RAC V

RESPONSE ACTION CONTRACT FOR

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

SAMPLING AND ANALYSIS PLAN SOUTH MINNEAPOLIS NEIGHBORHOOD RESIDENTIAL SOIL CONTAMINATION SITE

Minneapolis, Minnesota
Remedial Investigation/Feasibility Study
WA No. 250-RICO-B58Y/Contract No. 68-W6-0025

PREPARED FOR

U.S. Environmental Protection Agency

PREPARED BY

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QUALITY ASSURANCE PROJECT PLAN

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Prepared by: CH2M HILL

Date: February 2006
Revised: April 2006

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Acronyms and Abbreviations

°C	degrees Celsius
%R	percent recovery
ASM	assistant site manager
CLP	Contract Laboratory Program
CMC	CMC Heartland Light Yard
CO	contracting officer
COC	chain-of-custody
DMP	Data Management Plan
DMS	Data Management System
DQO	data quality objective
EB	equipment blank
EDD	electronic data deliverable
ESAT	Environmental Services Assistance Team
FOP	field operating procedures
FORMS	Field Operations and Records Management System
FS	feasibility study
FSP	Field Sampling Plan
FTL	field team leader
GPS	global positioning system
ID	identification number
KA	contracts administrator
LIMS	Laboratory Information Management System
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MDL	method detection limit
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
PM	project manager
PO	project officer
ppm	parts per million
PRG	preliminary remediation goal
QAM	quality assurance manager
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
RAC	response action contract
RI	remedial investigation

RPD	relative percent difