inches below grade in yards, and to a depth of 18 inches below grade in garden areas) that has total arsenic concentrations above 25 mg/kg, or parts per million (ppm).
- Post-excavation soil sampling to document the concentrations in the remaining soil.
- If the samples at the base of the excavation exceed the deep soil arsenic cleanup standard, 95 mg/kg, then excavation will continue until the deep soil cleanup standard is met, or to a maximum depth of 10 feet.
- Placement of a permeable and permanent high visibility marker layer in the bottom of the excavation. The marker layer will provide a visual barrier over soils that were not excavated during the remedial actions and may contain residual contamination above the shallow soil cleanup standard. The selected remedy was revised from the ROD to only require the placement of demarcation fabric where soils exceeding the deep soil arsenic cleanup standard of 95 mg/kg remain.
- Backfilling excavation with clean fill and topsoil to the original grade.
- Restoration of the excavated areas (that is, restoring vegetation by seeding the final graded surface and planting replacement plants identified prior to excavation during an inventory).
- Collecting samples from excavated soil to verify that the soil is not characteristically hazardous and may be transported to, and disposed of at, a permitted and compliant Resource Conservation Recovery Act (RCRA) Subtitle D landfill. Soil has not been found to be characteristically hazardous during interim removal actions and so handling and disposal of RCRA hazardous waste is not anticipated to be required for this remedial alternative. However, if soil is characteristically hazardous, the soil may be managed as follows:
 - Stabilized and solidified at a centralized offsite treatment area prior to disposal at a RCRA Subtitle D landfill.
 - Transported and disposed of as characteristically hazardous waste at a RCRA Subtitle C landfill.
- If cleanup standards are not obtained at the bottom of the excavation, institutional controls would be placed on the land in the form of use restrictions to define areas of remaining concern, or zoning and permit requirements to limit exposure.

Where property owners consented, removal actions were performed from 2004 to 2008 at residential properties where surface soil concentrations are greater than 95 mg/kg. The

removal actions consisted of excavation of 12 inches of soil in yards and 18 inches in gardens. Samples were collected from the bottom of the excavation. A total of 46 yards, located within 40 properties, had samples collected at depth with arsenic concentrations above 95 mg/kg.

A predesign investigation was performed in 2008 at 27 of the 46 yards known to have soils containing arsenic at concentrations exceeding the 95 mg/kg subsurface remediation goal (RG). From these 27 yards, only 3 yards were identified where arsenic concentrations exceeded 95 mg/kg at 1 foot and would require re-excavation during the remedial action (RA). The required depth of excavation at each of these properties is 2 feet below ground surface (bgs) based on the subsurface soil predesign investigation results. Additional investigation will be required to determine if re-excavation is required at the remaining 19 yards located at 17 properties and the associated depth.

Remedial action objectives (RAOs) are goals that are specific to media or operable units for protecting human health and the environment. The site-specific RAO is to control concentrations of arsenic in residential soil that present a human health risk by minimizing the potential for dermal contact, ingestion, and inhalation exposures. The site-specific RAO will be achieved by addressing residential soils above the RGs. The soil cleanup levels for arsenic at the site are 25 mg/kg at the surface and 95 mg/kg at a depth of up to 10 feet bgs. Details regarding the development of the RGs are presented in the *FS Report* (CH2M HILL, 2008a). A total of 487 properties are known to require remedial action based on an exceedance of the surface soil RG of 25 mg/kg or a subsurface RG of 95 mg/kg as provided in Appendix A. The quantities presented in this design are based on the 487 known properties.

Two additional properties are estimated to require remedial action based on pending investigation at the remaining properties where arsenic concentrations exceed 95 mg/kg at a depth of 1 foot bgs. Finally, there are 20 properties within the boundaries of the site that have not been previously sampled. Based on the percentage of previous properties sampled that required remediation, it is estimated that three of these properties would require remedial action. The number of properties requiring remedial action will be revised as necessary as new information becomes available, but it is estimated that 492 properties will require remedial action. The quantities presented in this design are based on the 487 known properties.

1.4 Remedial Design Activities

Remedial design activities to support implementation of the selected remedy have been outlined in the scope of work (SOW) dated July 25, 2008 and approved by USEPA. The activities include the following:

- Project Management
- Community Involvement
- Field Investigation
- Sample Analysis
- Analytical Support
- Data Evaluation

- Preliminary Design
- Equipment, Services, and Utilities
- Intermediate Design
- Prefinal/Final Design
- Post-remedial Design Support

Project management, community involvement, and post-remedial design support are efforts that are required to manage the work and support USEPA in related activities.

Phase I of the field investigation was performed in 2008 and consisted of soil borings and sampling at 27 yards known to have soils containing arsenic at concentrations exceeding the 95 mg/kg subsurface RG. Samples were screened for arsenic using x-ray fluorescence (XRF) with select samples submitted for laboratory analysis to verify the XRF screening. The sample analysis, analytical support and data evaluation were performed in support of the investigation. Phase II of the field investigation will be performed in 2009 at 19 remaining yards known to have soils above the 95 mg/kg subsurface RG for arsenic.

Using the results from Phase I of the remedial design field investigation, a statistical analysis was performed to determine a correlation between the XRF measurements and laboratory results. The correlation will allow XRF to be used during the RA to define the extents of excavation. Soils above a laboratory result of 95 mg/kg will be excavated to a maximum depth of 10 feet bgs. If soils remaining above 95 mg/kg are unable to be excavated because of the maximum depth, or it is believed that continued excavation will cause damage to structures or other property or unacceptable health and safety risks, demarcation fabric will be placed within the excavation.

XRF will be used as possible to define surface soils above 25 mg/kg in areas where the property owner wants to protect plants or in boulevards that were previously not sampled. The results of the correlation are summarized in Table 1-1 to provide XRF measurements for arsenic concentrations of 95 mg/kg and 25 mg/kg. Detailed analyses are provided in the *XRF Correlation Study for Arsenic Results* dated March 6, 2009.

TABLE 1-1
Expected Values with Observation Confidence Intervals
October 2008 Phase II Remedial Investigation

	XRF Measurement		
	Best Estimate	95% Confidence Interval	
Laboratory result of 95 mg/kg	80	62	96
Laboratory result of 25 mg/kg	27	8	44

A preliminary design was performed to identify design assumptions and parameters with design calculations, to evaluate how applicable or relevant and appropriate requirements (ARARs) will be met, and to prepare a preliminary engineer's estimate of construction costs and schedule. A value engineering (VE) screening of costs did not result in a recommendation of a full-scale VE study based on the review of the preliminary design and preliminary

engineer's estimate of construction cost. It is believed that additional significant savings would not likely be found in a full-scale value engineering study.

Under the preliminary design, property sketches were prepared for a total of 487 properties known to require remedial action based on an exceedance of the surface soil RG of 25 mg/kg or a subsurface RG of 95 mg/kg. The property sketches are included with the detailed design calculations in Appendix A.

Equipment, services, and utilities activities were focused on identifying equipment and services that require long lead times. Long lead items are expected to include the acquisition of office rental space and an area for equipment storage (laydown areas). Prequalification of subcontractors will be performed for these activities.

During the intermediate design, detailed specifications were drafted. An intermediate design submittal was not prepared. The detailed specifications are included under separate cover. The engineer's estimate of costs, refined with a goal to plus 15 to minus 5 percent, is included in Appendix B of this report. A draft Project Quality Management Plan (PQMP) was prepared and is submitted under separate cover as part of this final design package. The PQMP will be finalized in the RA after determination of staff and subcontractors.

Comments and/or changes recommended based on the prefinal design were incorporated into the final design. Complete contract documents, including the solicitation package with specifications and bid forms, were prepared separately. A biddability and constructability review was performed for the final design. Also, a draft operations and maintenance (O&M) manual was prepared for the implementation and maintenance of institutional controls where remedial actions were unable to be performed or were incomplete. The draft O&M manual is attached in Appendix C.

After the 100 percent design is completed, post-remedial design support will be performed including soliciting procurement, evaluating offers received, and informing the USEPA Contracting Officer of the best qualified and cost-effective offer for the RA.

1.5 Planning and Chartering

RA planning and chartering will be conducted before the beginning of the RA activities. Planning and chartering will consist of the following components:

- Conducting team chartering
- Reviewing phase-specific logistics
- Reviewing special considerations, requirements, and restrictions
- Coordinating with the State of Minnesota, Hennepin County, and the City of Minneapolis

SECTION 2

Project Delivery Strategy

This section presents the RA project delivery strategy for SMRSCS. The remedial action, to be discussed in further detail in the following sections, consists of excavating soil from residential properties with arsenic concentrations exceeding the surface soil RG of 25 mg/kg and subsurface RG of 95 mg/kg to a maximum depth of 10 feet bgs. If the arsenic concentration exceeds the subsurface RG of 95 mg/kg at 10 feet bgs, then institutional controls will need to be employed. The excavation will be backfilled with clean fill and topsoil to the original grade and the vegetation will be restored to as close to its original condition as practicable.

The implementation of this RA will consist of several components. These consist of general activities for the project as well as activities that will occur on a property-to-property basis. Although some of the components will occur concurrently, the general sequencing of these primary components will be as follows:

- Contracting
- Preconstruction
- Initial mobilization
- Site preparation
- Excavation, transportation, and disposal
- Backfill and compaction
- Site restoration
- Landscaping and maintenance
- Post-construction meeting
- Final demobilization

Figure 2-1 outlines the process to be followed for remediation activities at individual properties.

The primary components of the RA implementation strategy are summarized below. Key project delivery strategies, relative to a specific component, are noted in their respective sections.

2.1 Contracting and Subcontracting

This work is anticipated to occur over several seasons, with the remedial activities occurring as long as the weather allows (generally April through the end of October). For continuity, the same subcontractors will be employed from season to season, though this is subject to the discretion of USEPA. CH2M HILL intends to allow the bidders to propose means and methods under a given set of performance standards. The solicitation documents, to be prepared by CH2M HILL, will identify USEPA as the Owner of the project and CH2M HILL as the Contractor. In this document, activities performed during the RD refer to "CH2M HILL," while RA activities reference "Contractor."

CH2M HILL will solicit separate subcontracts for select components of the RA. These components include, but are not limited to, surveying, earthwork, analytical, and landscaping services. Although the primary subcontractors may choose to subcontract parts of the project to lower tier subcontractors, in this document “subcontractors” will refer to the primary subcontractors. Splitting up the components of the RA into smaller packages encourages small businesses to participate in the bidding process, stimulates competition, and promotes the socioeconomic goals of the USEPA RAC2 Program. The number and scope of the subcontracts will be evaluated as part of the prequalification stage to maximize participation of Small, Small Disadvantaged, Woman-Owned, Hub-Zone, Veteran-Owned, and Service Disabled Veteran-Owned Small Businesses.

2.2 Preconstruction

The primary components of the preconstruction activities are described below in their expected sequence.

2.2.1 Community Relations

Distribution of information regarding the upcoming construction activities will be coordinated through USEPA. Fact sheets developed by USEPA were mailed to residents with the sampling results from the RI and previous investigations, or from the RD. Before mobilization occurs, a public meeting will be held to discuss the RA plans and schedule. Additional meetings may be held after that to present progress made. Details describing the upcoming construction activities will be submitted to the following recipients:

- USEPA for its web site and community mailings
- Local publications including, but not limited to, *The Alley*, the *Corcoran News*, and *The Circle*
- Contact list in the *Community Involvement Plan*
- Local television stations
- Local repositories at the following locations:
 - Green Institute, 2801 21st Avenue South, Suite 100, Minneapolis, Minnesota
 - City of Minneapolis Police Department, 1201-B East Franklin Avenue, Minneapolis, Minnesota
 - Minneapolis Central Library, 300 Nicollet Mall, Second Floor, Minneapolis, Minnesota
 - Minneapolis Public Library, East Lake Branch, 2727 East Lake Street, Minneapolis, Minnesota

The USEPA mailed access agreements with results from previous investigations to the current property owners as identified in the First Quarter 2008 taxpayer database from Hennepin County. As access agreements were returned to USEPA, the status of access was tracked for properties to document where owners consented access and to identify where

additional attempts should be made during the RD and RA to contact those owners who failed to sign the documents.

2.2.2 Staging Area, Storage Area, Fill Material Supplier, and Disposal Facility Identification

As part of the pre-construction activities, a staging and storage area in a central location will be identified and secured for construction equipment and materials. This area will also be used as a soil staging area. The storage, staging, and laydown area(s) will be secured with a minimum 6-foot standard temporary security fence with appropriate signage displayed and other security measures, as appropriate. Site preparation for these areas is included as mobilization activities.

The individual items removed from yards, such as play sets or lawn furniture that cannot be relocated elsewhere on the property prior to remedial action, shall be stored in a secure storage location. This location may be separate from the staging and equipment storage area.

Suppliers of clean fill material and topsoil shall also be located as part of the pre-construction activities. For the purpose of continuity, efforts will be made to obtain these materials from the same suppliers throughout the RA, but due to the large volume of soil needed, this may not be possible. The fill and topsoil will undergo testing to verify that the soil is clean and appropriate for use.

A disposal facility, or facilities, if necessary, shall also be identified. Alternatives for the beneficial reuse of the soil will be evaluated for cost effectiveness and applicability.

2.2.3 Coordination with City of Minneapolis

CH2M HILL will coordinate with the City of Minneapolis before construction begins. At a meeting with the City, CH2M HILL will discuss transportation routes, direct loading plans, USEPA exempt permits, required licenses, allowable work hours, use of city water, street closings, street and alley closing restrictions, city debris pickup, and special requirements and considerations.

2.2.4 Preparation of Site Plans

The subcontractors will verify compliance with the requirements of applicable permits. The subcontractors will also deliver applicable preconstruction submittals to the Contractor for approval before mobilization. Preconstruction submittals include site-specific plans and samples of materials, as necessary. A site-specific Health and Safety Plan (HASP) will outline procedures to be followed to ensure the work is completed safely and with no adverse health effects to workers or the community. A site-specific Transportation and Disposal Plan will guide the transportation and disposal of wastes and restoration materials, and stockpiling of excavated soils or construction debris generated during the RA. A site-specific Stormwater Management Plan will incorporate the use of best management practices for earth disturbing activities associated with the RA and procedures to control potential spills.

2.3 Initial Mobilization

The primary components of the initial mobilization strategy are described below in their expected sequence.

2.3.1 Mobilization

Mobilization involves establishing the storage, staging, and laydown areas, including temporary facilities, erosion and sediment control, and security, and the Contractor and subcontractors mobilizing to the site. Mobilization will consist of the following:

- Constructing temporary facilities such as field trailers, utilities, material storage facilities, and equipment decontamination facilities
- Grading and placing gravel at storage, laydown, and staging areas
- Delivering equipment
- Placing erosion and sediment control features for staging areas, such as silt fencing

2.3.2 Site Security and Coordination

Site security will entail coordination among the USEPA, Contractor, subcontractors, State of Minnesota, and City of Minneapolis. If a security fence is not present, one will be installed around the perimeter of the site storage and laydown areas. If possible, the equipment shall be stored in a locked facility. Materials removed from the individual houses shall be locked in a storage facility, such as in Portable On Demand Storage (PODS), or storage sheds. The Earthwork Subcontractor will subcontract security to monitor site equipment, staging areas, and property during nonworking hours. The subcontractors will maintain control over their work areas during working hours at the site.

2.4 Site Preparation

The primary components of site preparation for individual properties are described below in their expected sequence.

2.4.1 Site Visit Folder

The Contractor will prepare a site visit folder prior to meeting with the property owners to plan property-specific remedial actions. This folder will contain a base sketch of the property created using available parcel information from Hennepin County and the City of Minneapolis, aerial photography and property sketches from the RI sampling activities, and a signed site access agreement.

2.4.2 Initial Property Visit

The Earthwork Subcontractor, together with the Contractor, will perform an initial property visit to all properties where an access agreement was obtained or where the property owner has expressed a willingness to sign an agreement. During this site visit, the base sketch will be used and expanded upon to develop a property-specific plan for remedial actions at that

property. The items present in or around the excavation area will be inventoried with the property owner and resident, as appropriate. If plants are located within the excavation area, the Contractor will instruct the Landscaping Subcontractor to inventory the plants after the initial property visit. Photographs and video will be taken to document the preconstruction condition of the property and adjacent properties, as appropriate, and items in the inventory.

2.4.3 Second Property Visit

A second property visit shall be performed at least one week before construction activities begin. During this visit, the sketch with notes made during the first property visit and converted into AutoCAD or a similar electronic format, will be confirmed with the current property owner. The property and plant inventory lists will also be confirmed, and the current property owner will be given a copy of the photo documentation taken during the first site visit. The property owner, Contractor, and Earthwork Subcontractor will all sign the access agreement and the final sketch.

2.4.4 Preconstruction Survey

A preconstruction survey will be performed for each residential property where remedial actions are required. The survey will document the existing grade so the property can be restored to the preconstruction conditions to the extent practicable. The preconstruction survey will verify property boundaries to ensure that the limits of excavation are within the property boundaries.

2.4.5 Excavation Limits

The excavation limits will be staked by the Contractor to delineate the excavation area (front yard, back yard, side yard) at each property. Plants to be removed, as identified in the inventory completed prior to the second property visit, will be marked at each property. Protective measures will be installed around trees within or near the excavation limits if the trees are to remain but are located in an area where they would be susceptible to damage.

2.4.6 Utility Locate

Gopher State One-Call will be used to clear utilities before mobilization of the Earthwork Subcontractor to each property. Utilities will be verified as marked before excavation on each property and protected from damage during construction.

2.4.7 Alternative Utility Routing

Alternative utility routing may be necessary and may consist of temporary disconnection of low overhead electrical lines or shielding of electrical lines. The Earthwork Subcontractor will be responsible for this activity, as necessary.

2.4.8 Site Preparation

Before any soil excavation can begin, several onsite activities need to occur. Access to soil excavation areas will be determined for each property. The Earthwork Subcontractor will install protective measures around trees within or near the excavation limits if the trees are

to remain but are located in an area where they would be susceptible to damage. The Earthwork Subcontractor will establish and maintain two points of continuous access for residents and property owners when possible with one point of continuous access at all times.

The width of access past site features (fences, abandoned vehicles, debris) may be narrow at some locations. The Earthwork Subcontractor will remove sections of fence and other obstructions and temporarily store them at the property outside the excavation limits or move them to the previously identified secure storage areas. The removed yard obstructions will be clearly labeled with the correct owner information. If sections of fencing are removed, the opening(s) will be secured at the end of each day to provide an equivalent level of protection. Debris will be taken to the staging area or offsite for disposal in accordance with the applicable waste restrictions.

2.4.9 Clearing and Grubbing

The Earthwork Subcontractor will perform clearing and grubbing. Clearing and grubbing includes removal of interfering or objectionable material lying on or protruding above the ground surface. This includes vegetation and other organic matter including stumps, buried logs, and roots greater than 2 inches caliper to a depth of 6 inches below subgrade.

2.4.10 Erosion and Sediment Control

Before excavation begins, the Earthwork Subcontractor will apply erosion and sediment control measures as specified in the Stormwater Management Plan. The Earthwork Subcontractor will manage erosion control throughout earthwork activities. The Landscaping Subcontractor will remove the erosion and sediment control measures, as necessary, at residential properties after grass is established.

2.5 Excavation, Transportation, and Disposal

The primary components of the excavation and transportation and disposal strategy are described below in their expected construction sequence.

2.5.1 Excavation

The soil designated for excavation will be based on the analytical results from the RI or previous investigations and additional data collected during the RD or RA, as appropriate. The XRF and/or laboratory samples may be used to determine arsenic concentrations in boulevards, within tree driplines, and in areas around legacy plants to determine if excavation is necessary within these distinct subareas for protection of property or where data was not previously available.

Soil will be mechanically excavated to the maximum extent possible. Access to soil excavation areas will be determined for each property. Sections of fencing may be removed as necessary to facilitate mechanical excavation. In areas with limited access, existing site features (mature trees, legacy plants) that impede mechanical excavation, or where heavy equipment may damage structures, soil will be hand excavated by the Earthwork Subcontractor.

2.5.2 Post-Excavation Survey

Each excavation will be surveyed after a minimum of 1 foot of excavation and the arsenic concentrations are below the subsurface RG of 95 mg/kg. The survey will be used to determine quantities excavated and to document the excavation depth.

2.5.3 Waste Characterization Sampling

Waste characterization sampling will be conducted during the RA, as necessary, to support establishment of waste profiles with an approved offsite nonhazardous disposal facility. The Analytical Laboratory Subcontractor will analyze the waste characterization samples.

2.5.4 Transportation and Disposal

The Earthwork Subcontractor will load excavated soil directly onto trucks for transport as possible. Debris that has been removed will be segregated for offsite disposal as construction debris or yard waste. Transport of the excavated and potential debris material will be completed by a licensed transporter, and each truckload will be covered with a functioning tarp system. Provisions for equipment decontamination and regular street/alley cleaning will be developed to minimize contamination and maintain a clean work area.

2.6 Backfill and Compaction

Imported clean fill material will be placed up to the depth of topsoil. Subsoil will be compacted to minimize differential settlement, sinkholes, and subsidence. The top 6 inches of the excavation will be filled with topsoil to restore the area to existing contours. The topsoil will be compacted to minimize settlement while still allowing infiltration of water and penetration of roots. The topsoil surface will be raked prior to seeding. Gardens will be backfilled with 18 inches of higher quality select topsoil.

Efforts will be made to obtain fill and topsoil from the same suppliers for continuity, but due to the large volume of soil needed, this may not be possible. Soils will be tested upon identification of the borrow(s) and will be sampled at a frequency of 1 grab sample per 1,000 cubic yards (yd³) to determine if contamination is present.

2.6.1 Post-construction Survey

The properties will be surveyed to verify positive grading at residential properties.

2.7 Site Restoration

Residential properties will be restored as close as possible to the grade prior to excavation and with positive drainage. Fences or other features removed to facilitate the RA will be replaced. The sections of fence removed from properties that are not reusable will be replaced with new sections of like-kind fencing. Concrete sidewalks and asphalt areas damaged during the construction activities will be repaired. Any utility lines that were damaged or removed will be replaced according to the building codes of the City of Minneapolis. Unforeseen conditions encountered during excavation will be addressed site by site.

The items removed from the site, such as patio furniture and play sets, shall be returned to the site and reinstalled as appropriate. Items damaged while in storage or in transit will be repaired or replaced, as necessary.

2.8 Landscaping and Maintenance

The Landscaping Subcontractor will restore the filled and graded areas of the site after completion of the earthwork. Individual residential properties will be restored as close as possible to their pre-excavation condition. Landscaping at each property will be site-specific and depend on conditions documented by the Preconstruction Property Assessment Checklist or with preconstruction video and photographs with concurrence from the property owner. Restoration will include the following:

- Seeding and fertilization of lawn areas
- Installation of erosion control blanket, as necessary
- Installation of replacement perennials, shrubs, and trees
- Watering for up to 6 weeks to assist with germination of the seed

Landscaping maintenance will be conducted for individual properties, as needed. The Landscaping Subcontractor will guarantee the trees, shrubs, and perennials for one year. After one year, the site will be inspected and any defective trees or shrubs may be replaced. After the one-year inspection, the Landscaping Subcontractor shall be responsible to repair any minor settlement and reseed as necessary. If significant settlement has occurred, the Earthwork Subcontractor shall be responsible to repair the settlement and the Landscaping Subcontractor will reseed the disturbed areas.

2.9 Post-Construction Meeting

A post-construction meeting will be conducted with each property owner following completion of the restoration or landscape maintenance period. The acceptability of the completed work will be determined based on a review of the original survey notes and construction drawings. A punch list of action items may be developed, as necessary, to identify areas requiring additional restoration.

After the completion of work, the current property owner will be asked to sign off that their property has been restored to the condition agreed to during the second property visit prior to construction activities. The property owner will also be asked to evaluate the performance of key subcontractors. The review will be one metric used to determine the amount of performance-based incentive fees the subcontractors should be awarded. If the property owner is unwilling to sign off at the post construction review, arrangements will need to be made to obtain sign off at the end of the one-year warranty period.

2.10 Final Demobilization

Demobilization will include removal of the subcontractor's temporary facilities, such as field trailers, utilities, material storage facilities, equipment decontamination facilities, and erosion and sediment control features. It will also include removal of the USEPA's and the Contractor's temporary facilities.

Basis of Design

This section presents the technical details and assumptions of the RD. The work for each component of the RA, followed by the design assumptions, is described in the expected project delivery sequence.

3.1 Contracting

3.1.1 Description of Work

It is expected that procurement of temporary facilities, security, analytical, survey, earthwork, and landscaping subcontractors will be completed prior to the beginning of construction activities with the same subcontractors used for the duration of the project, as practicable.

3.1.2 Design Assumptions

Contractor and subcontractor oversight will be conducted during the entire time work is occurring. The contracts for each subcontractor will be prepared for the duration of the project encompassing the several construction seasons. The continued use of the subcontractors will be subject to their performance and at the discretion of USEPA. Small Business Enterprises, Small Disadvantaged, Woman-Owned, Hub-Zone, Veteran-Owned, and Service Disabled Veteran-Owned Small Businesses will be used to the maximum extent possible.

Subcontracts will be competitively procured as possible among qualified small businesses or subsets of small businesses including local small businesses that are able to meet the technical and schedule requirements. Under the RD, CH2M HILL will develop potential bidder lists from various sources including CH2M HILL's diverse supplier database, the USEPA Region 5 Small and Disadvantaged Business Utilization Coordinator, the U.S. Small Business Administration, and the Minnesota Procurement Technical Assistance Centers.

CH2M HILL intends to allow the bidders to propose means and methods under a given set of performance standards. The solicitation documents, to be prepared by CH2M HILL, will identify USEPA as the Owner of the project and CH2M HILL as the Contractor. The solicitation documents will include instructions to bidders, project specifications, drawings, proposed subcontract agreement (including USEPA RAC2 flow-down provisions), and other forms for bidders to complete. CH2M HILL will prepare the project specifications, drawings, bidding instructions, and contract terms.

For key subcontracts, CH2M HILL has included an estimate for the use of a performance-based incentive. The performance will be evaluated by the Contractor for metrics such as health and safety, quality, schedule, and an evaluation by the property owner and/or residents for the performance at their property. The intent of the performance-based

incentive is to promote a safe work environment and positive relationship with the residents.

It is anticipated that the performance incentive will be awarded at the end of each construction season. A total possible performance incentive fee will be determined for each subcontractor. The amount of the performance incentive awarded will be based on the evaluation of each performance metric at the end of each construction season, as described in Table 3-1.

TABLE 3-1
 Basis for Subcontractor Performance Incentive
South Minneapolis Residential Soil Contamination Site

Metric	Outstanding	Above Average	Average	Below Average	Needs Improvement
	+25% Performance Fee per Item	+12.5% Performance Fee per Item	No Performance Fee	-12.5% Performance Fee Penalty per Item	-25% Performance Fee Penalty per Item
Health & Safety (25%)	Demonstrates commitment to safety	No OSHA recordable injuries	No OSHA recordable injuries	No OSHA recordable injuries	OSHA recordable injuries
	No OSHA recordable injuries	No significant safety violations	Few significant safety violations	Few significant safety violations	Significant safety violations
	No minor safety violations	Few minor safety violations	Few minor safety violations	Several minor safety violations	Several minor safety violations
	No significant safety violations				
Quality (25%)	No environmental violations	No environmental violations	No environmental violations	No environmental violations	Environmental violations
	No rejected work	Minor rework required	Some rework required	Significant rework	Significant rework
	No notices issued	Few notices issued	Few notices issued	Several notices issued	Several notices issued
Schedule (25%)	Coordinates with other Subcontractors	Coordinates with other Subcontractors	Limited communication with other Subcontractors	Causes delays for other Subcontractors	Causes delays for other Subcontractors
	Completes tasks ahead of schedule	Completes tasks on schedule	Completes tasks on schedule	Completes tasks behind schedule	Completes tasks significantly behind schedule
Property Owner Review (25%)	Average property owner evaluation of 5	Average property owner evaluation of 4	Average property owner evaluation of 3	Average property owner evaluation of 2	Average property owner evaluation of 1

Each metric (Health and Safety, Quality, Schedule, and Property Owner Review) constitutes 25 percent of the total performance incentive fee. The amount awarded for each metric is based on the measurable performance with examples shown in Table 3-1. Assuming outstanding performance in each metric, the key subcontractors could be awarded 100 percent of their eligible performance incentive fee which is equal to 5 percent of their contract value for each construction season. Transportation and disposal costs and material

costs for fill and topsoil are not included in the contract value used to calculate the performance incentive.

The costs associated with these design assumptions are presented in Appendix B, Bid Items 10005010 and 10005020.

3.2 Preconstruction

3.2.1 Description of Work

Preconstruction work includes community relations, preparation of site plans, identification of staging areas, borrow sources, and disposal sources, and coordination with the City of Minneapolis. The work will be conducted prior to each construction season of the RA.

3.2.2 Design Assumptions

3.2.2.1 Community Relations Activities

It is assumed that there will be six public meeting/availability meetings with two Contractor personnel in attendance. One public meeting is anticipated prior to mobilization with one public meeting during the initial construction season and two public meetings each of the following years. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10002010.

3.2.2.2 Number of Properties Requiring Remediation

The 487 residential properties consist of the properties with surface soil concentrations greater than 25 mg/kg and/or subsurface soil concentrations greater than 95 mg/kg. Thirteen properties where access was denied during removal actions are included for remedial action.

Continued attempts will be made during the RA for access at 20 properties where access was denied for sampling, or will otherwise require institutional controls.

3.2.2.3 Site-Specific Plans

The Contractor will prepare a Health and Safety Plan, draft Transportation and Disposal Plan, Stormwater Management Plan, and Construction Plan. Draft versions of the plans will be provided to the Earthwork Subcontractor to revise with project-specific information. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10001010.

3.2.2.4 Staging Area, Borrow Source, and Disposal Source Identification

Storage, staging, and laydown areas will be located at a select property or properties within the City of Minneapolis, following individual owner acceptance. These areas will be targeted for areas centrally located within or near the boundary of the site with easy access to major roads. The areas will be secured with a minimum 6-foot standard temporary security fence and appropriate signage or will be a locked facility. Silt fencing and appropriate erosion control measures will be placed around stockpiled materials.

It is assumed that backfill borrow and disposal sources will be located within 60 miles of the site. The maximum distance of backfill borrow and disposal sources will be confirmed.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30001010.

3.2.2.5 Property Access

The USEPA mailed access agreements with results from previous investigations to the current property owners as identified in the March 2008 taxpayer database from Hennepin County. As access agreements were returned to USEPA, the status of access was tracked for properties to document where owners consented for access and to identify where additional attempts should be made during the RD and RA to contact those owners who failed to sign the documents for access.

A minimum of four attempts will be made to obtain an access agreement. The first attempt consisted of the mailings sent out by USEPA, the second attempt will consist of a phone call request by a CH2M HILL representative, and the last two attempts will be in-person visits to the property. Continued attempts to contact the property owner will occur during the RA while work is being performed in the area.

Some residential properties will be rental properties, and the owners may not occupy the property. In that case, two attempts will be made to obtain property owner contact information from the tenant with two subsequent telephone call attempts to contact the property owner.

For rental properties or bank-owned properties, CH2M HILL may discuss alternatives with the USEPA and the City of Minneapolis to obtain access for remedial actions. Access will be obtained from the City of Minneapolis for work within the city right-of-way, including the boulevards adjacent to the residential properties. Access for work in the right-of-way is assumed to be obtained under a blanket agreement rather than on a property-specific basis.

3.3 Initial Mobilization

3.3.1 Description of Work

Initial mobilization includes mobilization of the Contractor and the subcontractors.

3.3.2 Design Assumptions

3.3.2.1 Contractor and Subcontractor Mobilization

Initial mobilization will consist of the following, as needed:

- Constructing temporary facilities such as existing office space or field trailers, utilities, material storage facilities, security fencing, and equipment decontamination facilities
- Grading and placing gravel at storage, laydown, and staging areas
- Delivering equipment
- Placing erosion and sediment control features for staging areas, such as silt fencing

The appropriate subcontractors (e.g., temporary facilities, earthwork) will mobilize to the site. The Landscaping and Surveying Subcontractors are expected to be local, but may require office and laydown areas closer to the target area. Equipment to be used by subcontractors is expected to be transported by road.

The office space and temporary utilities will be active for the duration of the project.

The costs associated with these design assumption are presented in Appendix B, Bid Items 10004010, 10004030, and 10004040.

3.3.2.2 Site Security and Coordination

Security coverage to monitor site equipment and staging areas will occur during non-working hours. During working hours, the Earthwork Subcontractor will maintain control over its work areas. Security services will be active through the duration of each construction season of the project. If sections of fencing are removed at residential properties to facilitate remediation activities, the opening(s) will be secured at the end of work each day to provide an equivalent level of protection during non-working hours. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10004020.

3.4 Site Preparation

3.4.1 Description of Work

Site preparation activities specific to the remedial actions at residential properties include delineating excavation limits, locating underground utilities, surveying properties, installing erosion and sediment control measures, and performing fence and debris removal and tree and shrub removal.

3.4.2 Design Assumptions

The property assessment will consist of completing a Pre-construction Property Assessment Checklist with the property owner to document the existing internal and external conditions and capturing digital photographs or video recording. It is assumed that each property will take approximately 2 hours each for one Contractor and one Earthwork Subcontractor personnel to complete the assessment.

A copy of the Pre-construction Property Assessment Checklist along with a copy of the property-specific improvement drawing will be provided to each property owner before remediation begins. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30003010.

3.4.2.1 Initial Property Visit

The Earthwork Subcontractor, together with the Contractor, will perform an initial property visit to all properties where an access agreement was obtained or where the property owner expressed a willingness to sign an agreement. During this site visit, the base sketch will be used and expanded upon. The location and types of different structures (for example, swings set, patio, etc.) will be recorded in an inventory. The property owner will be

interviewed to determine if there are any plants that they do not want removed, hereto referred to as legacy plants. If plants are located in the excavation area, as confirmed during the initial property visit and supplemental sampling, the Landscaping Subcontractor will perform a separate property visit, identify the plants, and complete a plant inventory before the second property visit. For the cost estimate, it was estimated that 250 hours will be required for the Landscaping Subcontractor to assist in plant identification.

During the initial property visit, sampling will be performed using XRF or soil samples for laboratory analysis to analyze surface soil for arsenic in boulevards, under tree driplines, and around legacy plants identified by the property owner to determine if excavation is required in these areas. These areas will be identified on the property sketch. As discussed in the *XRF Correlation Study for Arsenic Results* (CH2M HILL, 2009), the 95 percent confidence interval for the XRF around a laboratory arsenic concentration of 25 mg/kg is 8 mg/kg (95LCL) to 44 mg/kg (95UCL). If XRF screening results are within the range of 8 mg/kg to 44 mg/kg, samples would be collected during initial property visits and submitted for laboratory analysis. It is estimated that 25 percent of the properties will have two samples submitted for laboratory analysis for arsenic where XRF measurements are uncertain.

Utilities will be marked prior to the initial site visit, if possible, for inclusion in the property sketch. The property owner will be interviewed, and the tenant, if applicable, to determine if there are any undocumented or private utilities, such as irrigations systems or shallow electrical lines to a garage, on the property.

Photographs of the interior basement walls, exterior foundation walls, and yards shall be taken in order to document the pre-construction conditions. If access is not allowed to photograph the basement, the property owner will be asked to sign a waiver. Attempts will be made to contact the neighboring property owners and document the condition of the neighboring properties as well.

During the initial property visit, the Contractor will also discuss with the property owner and resident the risks that are present during construction activities and the need to stay inside the residence or otherwise away from the construction during working hours.

3.4.2.2 Second Property Visit

A second property visit shall be performed at least one week before construction activities begin. During this visit, the sketch, made during the first site visit and converted into AutoCAD or a similar electronic format, will be confirmed with the current property owner. Any supplemental sampling results will be incorporated for determination of the excavation limits shown on the property sketch. The property sketch will include information on protection of plants or items within or near the excavation limits. The Earthwork Subcontractor will propose the means for access to the remediation areas, including removal of fencing sections or relocation of items.

The property inventories will also be confirmed and the current property owner will be given a copy of the photo documentation taken during the initial property visit. The property owner, the Contractor, and the Earthwork Subcontractor will all sign the property agreement and the final sketch.

3.4.2.3 Preconstruction Survey

The site will be surveyed to document preconstruction elevations at residential properties. The survey will be performed by the Surveying Subcontractor. The preconstruction survey will document preconstruction elevations and grade on the property. To the extent practicable, the property will be restored to the preconstruction elevation and grade unless otherwise discussed with the property owner. The property boundaries will also be verified during the preconstruction survey to confirm that the extents of the excavation are within property boundaries. One hour for a survey crew is estimated for each preconstruction survey. The deliverable shall provide coordinates with elevations for use in determining minimum post-excavation elevations (that is, 1 foot minus 0.0 to plus 0.1 foot). The costs associated with these design assumptions are presented in Appendix B, Bid Item 30002010.

3.4.2.4 Excavation Limits

The excavation limits will be determined by property features and identified arsenic concentrations. Excavation will not occur under the building footprint, garage footprint, paved areas, or other impervious surfaces and permanent structures. Impervious surfaces on a residential parcel are assumed to include the residential building, garage, driveway and sidewalks, and patios and concrete pathways, where present. In yards where arsenic concentrations exceed the RGs, the excavation limit will be located a maximum of 1 foot from impervious structures.

The current understanding of excavation limits are shown on property sketches developed using field sketches created during sampling activities, aerial photography, and parcel information available from the City of Minneapolis and Hennepin County. The boundaries of yards requiring remediation were based on sample locations and property features such as property limits, fence lines, structures, retaining walls, and sidewalks. Excavation limits were assumed to extend to the sidewalks and alleys (where present) even if these extended into a city right-of-way. Excavation limits did not extend across property boundaries if it would extend onto a private property. Where fencing is present, the fenceline will generally be used to define the boundaries as appropriate. Fencing will not be removed except as required to access the construction areas. Excavation boundaries will be evaluated on a property-specific basis with consideration for property boundaries, fencing, or other site features.

For estimation of total excavation areas, the assumptions described above were used with the arsenic results for the property to delineate the appropriate areas of the yards. A summary of excavation areas by property is included in Appendix A with property sketches. The calculated total area of 904,000 ft² was divided by 487, the known number of properties requiring remedial actions, to determine an average area per property of 1,856 ft².

The XRF may be used to analyze for arsenic in boulevards, within tree driplines, and in areas around legacy plants to determine if excavation is necessary within these subareas. The lower confidence interval for the XRF is 8 mg/kg to screen for the surface soil concentration of 25 mg/kg. XRF screening results below 8 mg/kg would not require excavation and XRF screening results above 44 mg/kg would require excavation. If XRF screening results are within the confidence interval of 8 mg/kg to 44 mg/kg, samples could be collected and submitted for laboratory analysis to verify if excavation is required within distinct areas of concern.

The actual excavation limits will be refined as appropriate during preconstruction property visits with the property owner. The excavation limits will be marked by the Contractor (staff level engineer) to delineate the excavation area (front yard, back yard, side yard) at each property as identified on the property sketch and agreed to with the property owner. Vegetation that will be removed will be inventoried and marked at each property.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 10005010.

3.4.2.5 Utility Locate

A third-party utility locate will not be subcontracted. It is assumed that Gopher State One-Call will be used to locate utilities at each property and that Gopher State One-Call can accommodate the required high volume of properties to receive utility locates. The Earthwork Subcontractor will be responsible for requesting the utility locate through Gopher State One-Call's online electronic ticketing system. It is assumed that two utility locates will be performed at each property. The first locate will be performed prior to the initial property visit so the utilities can be marked on the property sketch. The second utility locate will be performed prior to the start of the construction activities. The Earthwork Subcontractor will provide the Contractor with documentation from the online ticketing system to document that the utilities are cleared prior to beginning construction at the property. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10005010.

3.4.2.6 Property Protection

The Earthwork Subcontractor will install protective measures around trees within or near the excavation limits if the trees are to remain but are located in an area where they would be susceptible to damage. The Earthwork Subcontractor will establish and maintain two points of continuous access for residents and property owners when possible with one point of continuous access at all times. If it is necessary to restrict access for periods of time, it will be necessary to coordinate the work to be done at a time when the property owner and resident will not be present at the property. Access to the property shall not be restricted between the hours of 5:00 PM and 8:00 AM.

3.4.2.7 Fence Removal

During preparation of property sketches, fencing was identified if present at the yard, and if so, the type of fencing present (that is, chain-link, wood, wrought iron). It is estimated that 10 feet of fencing will be removed at each property where fencing is present to allow access for construction activities. The Earthwork Subcontractor will determine access to soil excavation areas on a property by property basis. Existing site features at some locations may limit access. It is assumed that fence removal and storage may need to be completed at each property to gain access to the area requiring remediation. Proposed access will be shown on the property sketch for discussion and approval by the Contractor and property owner during preconstruction property visits. The costs associated with these design assumption are presented in Appendix B, Bid Item 30004020.

3.4.2.8 Clearing and Grubbing

Access to soil excavation areas may be further limited by debris, trees, or shrubs.

Clearing and grubbing will include removal of debris, shrubs and brush, and trees less than 4 inches in diameter at breast height; felling and removal of dead trees, partially dead trees and limbs, and trees and limbs that pose a safety hazard to workers; and removal or grinding of stumps and roots. It is assumed that 1 tree, 6 shrubs, and 20 perennials will be removed per property. A tree service licensed in the City of Minneapolis is required for removal of trees larger than 2 inches in diameter. It is estimated that trees less than 2 inches in diameter will be removed by the Earthwork Subcontractor as part of the clearing and grubbing. The Earthwork Subcontractor will retain a tree service for removal of large trees where necessary. It is estimated the tree service will be required to remove 20 large trees.

The Contractor and Earthwork Subcontractor will work with the property owner if larger items or significant quantities of debris need to be relocated or removed. Debris and cleared plant materials will be segregated as necessary and transported to a designated disposal facility, which will be operated by others. Tree stumps and roots required to be removed are considered contaminated and will be mulched and disposed of with the soil by the Earthwork Subcontractor.

Trucks will be required to tarp, cover, or enclose loads destined for offsite disposal. Dust abatement measures will be taken during transportation operations. According to Minnesota Rule 7011.0150, reasonable control measures may include, but are not limited to, the frequent clearing of roads and applying water. Acceptable performance for dust abatement is a maximum annual particulate matter concentration of 75 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and a mean concentration of 60 $\mu\text{g}/\text{m}^3$ according to the Minnesota Rule 7009.0080. Street cleaning is assumed to be performed with equipment that will capture debris after sweeping, using either mechanical methods or vacuum, to minimize fugitive dust emissions.

The costs associated with these design assumption are presented in Appendix B, Bid Item 30004020.

3.4.2.9 Erosion Control

Erosion control measures will be implemented by the Earthwork Subcontractor for staging areas and residential properties during active construction activities. Erosion control measures at the staging and storage areas may include silt fencing, inlet protection, and appropriate best management practices at the construction site entrance and exit. The Earthwork Subcontractor will install, maintain, and remove the erosion control measures for each construction season.

Erosion control measures at residential properties may consist of inlet protection, silt fencing, tackifier and hydromulch, erosion control blanket, and best management practices. The Earthwork Subcontractor will be responsible for installing the appropriate erosion control measures prior to beginning ground disturbing activities at a residential property and maintaining them during the earthwork activities at the property. The Landscaping Subcontractor will be responsible for the application of tackifier and hydromulch with the hydroseeding activities and installation of erosion control blanket after seeding, as necessary. The use of silt fence at the residential properties is not the preferred erosion control measure due to maintenance requirements, but will be used if necessary. Silt fence will be installed by the Earthwork Subcontractor where there is a slope of 1V:5H or greater.

The silt fence will be removed by the Landscaping Subcontractor during hydroseeding and hydromulching activities. Erosion control measures used that require removal, such as inlet protection, will be removed by the Earthwork Subcontractor post-construction after the establishment of a satisfactory 70 percent stand of grass and final street cleaning.

Erosion control at the staging and storage areas and the residential properties will be performed in accordance with the Stormwater Management Plan drafted by CH2M HILL in discussion with the City of Minneapolis and Minnehaha Creek Watershed District and finalized and submitted by the Earthwork Subcontractor.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005030.

3.5 Excavation, Transportation, and Disposal

3.5.1 Description of Work

Excavation, transportation, and disposal activities will be performed by the Earthwork Subcontractor. Excavation activities include mechanical and manual soil excavation.

3.5.2 Design Assumptions

3.5.2.1 Excavation of Soil

For estimation of quantities, it is assumed soil will be excavated to 12 inches bgs in the yards and 18 inches bgs in garden areas where the surface soil concentrations exceed the RG of 25 mg/kg. Once this depth is achieved, the soil will be screened using the XRF to determine if the subsurface arsenic concentration is below 95 mg/kg. Using XRF to screen soils for arsenic concentrations above 95 mg/kg, the 95 percent lower confidence limit (LCL) of 62 mg/kg was determined from the initial phase of the remedial design investigation, unless additional data is available and the confidence interval is refined. If the XRF screening indicates arsenic concentration is less than 62 mg/kg, the excavation is complete. If not, the soil will be excavated further, taking readings every foot until concentrations are below the XRF screening level of 62 mg/kg or to a maximum depth of 10 feet bgs.

If the arsenic concentration is above 95 mg/kg, as determined by the XRF 95LCL of 62 mg/kg, but the excavation cannot continue without causing potential property damage or health and safety risks, a demarcation fabric will be placed in the base of the excavation to prevent contact with soils. On top of the demarcation fabric, a detectable high visibility red underground marking tape, 4 inches wide, labeled "POTENTIAL DANGER OF ARSENIC CONTAMINATION BELOW" will be placed on 3-foot centers. For estimation of quantities, it was assumed that 2,500 ft² of demarcation fabric will be required. This is based on an assumed 10 percent of the total area remaining with concentrations exceeding 95 mg/kg.

Using the vertical profiling results from the investigation performed in 2008, an excavation depth of 2 feet was assumed for properties where access was denied for removal or where removal actions have identified subsurface soil concentrations exceeding 95 mg/kg. However, XRF screening will be used to determine the lower extent of the excavation. If the

desired arsenic concentration is not reached, then a demarcation fabric shall be placed at the bottom of the excavation to identify the potential soil hazards below 10 feet.

The volume of soil requiring excavation at each property was calculated by multiplying the area requiring remediation by the assumed excavation depth. A 6-foot radius was assumed for trees within excavation areas. Soil will be hand excavated to a depth of 6 inches under tree driplines to protect shallow root systems. An excavation depth of 12 inches bgs is assumed where the surface soil investigation result was greater than 25 mg/kg. Gardens, identified from field property sketches and aerial photography, are assumed to require remediation to a depth of 18 inches bgs. Where the post-excavation sample result is greater than 95 mg/kg, the area requiring remediation was multiplied by an assumed depth of 2 feet. The estimated average in-place volume of soil requiring excavation per property was calculated by dividing the total excavation volume by the number of properties for an average volume of 67 yd³. To calculate the average tonnage of soil per property for transport and disposal, the soil volume was multiplied by an assumed factor of 1.6 tons per cubic yard for an estimated 107 tons of excavated soil per property.

Mechanical excavation will be used where possible. Hand excavation will be performed underneath the drip line of mature trees, near legacy plants, around utility lines, around fences that have not been removed, and areas of limited access. The Contractor will retain the services of an arborist to consult on an as-needed basis when working around the trees. A total of 100 hours were estimated for an arborist.

Excavated soil may be loaded directly into trucks for transport, but the means and methods used will be proposed by the Earthwork Subcontractor for approval. Soil excavation will be performed a maximum of 1 foot away from structures and fences, plus an excavation at a 1:1 slope away from the structure or fence. Vertical excavation limits shall be performed to within minus 0.00 foot and plus 0.10 foot. Horizontal excavation limits shall be performed to within minus 0.00 foot to plus 0.10 foot.

The excavations will be covered on a daily basis as practicable. However, if standing water is observed in an open excavation, the standing water will be containerized and sampled for arsenic to determine the disposal requirements. It is estimated that up to 30,000 gallons of stormwater will be handled. Up to 20 stormwater samples will be collected and analyzed for arsenic. Samples that show acceptable levels of arsenic will be discharged to the storm sewer with approval from appropriate agencies; otherwise, the stormwater will have to be taken offsite and treated. It is estimated that 5,000 gallons of stormwater will require treatment. The sampling and handling requirements for stormwater will be detailed in the proposed Stormwater Management Plan. It is expected that containerization and sampling will be required during the first construction season, or portion thereof. If it can be demonstrated that the arsenic is only present at concentrations acceptable for discharge to the stormwater sewer or primarily adsorbed to suspended soil particles, alternate methods for handling of the water will be proposed.

The Contractor will visually monitor properties under remediation for multiple wind directions. Air monitoring will be conducted at each property while earthwork is being performed. Samples will be collected at a frequency of two samples per property. Activities may include a “stop work” order until dust abatement measures are implemented. Water application is the most common abatement measure. Acceptable performance for dust

abatement is a maximum annual particulate matter concentration of 75 $\mu\text{g}/\text{m}^3$ and a mean concentration of 60 $\mu\text{g}/\text{m}^3$ according to the Minnesota Rule 7009.0080.

Traffic control will be used as needed during earthwork activities. A visual barrier, such as high visibility fencing, will be placed around each excavation area to prevent accidental entry to the work site area if the area is to be left unattended. High visibility fencing will be reused at multiple properties. Signage will also be posted at the properties during earthwork activities with contact information for the Contractor in case of questions or concerns.

Excavation activities are based on a 40-hour work week. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30004030.

3.5.2.2 Transportation and Disposal of Excavated Soil

Excavated soils and materials will be transported to a designated disposal facility operated by others. Trucks will be required to tarp, cover, or enclose loads of contaminated and uncontaminated material destined for offsite disposal. The Earthwork Subcontractor will subcontract directly with the disposal facility.

For purposes of cost estimating, it is assumed that the excavated soils will be loaded at the property onto 12-ton dump trucks or comparable and transported from the properties to the staging area by the Earthwork Subcontractor. At the staging area, the excavated soil will be loaded onto larger trucks for transport to the disposal facility. This will allow trucks to be loaded more easily with a smaller excavator or skid steer loader that would be used on the properties. The Earthwork Subcontractor shall propose the means and methods for handling the materials for approval.

Dust abatement will be performed during transportation operations. Activities may include a work stoppage until dust abatement measures are implemented. Frequent cleaning of the roads and application of water are anticipated abatement measures. Given the site setting, transport is anticipated to be limited to paved roads used by the subcontractor to transport contaminated soils to the facility and return to the properties being remediated. Acceptable performance for dust abatement is a maximum annual particulate matter concentration of 75 $\mu\text{g}/\text{m}^3$ and a mean concentration of 60 $\mu\text{g}/\text{m}^3$ according to the Minnesota Rule 7009.0080. Street cleaning is assumed to use equipment that will capture debris after sweeping, using either mechanical methods or vacuum, to minimize fugitive dust emissions. To minimize spillage of excavated soil onto the roads, it is assumed that plastic sheeting or tarps will be placed under trucks during loading activities.

The soil quantity that will be transported offsite, and disposed of, is equal to the soil excavated. Therefore, the estimated soil quantity that will be transported offsite and disposed of per property is 107 tons. Soil destined for disposal is assumed to be nonhazardous. Soil has not been found to be characteristically hazardous during previous removal actions. The removal actions addressed yards with higher arsenic concentrations, so it is assumed that the soils excavated during the RA will not be characteristically hazardous. Alternatives will be evaluated for beneficial reuse of excavated soil as allowed under the applicable regulations.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30004040.

3.5.2.3 Waste Characterization of Soil for Disposal

Waste characterization samples will be collected from excavated soil. It is estimated that one soil sample will be collected and analyzed for every 500 tons of soil excavated and will be submitted for toxicity characteristic leaching procedure (TCLP) analysis. The actual sampling frequency will be determined by the requirements of the selected disposal facility. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30004035.

3.6 Post-Excavation Survey

3.6.1 Description of Work

The post-excavation survey will document the limits of the excavation for calculation of the excavation volumes and documentation of the lower extent of excavation.

3.6.2 Design Assumptions

When the Contractor has indicated the lower extent of the excavation has been reached based on XRF screening results, the Surveying Subcontractor will perform a post-excavation survey. The post-excavation survey will document the limits of the excavation for calculation of the excavation volumes and documentation of the lower extent of excavation.

One hour for a survey crew is estimated for each post-excavation survey. The Surveying Subcontractor will provide the Contractor with the survey deliverables in electronic format. The deliverable shall provide coordinates with elevations for use in determining excavation quantities and verifying tolerances (that is, 1 foot minus 0.0 to plus 0.1 foot). The costs associated with these design assumption are presented in Appendix B, Bid Item 30002010.

3.7 Filling and Compaction

3.7.1 Description of Work

Filling and compaction activities will be conducted after excavation activities are complete. Activities include placement and compaction of general fill and placement of topsoil.

3.7.2 Design Assumptions

3.7.2.1 General Fill Backfilled per Property

Samples will be collected from the borrow source for target compound list (TCL) organics and target analyte list (TAL) metals analysis upon identification of the potential source(s). Borrow sources will be required to meet Tier 1 Residential Soil Reference Value (SRV) criteria (12/08 Version or current) for the borrow to be approved for use. As noted, the Contractor will approve fill borrow sources. One TCL organics and TAL metals sample will be collected per 1,000 yd³ of fill material during construction to verify continued compliance with the Tier I Residential SRV criteria. It is assumed that the Contractor will collect and submit the samples

to the Analytical Subcontractor to perform the analyses of the fill material. The samples will be tracked to allow for corrective action to be performed, if necessary, and to provide the backfill analysis results to the property owner as a part of the closure package.

The Earthwork Subcontractor will transport, place, and compact the borrow materials. Dust abatement will be performed during transportation and backfilling operations. Abatement may include a stop work order until dust abatement measures are implemented. Dust abatement measures will include unpaved roads used by the subcontractor to transport borrow materials to the properties being remediated. Acceptable performance for dust abatement is a maximum annual particulate matter concentration of $75 \mu\text{g}/\text{m}^3$ and a mean concentration of $60 \mu\text{g}/\text{m}^3$ according to the Minnesota Rule 7009.0080

General fill will be placed in a 6-inch compacted lift, with compaction to 90 percent of standard Proctor maximum density (American Society of Testing and Materials [ASTM] D698). A geotechnical testing firm will be retained by the Contractor for periodic testing of compaction during backfilling activities. With the exception of gardens and planting beds, excavations that are 1 foot or deeper will have imported general fill material placed in 6-inch compacted lifts from the base of the excavation to 6 inches bgs. General fill will not be placed under tree driplines where excavation was limited to 6 inches deep for protection of shallow root systems. General fill will not be placed within the upper 18 inches in gardens or 1 foot in planting beds. Trees, gardens, and planting beds were identified from field property sketches and aerial photography, as possible, and will be revised, as appropriate, during preconstruction meetings with the property owner.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005010.

3.7.2.2 Topsoil Backfilled per Property

Samples will be collected from the borrow source for TCL organics and TAL metals analysis in addition to nutrient analyses upon identification of the potential source(s). Borrow sources will be required to meet Tier 1 Residential SRV criteria (12/08 Version or current) for the borrow to be approved. The Contractor will approve topsoil borrow sources. During construction activities, one TCL organics and TAL metals sample will be collected per $1,000 \text{ yd}^3$ to verify continued compliance with the Tier I Residential SRV criteria. It is assumed that the Contractor will collect the samples and the Analytical Subcontractor will perform the analyses of the topsoil. The samples will be tracked to allow for corrective action to be performed if necessary and to provide the topsoil analysis results to the property owner as a part of the closure package.

The Earthwork Subcontractor will transport and place the topsoil. Dust abatement will be performed during transportation operations. Abatement may include work stoppage periods until dust abatement measures are implemented. Acceptable performance for dust abatement is a maximum annual particulate matter concentration of $75 \mu\text{g}/\text{m}^3$ and a mean concentration of $60 \mu\text{g}/\text{m}^3$ according to the Minnesota Rule 7009.0080.

Properties will be restored to preconstruction conditions to the extent practicable. Drainage will be away from structure's foundations. If the drainage or elevation is a change from the preconstruction conditions, this will be discussed with the property owner. The final restored grade will be within plus or minus 0.10 foot of the original grade when possible.

Within grassed areas, including under trees, 6 inches of topsoil will be placed. Premium grade topsoil will be used to backfill gardens and planting beds. Topsoil will be compacted to between 80 percent and 85 percent of standard Proctor maximum density. Within grassed areas, the Landscape Subcontractor will prep the top 3 inches of topsoil prior to hydroseeding.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005020.

3.8 Post-construction Survey

3.8.1 Description of Work

The site will be surveyed to verify positive grading at each residential property and to document the final restored grade.

3.8.2 Design Assumptions

It is assumed that one hour will be required for a survey crew at each residential property. The Surveying Subcontractor will provide the Contractor with the survey deliverables in electronic format. The deliverable shall provide coordinates with elevations for use in determining backfill quantities and verifying tolerances (plus or minus 0.10 foot) and restored grade. The costs associated with these design assumption are presented in Appendix B, Bid Item 30002010.

3.9 Restoration

3.9.1 Description of Work

Restoration work includes contingencies for fence replacement, sidewalk and asphalt repair, utility repair, and final street cleaning.

3.9.2 Design Assumptions

3.9.2.1 Contingencies

Contingencies will be established for the repair or replacement of items that may become damaged during the remedial action activities. The following contingency items are included as part of the design:

- Damaged concrete sidewalks will be repaired using sand, gravel, slurry concrete (2,000 pounds per square inch [psi]), and concrete (3,500 psi), per property. It is not believed that concrete repair will be required at each property, but for the purposes of the estimate, 10 ft² of concrete were estimated per property. Public sidewalks will be repaired to the City of Minneapolis specifications. Private sidewalks will be repaired using similar construction as that of the surrounding sidewalk or to an equivalent or better condition.

- Removed fence sections will be relocated and stored for reinstallation. The fence sections that are removed and are not usable will be replaced with new fence sections of the same type and finish. The replacement fence section will be tied in to the existing fence section, as applicable. It is assumed that 10 percent of the fencing removed will need to be replaced with new fencing sections. The Earthwork Subcontractor will provide samples of new materials for approval to verify the match with the existing materials.
- Sprinkler systems, electrical, piping, and plumbing located within or near the limits of excavation will be inspected and tested, as appropriate, to determine if damage occurred during the remediation. Repairs will be made by appropriately qualified and licensed subcontractors as applicable. Costs to repair damages will be borne by the Earthwork Subcontractor if they were the result of negligence, such as insufficient clearances or lack of or insufficient protection around the property.
- Other items damaged while in storage or in transit will be repaired or replaced as necessary. Photographic and video documentation from the preconstruction meetings with the property owner will be used to document the condition of the property prior to removal from the property.

Repairs will be performed according to manufacturer's instructions and applicable building codes. Unforeseen conditions encountered during excavation will be addressed on a site-specific basis. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005050.

3.9.2.2 Street Cleaning

The Earthwork Subcontractor will perform street cleaning daily from the time clearing and grubbing is initiated until the Landscape Subcontractor has completed hydroseeding and installation of an erosion control blanket, as needed. Additional street cleaning will be performed by the Earthwork Subcontractor as directed by the Contractor, and final street cleaning will be conducted prior to the removal of the erosion control measures, such as inlet protection. Street cleaning is assumed to use equipment that will capture debris after sweeping, using either mechanical methods or vacuum, to minimize fugitive dust emissions.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005050.

3.10 Landscaping and Maintenance

3.10.1 Description of Work

Landscaping and maintenance includes seeding for turf and grasses; replacing trees, shrubs, and perennials removed during remedial actions; fertilizing; and watering. The Landscaping Subcontractor will guarantee the shrubs and replacement trees for 1 year. If the replacement plants die within 1 year of planting, they will be replaced by the Landscaping Subcontractor. If existing trees die during the remedial action within 1 year where hand-digging was performed under the drip-line, the trees will be removed and replacement trees planted.

3.10.2 Design Assumptions

3.10.2.1 Seeding

Hydroseeding will be performed to sow the grass seed. The use of hydroseeding allows for shorter germination time, reduces weed competition with the more rapid establishment of grass and elimination of weeds that may be present in straw, and provides erosion control.

Grassed areas within each property were identified using the property sketches. The quantities are shown in the property sketches and summary table in Appendix A. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005030.

3.10.2.2 Erosion Control Blanket

The properties within the site generally have flat topography near the house and in the backyard. However, the properties often have a slope adjacent to the public sidewalk which is assumed to have a slope between 1V:3H and 1V:2H that requires the use of an erosion control blanket. The properties with a slope adjacent to the sidewalk were identified during the development of property sketches. The length of the slope was measured from the property sketches to estimate the required quantity of erosion control blanket. The quantities are shown in the property sketches and summary table in Appendix A. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005030.

3.10.2.3 Tree, Shrub, and Perennial Replacement

For estimating purposes, it is assumed that 1 tree, 6 shrubs, and 20 perennials will be replaced per property as described below:

- Trees that are less than 4 inches in diameter at breast height will be removed and replaced with a 2-inch-diameter tree of similar species as practicable. Tree species that are at risk due to current or anticipated diseases or infestations in the foreseeable future (that is, Dutch Elm disease or Emerald Ash tree borer) will not be replaced with the same species.
- Shrubs shall be replaced with the similar species, quantity, and size (if possible) that were removed.
- Perennial plants shall be replaced with the similar quantity and species removed.
- Due to the fact that annuals achieve their growth cycle in one year, they shall not be replaced during site restoration activities.
- Mature trees that die during the RA as a result of the construction activities will be replaced with a 2-inch-diameter tree of the same species as practicable.

Plant materials will be replaced with species readily available at local nurseries. If it is necessary to remove species that are not locally readily available, the Contractor will work with the property owner to identify acceptable plant materials that are readily available at local nurseries. The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005040.

3.10.2.4 Fertilizing and Watering Services

Watering and fertilizing services will be provided for turf and grasses, shrubs, trees, and perennials at each property for a maintenance period of 6 weeks. The watering will also be performed during this period around mature trees where hand excavation was performed within the tree drip-line or where equipment traffic may have damaged shallow roots.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005030.

3.10.2.5 Erosion Control

The Landscape Subcontractor will be responsible for the erosion control measures applied when hydroseeding, such as tackifier and hydromulch, and an erosion control blanket is installed where necessary after seeding. The erosion control blanket will be required where the slope exceeds 1V:3H.

Erosion control measures that may be used and require removal, such as inlet protection, will be removed by the Earthwork Subcontractor after the grass has been established to a satisfactory 70 percent stand of grass and final street cleaning. Silt fence will be installed by the Earthwork Subcontractor where there is a slope greater than 1V:5H within the excavation area. The silt fence will be removed by the Landscaping Subcontractor during hydroseeding and hydromulching activities. Erosion control will be performed in accordance with the Stormwater Management Plan drafted by CH2M HILL after discussion with the City of Minneapolis and Minnehaha Creek Watershed District and finalized and submitted by the Earthwork Subcontractor.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30005050.

3.11 Post-Construction Meeting

3.11.1 Description of Work

A post-construction meeting will be performed and property-specific documentation executed. The Contractor will prepare a *Remedial Action Completion Report* and an *Ambient Air Monitoring Report*.

3.11.2 Design Assumptions

3.11.2.1 Post-Construction Meeting and Property-Specific Documentation

A post-construction meeting will be conducted with each property owner within 3 work days of completing the restoration or landscape maintenance period to identify deficiencies. The Contractor will create a punch list of deficiencies for each property within 24 hours of the site inspection and forward it to the applicable subcontractor(s). The subcontractor(s) will correct the items on each punch list within 7 work days of receipt of the punch list.

The property owner and resident, if applicable, will also be asked to evaluate the performance of the subcontractors. Photographs and/or video of the restored work areas will be obtained during the meeting to document the post-construction condition.

After the completion of the punch list work, an EPA representative and the Contractor will meet with the property owner to perform a final inspection. Final inspections will be scheduled on predetermined days each month during construction to facilitate coordination of multiple final inspections at a time. At this time, the current property owner will be asked to sign off that their property has been restored to the condition agreed to during the second property visit prior to construction activities. If the property owner is unwilling to sign off at the final inspection, arrangements will need to be made to obtain sign off at the end of the one-year warranty period.

The costs associated with these design assumptions are presented in Appendix B, Bid Item 30006010.

3.12 Demobilization

3.12.1 Description of Work

Demobilization pertains to both the Contractor and the subcontractors. Similar to mobilization, demobilization will be conducted separately for each phase of the RA.

3.12.2 Design Assumptions

Demobilization will be consistent with design assumptions for mobilization. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10004010.

3.13 Post-Construction Documentation

3.13.1 Remedial Action Completion Report

The Contractor will prepare a *Remedial Action Completion Report*. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10001020.

3.13.2 Ambient Air Monitoring Report

The Contractor will prepare an *Ambient Air Monitoring Report*. The costs associated with these design assumptions are presented in Appendix B, Bid Item 10001030.

Compliance with ARARs

4.1 Applicable or Relevant and Appropriate Requirements

The statutes and regulations listed in Table 4-1 contain requirements deemed to be applicable or relevant and appropriate requirements (ARARs) at the SMRSCS site. Table 4-1 is organized by the two types of ARARs: federal action-specific and state action-specific.

TABLE 4-1
Potential ARARs
South Minneapolis Residential Soil Contamination Site

Requirement	Requirement Synopsis
Action-Specific ARARs	
Federal	
Resource Conservation and Recovery Act (RCRA) (42 United States Code [USC] 321 et seq.)	<p>RCRA was passed in 1976. It amended the Solid Waste Disposal Act by including provisions for hazardous waste management. The goals of RCRA are to promote conservation of natural resources while protecting human health and the environment. The statute sets out to control the management of hazardous waste from inception to ultimate disposal. RCRA is also linked closely with Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the CERCLA list of hazardous substances includes RCRA hazardous wastes.</p> <p>The Act applies to remedies that generate hazardous waste. Soils are required to be managed as hazardous waste if they contain listed hazardous waste or have the characteristics of hazardous waste. The Act may apply and will be adhered to if future remedies generate waste that can be classified as hazardous.</p>
Hazardous Materials Transportation Act (49 USC 1801 et seq.; 40 CFR 262.20 – 23 and 40 CFR 262.30 – 32)	<p>The Act provides regulations governing the transportation of hazardous materials and hazardous waste. The regulations include recordkeeping and reporting requirements, labeling and packaging requirements, and detailed handling requirements for each mode of transport (rail, air, waterway, or road).</p> <p>Remedial alternatives involving transport of hazardous materials are not anticipated. Contaminated soils or wastes that are excavated for offsite disposal would, however, be tested for hazardous waste characteristics, and if soil or waste is found to be hazardous waste, the requirements of this act would be followed.</p>
Clean Air Act (42 USC 7401 et seq.)	<p>The Act is intended to protect the quality of air and promote public health. Title I of the Act directed USEPA to publish national ambient air quality standards for “criteria pollutants.” In addition, USEPA has provided national emission standards for hazardous air pollutants under Title III of the Act. Hazardous air pollutants are also designated hazardous substances under CERCLA.</p> <p>The Clean Air Act amendments of 1990 greatly expanded the role of National Emission Standards for Hazardous Air Pollutants by designating 179 new hazardous air pollutants and directed USEPA to attain maximum achievable control technology standards for emission sources. Such emission standards are potential ARARs if selected remedial technologies produce air emissions of regulated hazardous air pollutants.</p> <p>The Act is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust. No chemical-specific standards exist for arsenic.</p>

TABLE 4-1
Potential ARARs
South Minneapolis Residential Soil Contamination Site

Requirement	Requirement Synopsis
Clean Water Act (33 USC 1251 et seq.)	<p>The Act was passed in 1977. It is a major amendment of the original 1972 Federal Water Pollution Control Act. Its chief purpose is to restore and maintain surface water quality by controlling discharges of chemicals (priority toxic pollutants) to surface water. The act is closely linked to CERCLA: all 126 priority toxic pollutants under the act are CERCLA hazardous substances. Direct and indirect discharges of priority pollutants to surface water are regulated through the National Pollutant Discharge Elimination System (NPDES). The NPDES program also includes ambient water quality standards and antidegradation policy standards.</p> <p>The Act is considered an ARAR for remedies involving construction activities that have the potential to affect surface water, such as excavation. Although there are no surface water bodies within the SMRSCS, there is a potential for runoff from excavation areas to enter storm sewers which would ultimately discharge to a surface water body. This Act is considered an ARAR.</p>
State	
Hazardous Waste (Minnesota Rules Chapter 7045 and 8870)	This law applies to remedies that involve offsite disposal of materials typically involved with excavations. Remedial alternatives involving transport of hazardous materials are not anticipated. Contaminated soils or wastes that are excavated for offsite disposal would be tested for hazardous waste characteristics and, if soil or waste is found to be hazardous waste, the requirements of the rules would be followed.
Transport and Disposal (Minnesota Rules Chapter 7001)	Substantive permit requirements will be met for the storage, treatment, or disposal of solid waste or hazardous waste.
Solid Waste (Minnesota Rules Chapter 7035)	This law is applicable to remedies that involve the offsite disposal of non-hazardous materials. The rules include characterization, transport, and reporting requirements in addition to criteria for beneficial use of solid waste. Contaminated soils removed during remedial alternatives are expected to be managed as solid waste since they are not anticipated to be hazardous.
Ground Water Protection Act (Minnesota Stat. Ch. 103H) and Underground Waters (Minnesota Rules Chapter 7060)	These requirements are considered ARARs to prevent the degradation of groundwater and promote the use of best management practices.
Minnesota Pollution Control Agency (Minnesota Statute § 116)	The Statutes are considered ARARs for remedies that involve creation of air emissions, such as excavation activities that have the potential to create dust.
Minnesota Environmental Response And Liability Act (Minnesota Statute §§ 115B.01-0.241)	This Act is to be considered for any release or threatened release of a hazardous substance occurring on or after July 1, 1983, including any release which began before July 1, 1983, and continued after that date.
Air Quality Rules and Emissions (Minnesota Statute § 116.061) and (Minnesota Rules Chapters 7005, 7007, 7009, 7017)	These regulations provide the air quality rules and the requirements for notification and abatement of excessive or abnormal unpermitted air emissions. These regulations are applicable in connection with activities that disturb soil or excavation during remedial activities and may result in emission of particulate matter.

4.2 Minimizing Public and Environmental Impacts

Environmental and public health and welfare impacts will be minimized through the following methods:

- Site access control
- Construction Plan
- Stormwater Management Plan
- Transportation of contaminated and backfill materials
- Compliance with permits/codes

4.2.1 Site Access Control

Access control to the site during construction is necessary to prevent exposure of trespassers to contaminated soil and open excavations. Access will be controlled by installing fencing around work areas. The Earthwork Subcontractor will retain site security services to provide security at the staging and storage area(s) during nonworking hours. Typical working hours for construction activities will be 8:00 AM to 5:00 PM, Monday through Friday. Approval will need to be obtained for alternate work hours during the week or for work on the weekend.

If sections of fencing are removed at residential properties, the opening(s) will be secured at the end of each day to provide an equivalent level of protection. The Earthwork Subcontractor will establish and maintain two points of continuous access for residents and property owners when possible with one point of continuous access at all times. If it is necessary to restrict access for periods of time, it will be necessary to coordinate the work to be done at a time when the property owner and resident will not be present at the property. Access to the property shall not be restricted between the hours of 5:00 PM and 8:00 AM.

4.2.2 Stormwater Management Plan

Subcontractors will be required to implement procedures during construction activities to prevent or reduce pollutants in stormwater discharges. Erosion control features will be outlined in a Stormwater Management Plan designed to reduce stormwater pollution potential at the site. The following erosion control measures will be identified in the plan:

- Silt fence
- Inlet protection
- Appropriate best management practices at construction site entrance and exit
- Inspections and maintenance procedures

Spill and release accident scenarios could occur and involve rinsates from decontamination activities or contaminated soil. Also, the potential for spills of vehicle fuel and hydraulic oils exist. A Stormwater Management Plan will address the following activities:

- Preplanning for spill control
- Spill and fire control materials and equipment
- Spill control measures
- Drum, container, and tank handling and moving procedures

The plan will also provide instructions to respond to and mitigate releases on the project site.

4.2.3 Transportation Plan

A Transportation Plan will provide the plans for transporting and disposing of contaminated soil and debris from the SMRSCS site to the approved disposal facility and importing materials from approved borrow sources. The Earthwork Subcontractor will be required to tarp, cover, or enclose all loads of contaminated and non-contaminated material. The Earthwork Subcontractor shall submit a Transportation Plan to the Contractor for approval prior to mobilization. The Transportation Plan will address the following:

- Waste transportation practices
- Manifests/haul tickets and other shipping documentation
- Waste disposal
- Spill response and reporting
- Dust abatement
- Records and reporting

4.3 Compliance with Permitting Requirements

CERCLA response actions do not need to comply with the administrative requirements of applicable or relevant and appropriate environmental laws and regulations, such as permitting. Substantive requirements, however, must be met.

SECTION 5

Construction Schedule

The RA is assumed to occur over 3 years. The work is funded under the American Recovery and Reinvestment Act (ARRA). As a result, a minimum of 70 percent of the work is expected to be completed by March 2011. To meet this requirement, it is expected that by the end of the 2010 construction season, the remedial action will be completed at 70 percent of the properties slated for cleanup, approximately 340 residential properties. Remedial construction at all the properties slated for cleanup (approximately 487 residential properties) and Project Substantial Completion is expected to be completed by the end of 2011.

Figure 5-1 provides the final construction schedule.

Earthwork activities at individual properties shall be completed within seven days and seeding will be completed within two days of final grading of topsoil. Remedial actions will be sequenced with properties located on the same or neighboring blocks to perform the work in an efficient and cost-effective manner. Remedial actions are anticipated to begin in areas of high response for access and move in an organized fashion throughout the site for the remaining construction seasons.

SECTION 6

Engineer's Estimate of Construction Cost

The final engineer's estimate of construction costs for the RA, as described in this report, is estimated at \$19,600,000 with an accuracy of plus 15 percent to minus 5 percent. Appendix B contains the cost estimate in a format similar to Micro-Computer Aided Cost Estimating System (M-CACES) Gold.

As discussed in the Preliminary Basis of Design, a value engineering (VE) screening did not recommend a full-scale VE study based on the review of the preliminary design and preliminary engineer's estimate of construction cost. It was believed that additional significant savings would not likely be found in a full-scale value engineering study. No further evaluation was performed. The final engineer's estimate of \$19,600,000 is within 2.5 percent of the preliminary engineer's estimate of construction after reducing uncertainty in assumptions and detailed evaluation of properties requiring remediation.

SECTION 7

Drawings

Drawings of each individual property are provided in electronic format in Appendix A. The following details are provided in Appendix D:

- Temporary stockpile covering
- Medium tree planting
- Shrub replacement
- Excavation

Additional drawings, such as the transportation map and staging areas may be submitted under separate cover as a part of the Transportation Plan or similar documents.

SECTION 8

Specifications

The specifications are submitted under separate cover as a part of the final design package. The specifications developed for the RA include the following:

DIVISION 1—GENERAL REQUIREMENTS

01 11 00	Summary of Work
01 26 00	Contract Modification Procedures
01 29 00	Payment Procedures
01 31 13	Project Coordination
01 31 19	Project Meetings
01 32 00	Construction Progress Documentation
01 33 00	Submittal Procedures
01 42 13	Abbreviations and Acronyms
01 45 16.13	Contractor Quality Control
01 50 00	Temporary Facilities and Controls
01 77 00	Closeout Procedures

DIVISION 31—EARTHWORK

31 10 00	Site Clearing and Grubbing
31 23 16	Excavation
31 23 23	Fill and Backfill

DIVISION 32—EXTERIOR IMPROVEMENTS

32 10 01	Site Restoration
32 31 13	Chain-link Fences and Gates
32 91 13	Topsoil Preparation
32 92 00	Turf and Grasses
32 93 00	Trees, Shrubs and Perennials

SECTION 9

References

CH2M HILL. 2007. *Remedial Investigation Report, South Minneapolis Residential Soil Contamination Site, Minneapolis, Minnesota.*

CH2M HILL. 2008a. *Feasibility Study, South Minneapolis Residential Soil Contamination Site, Minneapolis, Minnesota.*

CH2M HILL. 2008b. *Revised Work Plan, South Minneapolis Residential Soil Contamination Site, Minneapolis, Minnesota*

CH2M HILL. 2009. *XRF Correlation Study for Arsenic Results.* March 6, 2009.

Geomega, Inc. 2004. *Sourcing Arsenic from the Lite Yard Site.* December 9, 2004.

Peer Engineering, Inc. 2005. *Response Action Plan, Hiawatha Business Center, Former Lite Yard Property, Minneapolis, Minnesota.* March 31, 2005.

USACE. 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study.* EPA 540-R-00-002 OSWER 9355.0-75.

USEPA. 2005a. *Statement of Work for Remedial Investigation/Feasibility Study, South Minneapolis Neighborhood Residential Soil Contamination Site, Minneapolis, MN. WA#250-RICO-B58Y.* November 14, 2005.

Figures

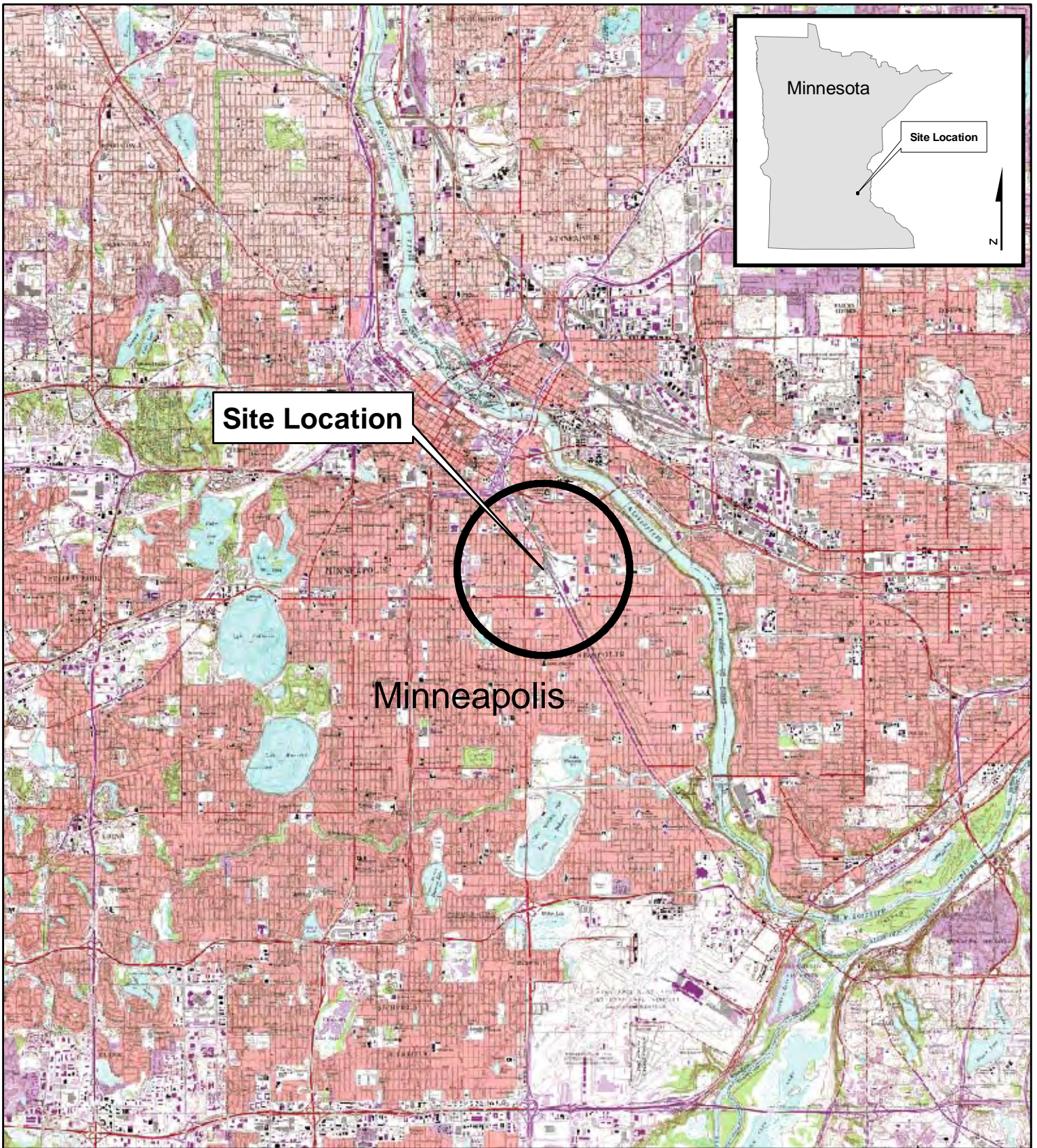
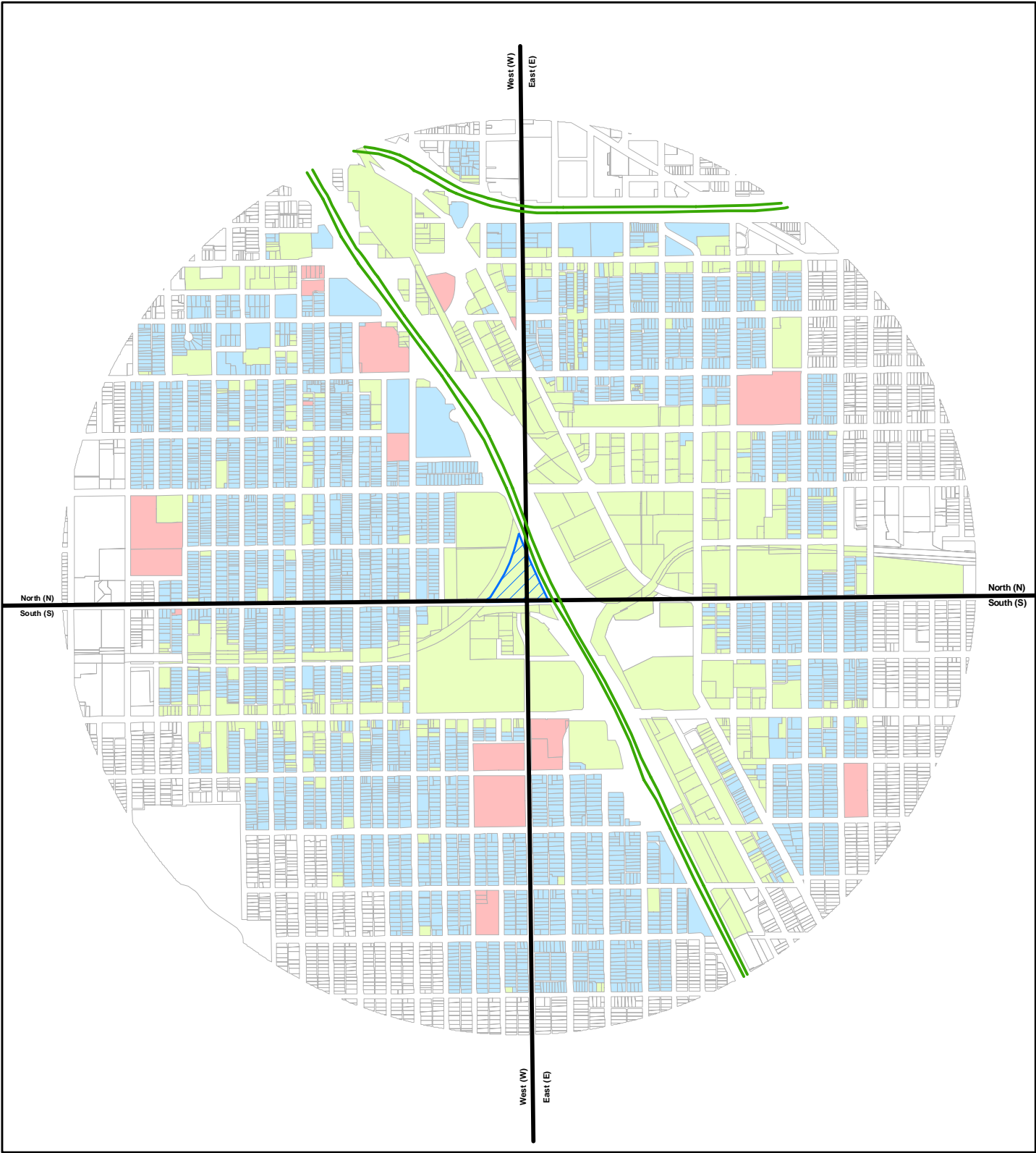


Figure 1-1
Site Location Map
South Minneapolis Site
Minneapolis, MN





Legend
Property Use

- Residential Properties
- Commercial / Industrial Properties
- Schools and Parks

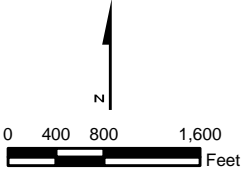


Figure 1-2
Property Use
South Minneapolis Site
Minneapolis, MN



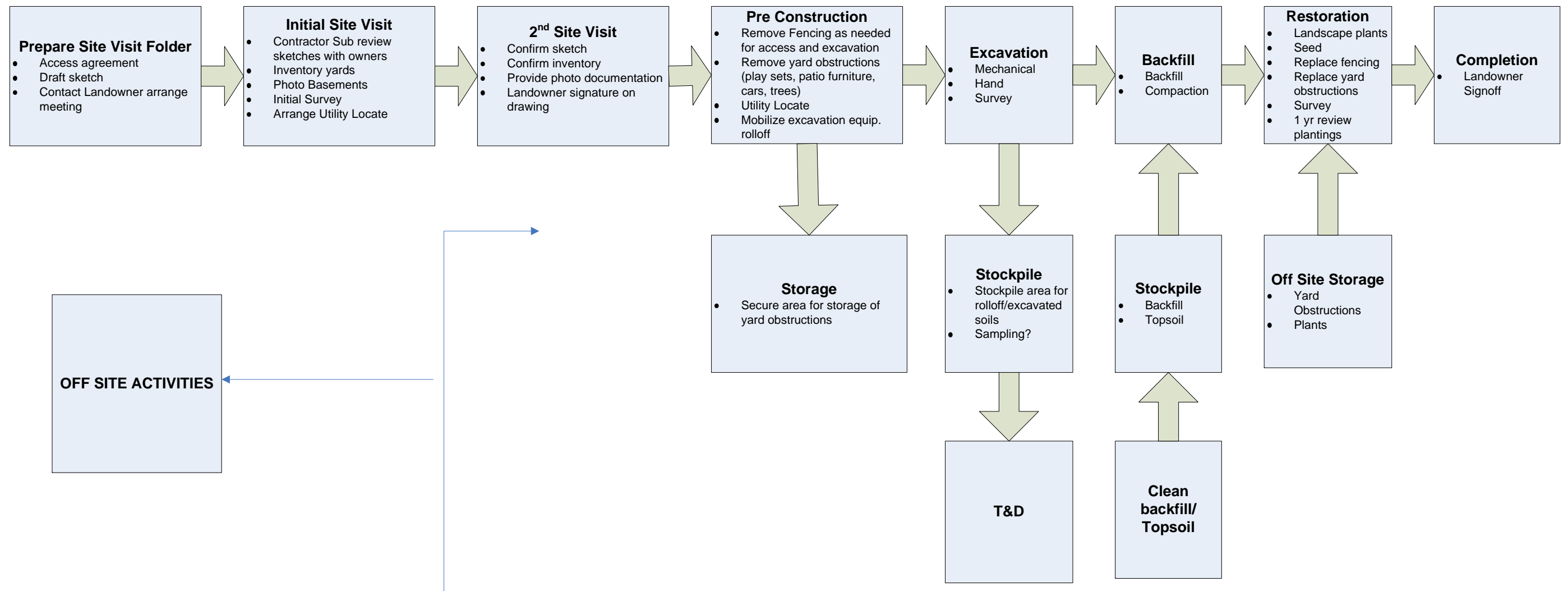
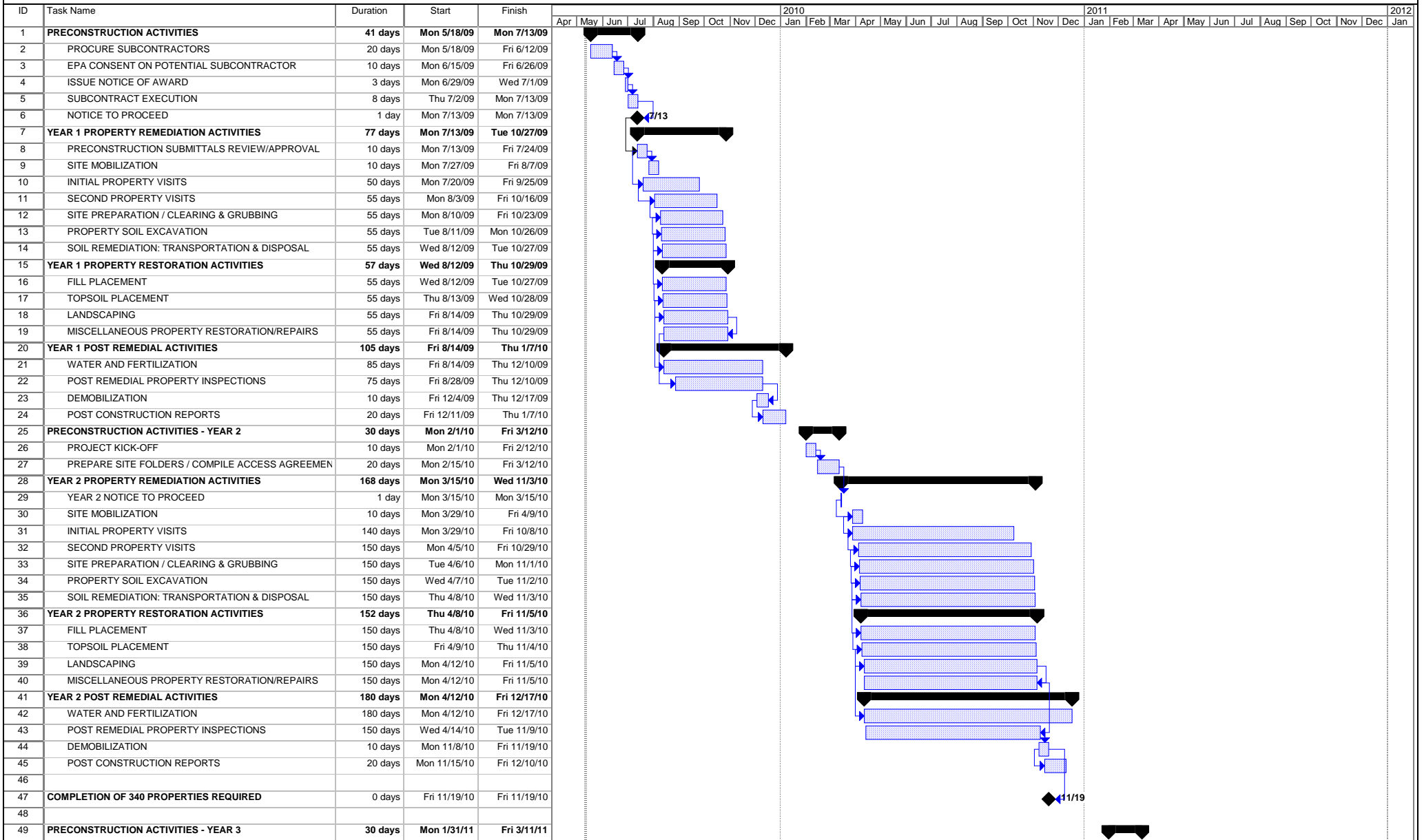


Figure 2-1
 Remediation Process Flow Diagram
 South Minneapolis Neighborhood Soil Contamination Site
 Minneapolis, Minnesota

Figure 5-1
Construction Schedule



Project: SouthMinn Rev3
Date: Mon 5/11/09

Task: Progress Summary External Tasks Deadline

Split: Milestone Project Summary External Milestone

Appendix A
Design Assumptions and Calculations

Appendix A is included on the attached CD

Appendix B
Engineer's Estimate of Construction Cost

Final Engineer's Estimate of Construction Cost
South Minneapolis Soil Contamination Site

Bid Item	SHORT TERM AND CAPITAL COSTS	Quantity	Unit	Unit Cost	Cost
General Conditions					
10001010	Site Specific Plans	1	LS	49,000	\$49,000
10001020	Remedial Action Completion Plan	1	LS	9,900	\$9,900
10001030	Ambient Air Monitoring Report	1	LS	4,200	\$4,200
10002010	Community Relations	1	LS	29,500	\$29,500
10004010	Mobilization / Demobilization	3	LS	63,800	\$191,400
10004020	Site Security	23	MO	24,000	\$552,000
10004030	Office Trailer	23	MO	1,900	\$43,700
10004040	Temporary Utilities	23	MO	5,400	\$124,200
10005020	Subcontractor Oversight	1	LS	1,729,000	\$1,729,000
Property Remediation					
30001010	Staging Area	1	LS	40,500	\$40,500
30002010	Property Survey	487	EA	780	\$379,860
30003010	Pre Construction Property Assessment	487	EA	380	\$185,060
30004010	Air Monitoring	487	EA	315	\$153,405
30004020	Site Preparation / Clearing & Grubbing	487	EA	1,740	\$847,380
30004030	Property Excavation	487	EA	5,840	\$2,844,080
30004035	Lab Analysis	487	EA	495	\$241,065
30004040	Soil Transportation & Disposal	487	EA	4,010	\$1,952,870
30005010	General Fill	24,100	TN	33.00	\$795,300
30005020	Topsoil Placement	28,110	TN	45.00	\$1,264,950
30005030	Landscaping and Erosion Control	487	EA	620	\$301,940
30005040	Tree/Shrub Replacement	487	EA	1,110	\$540,570
30005050	Property Restoration	487	EA	1,250	\$608,750
30006010	Post Construction Review	1	LS	183,000	\$183,000
Subtotal					\$13,071,630
Additional Costs					
NA	Escalation to Mid-Point of Construction	8%		of subtotal	\$1,046,000
NA	Engineering/Design	0%		covered in Task Order	\$0
NA	Project Management	5%		of subtotal	\$654,000
NA	Incentive Fee for Subcontractors (excludes T&D, Fill & Topsoil)	5%		\$ 9,220,000	\$461,000
10005010	Construction Management	est		Detailed Estimate	\$1,730,000
NA	Contingencies	20%		of subtotal	\$2,614,000
Total Capital Cost					\$19,576,630
OPERATION AND MAINTENANCE COSTS					
Maintenance (3 years)					
	Reporting	12	QTR	\$3,600	\$43,200
Total Maintenance Cost					\$43,200
Total Cost					\$19,619,830

Note: NA - not applicable

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10001000
Description = Submittals

Land Item SCHEDULE: 1 100
Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

10001010 Site Specific Plans Quan: 1.00 LS Hrs/Shft: 8.00 WC: NONE

Site specific plans include Health and Safety Plan, Transportation and Disposal Plan, Storm Water Pollution Prevention Plan, and Construction Plan.

The subcontractors will prepare the plans.

4FEDEX08	FEDEX/SHIPPING	1.00	EA	1,000.000					1,000	1,000
4REPRO08	REPRODUCTION	1.00	LS	5,000.000					5,000	5,000
CHS5XX08	H&S Manager	80.00	MH	52.500	5,628					5,628
CPM2XX08	Program Manager	16.00	MH	89.140	1,911					1,911
CQC5XX08	QC Manager	40.00	MH	49.940	2,677					2,677
CRC6XX08	Reg compliance	40.00	MH	42.770	1,711					1,711
CSE5XX08	Staff Engineer 5	160.00	MH	49.300	10,570					10,570
CWP9XX08	Word Processor	160.00	MH	21.400	4,588					4,588
\$33,084.82	496.0000 MH/LS	496.0000	MH	[20646.64]	27,085				6,000	33,085
			0.0020 Unit/M		27,084.82				6,000.00	33,084.82

10001020 Remedial Action Completion Plan Quan: 1.00 LS Hrs/Shft: 8.00 WC: NONE

A Remedial Action Completion Plan will be prepared following completion of the Remedial Action.

The Contractor will prepare the Remedial Action Completion Plan.

4FEDEX08	FEDEX/SHIPPING	1.00	EA	500.000					500	500
4REPRO08	REPRODUCTION	1.00	LS	1,000.000					1,000	1,000
CPM2XX08	Program Manager	4.00	MH	89.140	478					478
CQC5XX08	QC Manager	4.00	MH	49.940	268					268
CRC6XX08	Reg compliance	16.00	MH	42.770	684					684
CSE5XX08	Staff Engineer 5	40.00	MH	49.300	2,642					2,642
CWP9XX08	Word Processor	40.00	MH	21.400	1,147					1,147

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10001000			Land Item	SCHEDULE: 1	100					
Description = Submittals				Unit = LS	Takeoff Quan:	1.000	Engr Quan:		1.000	
\$6,719.31	104.0000 MH/LS	104.0000	MH	[4068.64]	5,219				1,500	6,719
			0.0096 Unit/M		5,219.31				1,500.00	6,719.31

10001030 Ambient Air Monitoring Report Quan: 1.00 LS Hrs/Shft: 8.00 WC: NONE

An Ambient Air Monitoring Report will be prepared at the completion of the Remedial Action.

The Contractor will prepare the Ambient Air Monitoring Report.

4FEDEX08	FEDEX/SHIPPING	1.00	EA	500.000					500	500
4REPRO08	REPRODUCTION	1.00	LS	1,000.000					1,000	1,000
CHS5XX08	H&S Manager	4.00	MH	52.500	281					281
CPM2XX08	Program Manager	4.00	MH	89.140	478					478
CQC5XX08	QC Manager	4.00	MH	49.940	268					268
CSE5XX08	Staff Engineer 5	4.00	MH	49.300	264					264
CWP9XX08	Word Processor	6.00	MH	21.400	172					172
\$2,963.18	22.0000 MH/LS	22.0000	MH	[1091.92]	1,463				1,500	2,963
			0.0455 Unit/M		1,463.18				1,500.00	2,963.18

=====> Item Totals: 10001000 - Submittals

\$42,767.31	622.0000 MH/LS	622.00	MH	[25807.2]	33,767				9,000	42,767
42,767.310	1 LS				33,767.31				9,000.00	42,767.31

BID ITEM = 10002000			Land Item	SCHEDULE: 1	100					
Description = Community Relations				Unit = LS	Takeoff Quan:	1.000	Engr Quan:		1.000	

10002010 Community Relations Quan: 180.00 HR Hrs/Shft: 8.00 WC: NONE

Contractor will submit articles to two newspaper publications, two local television stations, one repository, and prepare fact sheets for the RD sampling results mailing.

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Matl/Ex	Equipme Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10002000 Land Item SCHEDULE: 1 100
 Description = Community Relations Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

The Contractor will update the email distribution list, which includes officials presented in the Community Involvement Plan.

USEPA will maintain a Web site and respond to inquiries.

Two public meetings will be held phase, for a total of six public meetings.

Twenty-four hours per construction phase will be included for community relations activities.

Meeting costs include, but are not limited to, facility rental, projector rental, poster printing, and travel costs.

2MEETEQP	Meeting equip; @108.	6.00	EA	300.000				1,953		1,953
5AIR0600	Airfare	6.00	RT	600.000					3,600	3,600
5CAR0070	Car Rental inc/fuel	12.00	DY	70.000					840	840
5HTL0090	Hotel inc/taxes	6.00	DY	90.000					540	540
5MIS0100	Misc Travel	12.00	EA	100.000					1,200	1,200
5PDM0060	Meals - per diem	12.00	DY	60.000					720	720
CSE5XX08	Staff Engineer 5	180.00	MH	49.300	11,891					11,891
\$20,744.16	1.0000 MH/HR	180.0000	MH	[49.3]	11,891	1,953	6,900			20,744
			1.0000 Unit/M		66.06	10.85	38.33			115.25

=====> Item Totals: 10002000 - Community Relations
 \$20,744.16 180.0000 MH/LS 180.00 MH [8874] 11,891 1,953 6,900 20,744
 20,744.160 1 LS 11,891.16 1,953.00 6,900.00 20,744.16

BID ITEM = 10004000 Land Item SCHEDULE: 1 100
 Description = Mobilization Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

10004010 Mob/Demob Quan: 3.00 LS Hrs/Shft: 8.00 WC:NONE

This includes 3 mobilizations and 3 demobilizations.

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10004000
Description = Mobilization

Land Item SCHEDULE: 1 100
Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

Implementation of the Remedial Action will be conducted in 3 phases and therefore, will require the Contractor and subcontractors to mobilize to the site three separate times. The survey and landscaping subcontractors will operate from their local place of business and not require mobilization expenses.

4MOBDE08	MOB/DEMOB	3.00	LS	40,000.000					120,000	120,000
5AIR0700	Airfare	9.00	RT	700.000			6,300			6,300
5CAR0060	Car Rental inc/fuel	45.00	DY	60.000			2,700			2,700
5HTL0090	Hotel inc/taxes	36.00	DY	90.000			3,240			3,240
5MIS0100	Misc Travel	9.00	EA	100.000			900			900
5PDM0050	Meals - per diem	45.00	DY	50.000			2,250			2,250
CHS7XX08	H&S Site Safety Offic	96.00	MH	29.280	3,767					3,767
CSE5XX08	Staff Engineer 5	96.00	MH	49.300	6,342					6,342
\$145,498.53	64.0000 MH/LS	192.0000	MH	[2514.56]	10,109		15,390		120,000	145,499
			0.0156 Unit/M		3,369.51		5,130.00		40,000.00	48,499.51

10004020 Site Security
Site security will occur during off-work hours (evenings and weekends).

Three phases and therefore three construction seasons total. Assume Phase 1 -73 homes; Phase 2 - 146 homes and Phase 3 - 268 homes
Assume Phase 1 - 16 weeks;Phase 2 - 32 weeks; Phase 3 -38 weeks
Total 86 weeks. Round to 90 weeks.

4SERWD08	SECURITY GUARD	90.00	WK	2,800.000					252,000	252,000
4SERWE08	SECURITY GUARD	90.00	WK	1,920.000					172,800	172,800
\$424,800.00				[]					424,800	424,800
									18,469.57	18,469.57

10004030 Office Trailer
WC: NONE

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10004000 Land Item SCHEDULE: 1 100
 Description = Mobilization Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

An office trailer will be used for the duration of project.
 Three phase for the Remedial Action (round to 90 weeks or 23 months).

4FENCETMP	Fence -Temporary	800.00	LF	10.000					8,000	8,000
8TRALR08	TRAILER RENTAL	23.00	MO	500.000				12,478		12,478
8TRMOB08	TRAILER MOB/DE	6.00	LS	1,000.000				6,510		6,510
8TRSET08	TRAILER SETUP	3.00	LS	2,000.000				6,510		6,510
\$33,497.50				[]				25,498	8,000	33,498
								1,108.59	347.83	1,456.41

10004040 Temporary Utilities Quan: 23.00 MO Hrs/Shft: 8.00 WC: NONE

An temporary utilities will be used for the duration of work.
 Three phase for the Remedial Action (5+8+10 = 23 months).

2FURNI08	OFFICE FURNITUR	23.00	MO	400.000		9,982				9,982
2SUPPL08	OFFICE SUPPLIES	23.00	MO	500.000		12,478				12,478
4FEDEX08	FEDEX/SHIPPING	23.00	EA	300.000					6,900	6,900
4PHNM100	Phone Monthly	23.00	MO	500.000					11,500	11,500
4POWER08	POWER	23.00	MO	850.000					19,550	19,550
4SANI600	Sanitary Monthly	23.00	MO	600.000					13,800	13,800
4UTCON08	UTILITY CONNECT	1.10	LS	10,000.000					11,000	11,000
4WTRM250	Water Monthly	23.00	MO	150.000					3,450	3,450
8CONEX08	CONEX BOX	23.00	MO	300.000				7,487		7,487
\$96,146.00				[]		22,460		7,487	66,200	96,146
						976.50		325.50	2,878.26	4,180.26

=====> Item Totals: 10004000 - Mobilization

\$699,942.03	192.0000 MH/LS	192.00	MH	[7543.68]	10,109	22,460	15,390	32,984	619,000	699,942
699,942.030	1 LS				10,108.53	22,459.50	15,390.00	32,984.00	619,000.00	699,942.03

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Labor	Perm Material	Constr Matl/Ex Ownershi	Equipme Operatio	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10005000
Description = Oversight/Project Management

Land Item SCHEDULE: 1 100
Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

10005010 Contractor Oversight Quan: 1.00 LS Hrs/Shft: 8.00 WC: NONE

Contractor oversight will last a duration of project.
Three phase for the Remedial Action (23 months).
Assume two staff on travel.
Mileage is for 7 trips to site.

5HTL0070	Hotel inc/taxes	980.00	DY	70.000				68,600			68,600
5MIL0001	Mileage	3,000.00	MI	0.585				1,755			1,755
5PDM0050	Meals - per diem	980.00	DY	50.000				49,000			49,000
5TRKM100	Truck/SUV Rental	46.00	MO	800.000				36,800			36,800
CCD7XX08	CADD Tech	1,024.00	MH	29.280	40,182						40,182
CCO5XX08	Contracts	300.00	MH	52.500	21,105						21,105
CHS5XX08	H&S Manager	240.00	MH	52.500	16,884						16,884
CHS7XX08	H&S Site Safety Offic	5,060.00	MH	29.280	198,530						198,530
CPM2XX08	Program Manager	240.00	MH	89.140	28,667						28,667
CQC5XX08	QC Manager	240.00	MH	49.940	16,061						16,061
CRC6XX08	Reg compliance	120.00	MH	42.770	5,132						5,132
CSE5XX08	Staff Engineer 5	5,060.00	MH	49.300	334,274						334,274
CSE7XX08	Staff Engineer 7	5,060.00	MH	29.280	198,530						198,530
CWP9XX08	Word Processor	5,060.00	MH	21.400	145,101						145,101
\$1,160,620.78	22,404.0000 MH/LS	22,404.0000	MH	[750899.92]	1,004,466		156,155				1,160,621
					1,004,465.78		156,155.00				1,160,620.78

10005020 Subcontractor Oversight Quan: 1.00 LS Hrs/Shft: 8.00 WC: NONE

Subcontractor oversight will last a duration of (23 months).
Plus incidental OT for foreman.

4ASTPM08	SUB ASST PROJEC	5,060.00	HR	59.000						298,540	298,540
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DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 10005000		Land Item	SCHEDULE: 1	100						
Description = Oversight/Project Management			Unit = LS	Takeoff Quan:	1.000	Engr Quan:		1.000		
4FORMN08	SUB FOREMAN	11,000.00	HR	50.210				552,310		552,310
4OFFICE08	SUB OFFICE SUPPO	300.00	HR	42.000				12,600		12,600
4PROMR08	SUB PROJECT MAN	5,060.00	HR	84.000				425,040		425,040
4TRKCON	Pickup Truck - Owne	69.00	MO	600.000				41,400		41,400
\$1,329,890.00				[]				1,329,890		1,329,890
								1,329,890.00		1,329,890.00

=====> Item Totals: 10005000 - Oversight/Project Management										
\$2,490,510.78	22,404.0000 MH/LS	22,404.00	MH	[750899.92]	1,004,466	156,155		1,329,890		2,490,511
2,490,510.780	1 LS				1,004,465.78	156,155.00		1,329,890.00		2,490,510.78

BID ITEM = 30001000		Land Item	SCHEDULE: 1	100						
Description = Staging Area			Unit = LS	Takeoff Quan:	1.000	Engr Quan:		1.000		

30001010 Staging Area Quan: 4.00 EA Hrs/Shft: 8.00 WC:NONE

Storage, staging, and laydown areas will be located at select vacant properties following individual owner acceptance.

The areas will be secured with a minimum 6-foot standard temporary security fence and appropriate signage.

The areas will be secured with a minimum 6-foot standard temporary security fence and appropriate signage.

Fence - temporary chainlink fence w/gates Main yard is 300'x300', =1200 lf

Silt fence around stockpile 100' x 200' replace twice (600' x 3= 1800 lf)

2E0001	Silt Fence, Sm@108.5	1,800.00	LF	2.000		3,906				3,906
2SIGNAGE	Project Signs@108.5	4.00	EA	500.000		2,170				2,170
4FNC0004	Temp Fence	1,200.00	LF	10.000				12,000		12,000
4STAGING	Staging Area	1.00	LS	10,000.000				10,000		10,000
CSE5XX08	Staff Engineer 5	40.00	MH	49.300		2,642				2,642

DIRECT COST REPORT

Activity Resource	Description	Pcs	Quantity Unit	Unit Cost	Perm Labor	Material	Constr Matl/Ex Ownershi	Equipme Operatio	Equipme Contract	Total
BID ITEM = 30001000 Description = Staging Area Land Item SCHEDULE: 1 100 Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000										
\$30,718.48	10.0000 MH/EA	40.0000	MH [493]		2,642	6,076			22,000	30,718
			0.1000 Unit/M		660.62	1,519.00			5,500.00	7,679.62
=====> Item Totals: 30001000 - Staging Area										
\$30,718.48	40.0000 MH/LS	40.00	MH [1972]		2,642	6,076			22,000	30,718
30,718.480	1 LS				2,642.48	6,076.00			22,000.00	30,718.48

BID ITEM = 30002000 Description = Survey Land Item SCHEDULE: 1 100 Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000										
30002010	Property Survey		Quan: 487.00 EA	Hrs/Shft: 8.00					WC: NONE	
Preconstruction survey 1 hour per property; layout survey 2 hr; post construction survey 1 hour per property.										
4SURVEY 2	Survey Sub	1,948.00	HR	150.000					292,200	292,200

BID ITEM = 30003000 Description = Pre-Construction Property Accessment Land Item SCHEDULE: 1 100 Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000										
30003010	Pre Construction Property Assessment		Quan: 487.00 EA	Hrs/Shft: 8.00					WC: NONE	
Assume digital photos and videos; supplies include DVD disks and batteries. Digital and video camera rental for full construction period. Also 250 samples for arsenic.										
2CAMERA	Camera - Digita@108	23.00	MO	50.000		1,248				1,248
2SAMPLSUPP	Sampling Suppli@10	250.00	EA	10.000		2,713				2,713
2VIDEOCAM	Video Camera Re@1	23.00	MO	75.000		1,872				1,872
2VIDEOSUP	Video Supplies@108.	3.00	EA	200.000		651				651

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
BID ITEM = 30003000			Land Item	SCHEDULE: 1	100					
Description = Pre-Construction Property Accessment			Unit =	LS	Takeoff Quan:	1.000	Engr Quan:		1.000	
4FEDEX08	FEDEX/SHIPPING	100.00	EA	70.000					7,000	7,000
4LABARSENIC	Lab analysis - Arsenic	250.00	EA	20.000					5,000	5,000
4PROPASSMT	Property Assessment	487.00	EA	20.000					9,740	9,740
CSE5XX08	Staff Engineer 5	1,461.00	MH	49.300	96,517					96,517
\$124,739.46	3.0000 MH/EA	1,461.0000	MH	[147.9]	96,517	6,483			21,740	124,739
			0.3333 Unit/M		198.19	13.31			44.64	256.14
=====> Item Totals: 30003000 - Pre-Construction Property Accessment										
\$124,739.46	1,461.0000 MH/LS	1,461.00	MH	[72027.3]	96,517	6,483			21,740	124,739
124,739.460	1 LS				96,516.58	6,482.88			21,740.00	124,739.46

BID ITEM = 30004000			Land Item	SCHEDULE: 1	100					
Description = Remedial Activities			Unit =	LS	Takeoff Quan:	1.000	Engr Quan:		1.000	
30004010	Air Monitoring			Quan: 487.00 EA	Hrs/Shft: 8.00				WC: NONE	
Cost is for two samples per property										
Data validation is 45 minutes per sample.										
4LABAIR1	AIR SAMPLES	974.00	EA	50.000					48,700	48,700
4REPORTS2	Reports	487.00	EA	5.000					2,435	2,435
8PMPGILL	Gillian Pump	6.00	EA	1,500.000				9,000		9,000
CSE5XX08	Staff Engineer 5	487.00	MH	49.300	32,172					32,172
CSE8XX08	Staff Field Engineer 8	487.00	MH	25.980	16,954					16,954
\$109,261.22	2.0000 MH/EA	974.0000	MH	[75.28]	49,126			9,000	51,135	109,261
			0.5000 Unit/M		100.88			18.48	105.00	224.36

30004020	Clearing and Grubbing			Quan: 487.00 EA	Hrs/Shft: 8.00				WC: NONE	
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DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 30004000
Description = Remedial Activities

Land Item SCHEDULE: 1 100
Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

Clearing and grubbing will include removal of debris; movement of non-permanent property (swingsets, AG pools, fountains, etc; small trees and brush; removal or grinding of stumps and roots; and felling and removal of dead trees, partially dead trees and limbs, and trees and limbs that are a safety hazard to workers.
Remove 20 trees (tree service)

One operator, two laborers, and a skid-steer loader. 5 hrs per property

4ARBORIST	Arborist	100.00	HR	100.000					10,000	10,000
4BOBCT08	BOBCAT W/FOG	2,435.00	HR	27.000					65,745	65,745
4DEBRISBOX	Debris Box	487.00	EA	82.500					40,178	40,178
4DEBRISTD	Debris Box T&D	4,870.00	TN	55.000					267,850	267,850
4LABOR08	SUB LABORER	4,870.00	LS	33.000					160,710	160,710
4OPERT08	SUB OPERATOR	2,435.00	LS	41.670					101,466	101,466
4TREEREMOVA	Tree Removal Service	20.00	EA	250.000					5,000	5,000
				\$650,948.95	[]				650,949	650,949
									1,336.65	1,336.65

30004030 Property Excavation Quan: 487.00 EA Hrs/Shft: 8.00 WC: NONE

Average volume of excavated soil per property: 66.8 CY; 66.8 CY x 1.6 TON/CY = 107 TON
Mechanical excavation will be used where possible. Hand excavation will be done underneath the drip line of mature trees, around utility lines, and around fences that have not been removed. Excavated soil will be loaded directly into dump trucks for transport to staging area.

Soil excavation will be performed as outlined:

At least 1 foot away from structures and fences, plus an excavation at a 1:1 slope away from the structure or fence.

Excavation parallel or adjacent to structures will maintain a 45-degree slope from grade to bottom of the excavation.

Excavation activities are based on a 40-hour work week schedule,

6 hrs per property

Allow 5% OT >> 3140 hrs

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
BID ITEM = 30004000			Land Item	SCHEDULE: 1			100			
Description = Remedial Activities			Unit = LS	Takeoff Quan:	1.000	Engr Quan:	1.000			
High visibility and silt fencing placed at each property as needed.										
Bin count: Assume one bin per day onsite for material that needs additional analytical testing.										
Assume 10 rain events where stormwater will need collection and storage in Baker tank for analysis. Assume most stormwater will be clean, 5,000 will go to treatment.										
Two crews; one with each piece of equipment. Resources are two foremen, two operators, bobcat, backhoe, two dump trucks, two truck drivers and six laborers. Each piece of equipment has foreman, operator and three laborers. The two dump trucks will cycle between crews as material is ready for offhaul.										
2DEMARC	DEMARCATIION FA	2,500.00	SF	0.140		380				380
2FENCEHV	FENCE HIGH VISA	12,000.00	LF	8.000		104,160				104,160
4BACKHOESM	SMALL RT BACKH	1,200.00	HR	30.500				36,600		36,600
4BAKERTK	Baker Tank	24.00	MO	1,500.000				36,000		36,000
4BOBCT08	BOBCAT W/FOG	3,140.00	HR	27.000				84,780		84,780
4DEWATER	DEWATERING	13.00	LS	600.000				7,800		7,800
4DMPTRK12	Dump Truck 10 Whl	6,280.00	HR	29.800				187,144		187,144
4FORMN08	SUB FOREMAN	6,280.00	HR	50.210				315,319		315,319
4LABOR08	SUB LABORER	18,840.00	LS	33.000				621,720		621,720
4LABWTR	Lab Analysis - Water	30.00	EA	75.000				2,250		2,250
4OPERT08	SUB OPERATOR	6,280.00	LS	41.670				261,688		261,688
4SOILCON	Soil container	200.00	DY	82.500				16,500		16,500
4TRAFFIC	TRAFFIC CONTRO	512.00	DY	200.000				102,400		102,400
4TRKDRVR	SUB TRUCKDRIVE	6,280.00	HR	35.000				219,800		219,800
4WTRTRK	WATER TRUCK W/	1,400.00	HR	33.000				46,200		46,200
4WTRTRMT	Water Treatment	5,000.00	GL	2.000				10,000		10,000
4XRF	XRF	46.00	MO	2,950.000				135,700		135,700
\$2,188,440.15				[]		104,540		2,083,900		2,188,440
						214.66		4,279.06		4,493.72

30004035 Lab Analysis Quan: 487.00 EA Hrs/Shft: 8.00 WC: NONE

Analysis of soil being disposed is based on one sample per 500 tons of soil disposed.

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 30004000 Land Item SCHEDULE: 1 100
 Description = Remedial Activities Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

Confirmation sampling plus 10% field duplicates, 5% MS/MSD.
 Includes report writing.

Data validation will take 30 minutes per TCLP sample and 10 minutes per post-excavation sample..

2SAMPLSUPP	Sampling Suppli@10	150.00	EA	20.000		3,255				3,255
4FEDEX08	FEDEX/SHIPPING	150.00	EA	50.000					7,500	7,500
4LABARSENIC	Lab analysis - Arsenic	795.00	EA	20.000					15,900	15,900
4LABTCLP	LAB TCLP	104.00	EA	1,302.000					135,408	135,408
CHS7XX08	H&S Site Safety Offic	160.00	MH	29.280	6,278					6,278
CSE5XX08	Staff Engineer 5	200.00	MH	49.300	13,212					13,212
\$181,553.03	0.7392 MH/EA	360.0000	MH	[29.866]	19,490	3,255			158,808	181,553
			1.3528 Unit/M		40.02	6.68			326.09	372.80

30004040 Soil T&D Quan: 487.00 EA Hrs/Shft: 8.00 WC:NONE

The volume of soil that will be transported offsite, and disposed of, is equal to the volume of soil excavated.
 Therefore, the estimated average volume of soil that will be transported offsite, and disposed of, per property is 107 TON.

4BACKHOESM	SMALL RT BACKH	3,600.00	HR	30.500					109,800	109,800
4OPERT08	SUB OPERATOR	3,600.00	HR	41.670					150,012	150,012
4SOILT08	Contaminated So@10	52,060.00	TN	22.000					1,240,382	1,240,382
\$1,500,193.56				[]					1,500,194	1,500,194
									3,080.48	3,080.48

=====> Item Totals: 30004000 - Remedial Activities
 \$4,630,396.91 1,334.0000 MH/LS 1,334.00 MH [51206.16] 68,616 107,795 9,000 4,444,986 4,630,397
 4,630,396.91 1 LS 68,616.25 107,794.75 9,000.00 4,444,985.91 4,630,396.91

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 30005000
Description = Restoration Activities

Land Item SCHEDULE: 1 100
Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

30005010 General Fill Quan: 24,100.00 TN Hrs/Shft: 8.00 WC: NONE

The depth of soil excavation was assumed to be 12 inches below ground. Imported general fill material will be placed at a depth of 6 inches in yards. Conversion from cy to tons is 1.6

Assume borrow source provides laboratory analysis to determine if fill is "clean".

2FILL108	FILL MATERIAL 1	24,100.00	TN	10.000		261,485				261,485
2SAMPLSUPP	Sampling Suppli@10	15.00	EA	10.000		163				163
4BOBCT08	BOBCAT W/FOG	2,800.00	HR	27.000				75,600		75,600
4COMPT08	COMPACTOR W/FO	2,800.00	HR	17.150				48,020		48,020
4FEDEX08	FEDEX/SHIPPING	15.00	EA	70.000				1,050		1,050
4GEOTECH	Geotechnical Enginee	40.00	HR	90.000				3,600		3,600
4LABOR08	SUB LABORER	2,800.00	HR	33.000				92,400		92,400
4LABTCLP	LAB TCLP	15.00	EA	1,302.000				19,530		19,530
4OPERT08	SUB OPERATOR	2,800.00	HR	41.670				116,676		116,676
CSE5XX08	Staff Engineer 5	16.00	MH	49.300	1,057					1,057
\$619,580.74	0.0006 MH/TN	16.0000	MH	[0.033]	1,057	261,648		356,876		619,581
		1,506.2509	Unit/M		0.04	10.86		14.81		25.71

30005020 Topsoil Placement Quan: 28,110.00 TN Hrs/Shft: 8.00 WC: NONE

It is assumed that the top 6 inches in yards, 18" in gardens will be filled with topsoil. Conversion is 1.6 tons per cy.

Premium topsoil for gardens and planters

80 crew weeks 5% OT

2FILL208	TOPSOIL@108.5%	26,700.00	TN	16.000		463,512				463,512
2FILL210	Topsoil- Premiu@108	1,410.00	TN	22.000		33,657				33,657
2SAMPLSUPP	Sampling Suppli@10	20.00	EA	10.000		217				217
4BOBCT08	BOBCAT W/FOG	3,360.00	HR	27.000				90,720		90,720
4FEDEX08	FEDEX/SHIPPING	20.00	EA	70.000				1,400		1,400

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
BID ITEM = 30005000			Land Item	SCHEDULE: 1						
Description = Restoration Activities				Unit = LS	100					
					Takeoff Quan:	1.000		Engr Quan:	1.000	
4LABOR08	SUB LABORER	6,720.00	LS	33.000					221,760	221,760
4LABTCLP	LAB TCLP	20.00	EA	1,302.000					26,040	26,040
4OPERT08	SUB OPERATOR	3,360.00	LS	41.670					140,011	140,011
CSE5XX08	Staff Engineer 5	20.00	MH	49.300	1,321					1,321
\$978,638.14	0.0007 MH/TN	20.0000	MH	[0.035]	1,321	497,386			479,931	978,638
			1,405.5011	Unit/M	0.05	17.69			17.07	34.81

30005030 Landscaping and Erosion Control Quan: 487.00 EA Hrs/Shft: 8.00 WC: NONE

Landscaping maintenance includes watering, and fertilizing for a 6 week period.
Landscaping subcontractor responsible for placement and removal of silt fencing.
Erosion control blanket assumed where slope greater than 1V:3H is present based on property sketches.

2E0001	Silt Fence, Sm@108.5	10,000.00	LF	2.000		21,700				21,700
4EROSIONMAT	Erosion Mat	9,940.00	SF	0.300				2,982	2,982	
4LAWN108	LAWN MAINT	2,922.00	EA	40.000				116,880	116,880	
4MULCH	Mulch	5,350.00	SF	0.250				1,338	1,338	
4SEED108	SEEDING 1	900,000.00	SF	0.100				90,000	90,000	
\$232,899.50				[]		21,700		211,200	232,900	
						44.56		433.67	478.23	

30005040 Tree/Shrub Replacement Quan: 487.00 EA Hrs/Shft: 8.00 WC: NONE

4LANDSCAPER	Landscape Profession	250.00	HR	65.000				16,250	16,250	
4PERENNIALS	Perennials	9,740.00	EA	15.000				146,100	146,100	
4SHRUBS	Shrub Replacement	2,922.00	EA	45.000				131,490	131,490	
4TREES	Tree Replacement	487.00	EA	250.000				121,750	121,750	
\$415,590.00				[]				415,590	415,590	
								853.37	853.37	

30005050 Property Restoration Quan: 487.00 EA Hrs/Shft: 8.00 WC: NONE

Damaged concrete sidewalks will be repaired using sand, gravel, 2,000 psi slurry concrete, and 3,500 psi concrete,

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
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BID ITEM = 30005000 Land Item SCHEDULE: 1 100
 Description = Restoration Activities Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

up to an area of 10 square feet per property.
 Fences that are removed from properties and are not usable will be replaced with new fences, up to 10 linear feet for 10% of the properties.
 Utility repair for damage incurred to sprinkler systems, electrical, piping, plumbing, and drain tile within the limits of the excavation, up to a \$500 allowance per property.

4CONC108	SIDEWALK/DRIVE	4,870.00	SF	8.000					38,960	38,960
4DEBRIS08	DEBRIS	487.00	EA	76.920					37,460	37,460
4FENCE08	FENCE	200.00	LF	22.000					4,400	4,400
4FENCECL	Chain Link Fence	270.00	LF	14.000					3,780	3,780
4FENCEWI	Wrought Iron Fence	20.00	LF	30.000					600	600
4GATES	Fence Gates	50.00	EA	350.000					17,500	17,500
4STCLN08	STREET CLEANING	240.00	DY	500.000					120,000	120,000
4UTILY08	UTILITY REPAIR	487.00	EA	500.000					243,500	243,500
\$466,200.04				[]					466,200	466,200
									957.29	957.29

=====> Item Totals: 30005000 - Restoration Activities
 \$2,712,908.42 36.0000 MH/LS 36.00 MH [1774.8] 2,378 780,733 1,929,797 2,712,908
 2,712,908.420 1 LS 2,378.23 780,733.45 1,929,796.74 2,712,908.42

BID ITEM = 30006000 Land Item SCHEDULE: 1 100
 Description = Post Remedial Action Unit = LS Takeoff Quan: 1.000 Engr Quan: 1.000

30006010 Post Construction Review Quan: 1.00 LS Hrs/Shft: 8.00 WC:NONE

A post-construction meeting will be conducted with each property owner following completion of the restoration and /or landscape maintenance period to identify deficiencies.

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub-Contract	Total
BID ITEM = 30006000			Land Item	SCHEDULE: 1	100					
Description = Post Remedial Action				Unit = LS	Takeoff Quan:	1.000	Engr Quan:	1.000		
4REPORTS2	Reports	487.00	EA	100.000				48,700		48,700
CSE5XX08	Staff Engineer 5	974.00	MH	49.300	64,344					64,344
CWP9XX08	Word Processor	487.00	MH	21.400	13,965					13,965
\$127,009.60	1,461.0000 MH/LS	1,461.0000	MH	[58440]	78,310			48,700		127,010
			0.0007 Unit/M		78,309.60			48,700.00		127,009.60
<hr/>										
=====> Item Totals:		30006000	- Post Remedial Action							
\$127,009.60	1,461.0000 MH/LS	1,461.00	MH	[58440]	78,310			48,700		127,010
127,009.600	1 LS				78,309.60			48,700.00		127,009.60

\$11,171,937.15 *** Report Totals *** 27,730.00 MH 1,308,696 925,500 178,445 9,000 32,984 8,717,313 11,171,937

>>> indicates Non Additive Activity

-----Report Notes:-----

The estimate was prepared with TAKEOFF Quantities.

This report shows TAKEOFF Quantities with the resources.

Bid Date: Owner: Engineering Firm:

Estimator-In-Charge:

JOB NOTES

Estimate created on: 07/02/2008 by User#: 0 -

Source estimate used: C:\HEAVYBID\EST\ESTMAST

*****Estimate created on: 07/07/2008 by User#: 0 -

Source estimate used: C:\HEAVYBID\EST\EPAJAB01

DIRECT COST REPORT

Activity Resource	Description	Quantity Pcs	Unit Unit	Unit Cost	Perm Labor	Constr Material	Equipme Matl/Ex Ownershi	Equipme Operatio	Sub- Contract	Total
BID ITEM = 30006000			Land Item	SCHEDULE: 1						
Description = Post Remedial Action				Unit = LS	100					
					Takeoff Quan:	1.000	Engr Quan:		1.000	
*****Estimate created on: 07/09/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAJAB02										
*****Estimate created on: 07/10/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAJAB03										
*****Estimate created on: 07/15/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAJAB04										
*****Estimate created on: 08/25/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAJA05										
*****Estimate created on: 09/07/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAJA06										
*****Estimate created on: 10/07/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAMIN01										
*****Estimate created on: 10/10/2008 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAMIN02										
*****Estimate created on: 01/24/2009 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAMIN03										
*****Estimate created on: 01/26/2009 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAMIN04										
*****Estimate created on: 03/11/2009 by User#: 0 -										
Source estimate used: C:\HEAVYBID\EST\EPAMIN05										

* on units of MH indicate average labor unit cost was used rather than base rate.

Bid Summary Totals Report

Standard Markup Instructions

	Cost Basis	Markup %	Markup
Labor:	978,545	52.00	508,843
Burden:	330,151	52.00	171,678
Perm Matl:	925,500	30.00	277,650
Const Matl:	178,445	30.00	53,534
Sub:	8,717,313	30.00	2,615,194
Eq. Op. Exp:	32,984	30.00	9,895
Co. Equip:	9,000	30.00	2,700
Rented Eq.:	0	0.00	0
Misc1:	0	0.00	0
Misc2:	0	0.00	0
Misc3:	0	0.00	0
Overrides:	0		0
Total:	11,171,938	32.58	3,639,494
Bond Table:			

Previous Run

Summary: 03/11/2009 8:33 PM
 Spread: 03/11/2009 8:33 PM
 Summary run on Takeoff Quan and Adjusted to Bid Quan.

Standard Spreads

	Total
Indirect Spread:	Total
Markup Spread:	Total
Addon/Bond Spread:	Total

Totals as of Last Spread

	Cost:	Markup:	Total:
Direct:	11,171,937	3,639,494	14,811,431
Indirect:	0	0	0
Addons:	0	0	0
Bond:	0		0
Total:	11,171,937	3,639,494	14,811,431

Key Indicators

Balanced Markup	/	Total Labor	=	Balanced Markup/Total Labor
3,639,494.27	/	1,308,695.92	=	278.10%
Indirect Cost	/	Direct Cost	=	Indirect Cost/Direct Cost
0.00	/	11,171,937.15	=	0.00%

Appendix C
Draft Operations and Maintenance Plan

Draft Operations and Maintenance Manual

The remedial action (RA) at the South Minneapolis Residential Soil Contamination Site is anticipated to be performed from 2009 through 2011. Remedial actions are known to be required at 487 residential properties due to arsenic concentrations in soil. The remedy is generally described below:

- Surface soil with arsenic concentrations above 25 mg/kg will be excavated to a depth of 12 inches in yards and 18 inches in gardens.
- All soils with arsenic concentrations above 95 mg/kg will be excavated as possible to a maximum depth of 10 feet below ground surface (bgs).
- Properties will be backfilled with fill and 6 inches of topsoil to return the property to the pre-construction elevations.
- Properties will be restored by hydroseeding excavated areas, planting replacement plants of like-kind for those removed during the RA, and returning property features to the original condition or better, as practical.
- The revegetated areas will be watered for a six-week period and the replacement plants will have a one-year warranty.

After completion of the remedy, there are no continued operations and maintenance (O&M) requirements with the possible exception institutional controls. Institutional controls may be required at individual residential properties under the following conditions:

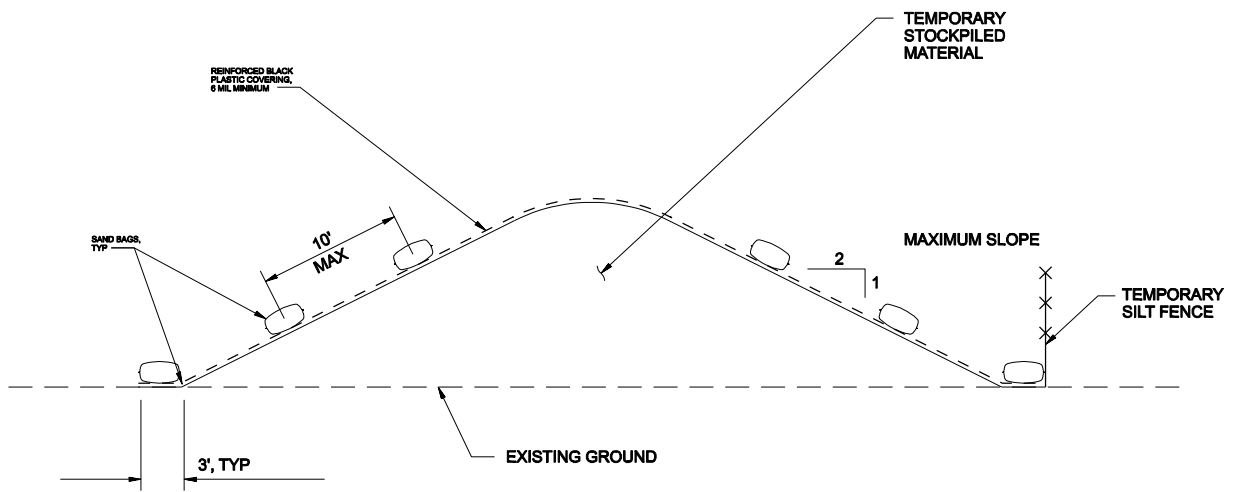
- The property owner denied access and remedial actions could not be performed at the property during the RA.
- Remedial actions were performed at the property, but soils remain with arsenic concentrations above 95 mg/kg.
 - Excavations will extend to a maximum depth of 10 feet bgs. If arsenic concentrations above 95 mg/kg remain at depths greater than 10 feet bgs, a demarcation fabric will be placed in the base of the excavation to prevent contact with soils.
 - Excavation will cease before 10 feet bgs if the Contractor determines that further excavation may result in property damage or safety hazards. If the arsenic concentration is above 95 mg/kg, but the excavation cannot continue, a demarcation fabric will be placed in the base of the excavation to prevent contact with soils.
 - On top of the demarcation fabric, a detectable, high visibility, red underground marking tape, 4 inches wide, labeled "POTENTIAL DANGER OF ARSENIC CONTAMINATION BELOW" will be placed on 3-foot centers.

A list of properties will be developed during the RA where one of the above conditions exists. Throughout the RA, efforts will be made to contact the property owner to obtain access for remediation and to track properties where access is denied in case of a transfer in

property ownership. The list of properties requiring institutional controls will be finalized at the end of the RA.

The institutional controls to be employed and the enforcement mechanisms will be determined during the RA. Institutional controls may consist of use restrictions to define areas of remaining concern, zoning and permit requirements to limit exposure, or other mechanisms.

Appendix D
Detail Drawings

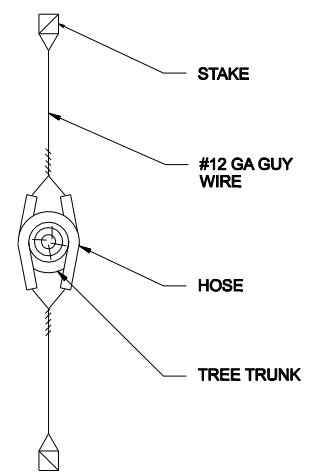
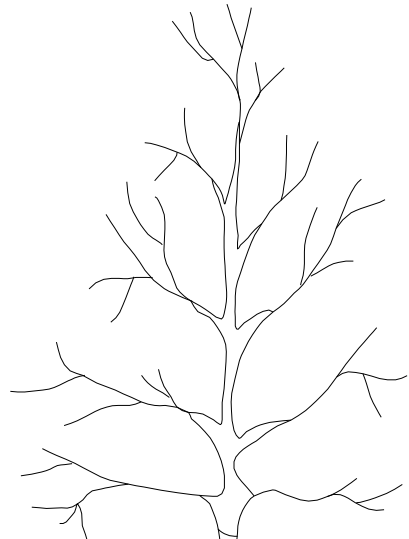


NOTES:

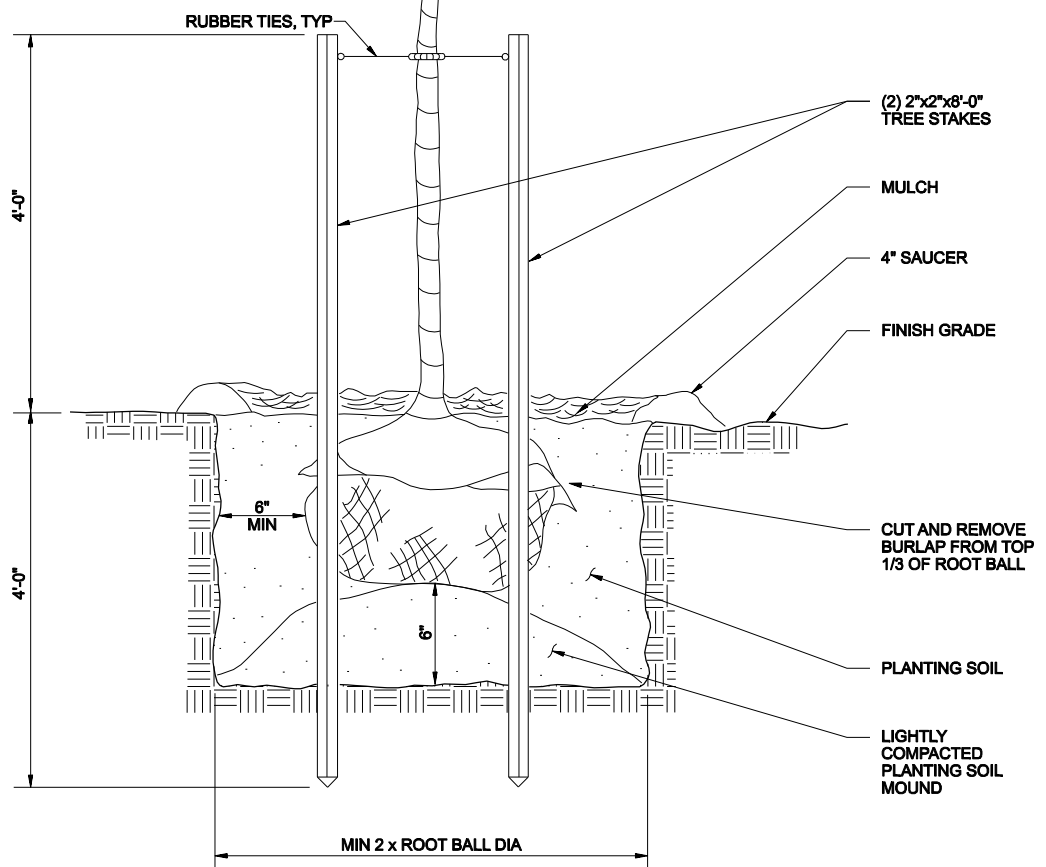
1. ALL SEAMS SHALL BE TAPED OR WEIGHTED DOWN FULL LENGTH. ALL SEAMS SHALL HAVE A MINIMUM 12" OVERLAP.
2. SEAMS PARALLEL TO THE SLOPE CONTOUR SHALL HAVE THE UPHILL SHEET OVERLAP THE DOWN HILL SHEET.
3. NO SURFACE RUN-OFF SHALL BE ALLOWED TO RUN UNDER THE PLASTIC COVERING.
4. DRAINAGE FROM AREAS COVERED BY REINFORCED PLASTIC SHEETING SHALL BE CONTROLLED SUCH THAT NO DISCHARGE OCCURS DIRECTLY ONTO UNCONTROLLED DISTURBED AREAS OF THE CONSTRUCTION SITE.

TEMPORARY STOCKPILE COVERING
PROPERTY IMPROVEMENTS
SOUTH MINNEAPOLIS RESIDENTIAL SOIL CONTAMINATION SITE

CH2MHILL

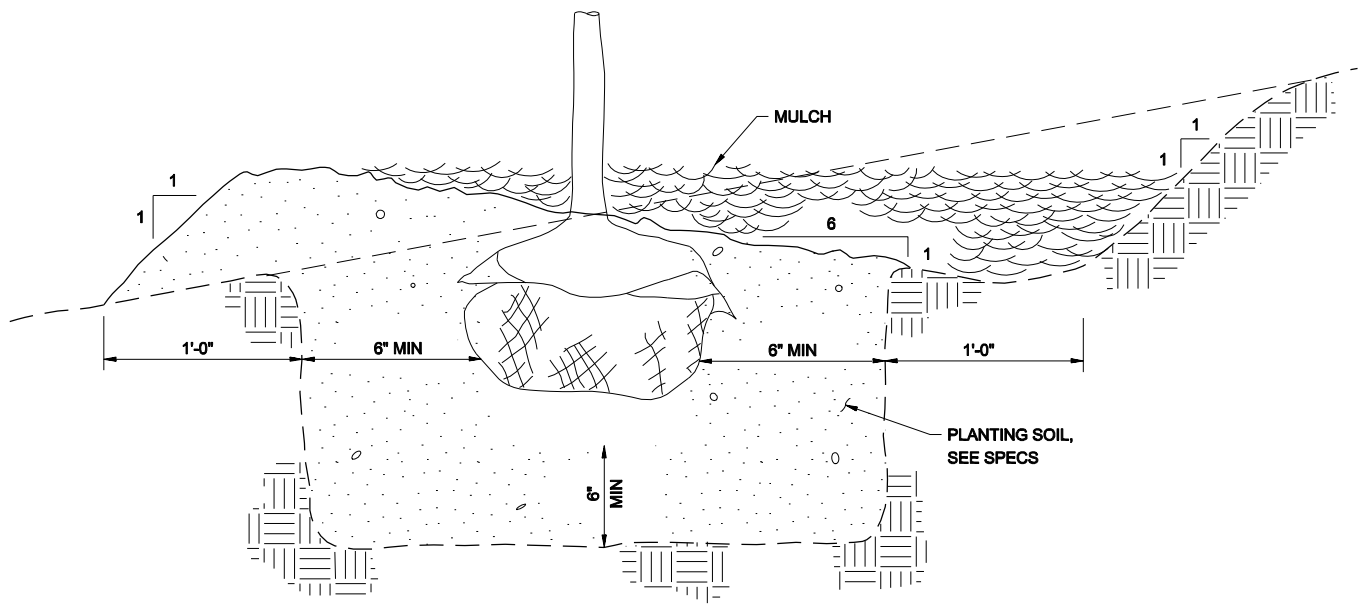


PLAN



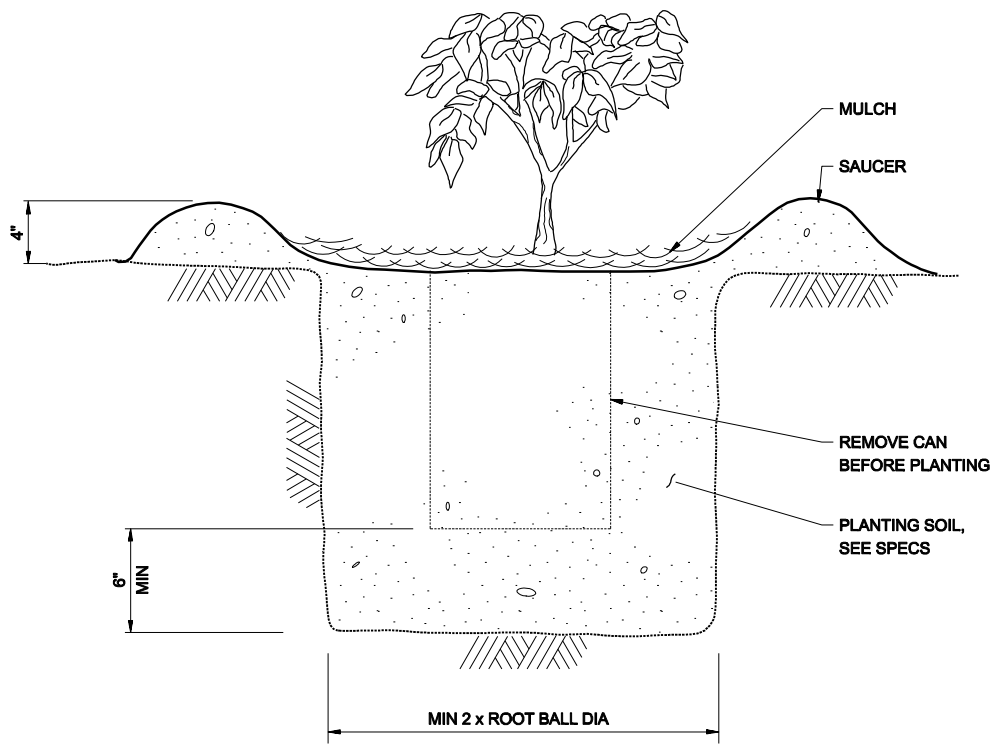
NOTE:

TREE SHALL BEAR SAME RELATION TO FINISH GRADE AS IT BORE TO PREVIOUS GRADE.



TREE PLANTING ON SLOPE
 PROPERTY IMPROVEMENTS
 SOUTH MINNEAPOLIS RESIDENTIAL SOIL CONTAMINATION SITE

CH2MHILL



SHRUB PLANTING FROM CONTAINER

PROPERTY IMPROVEMENTS
SOUTH MINNEAPOLIS RESIDENTIAL SOIL CONTAMINATION SITE

CH2MHILL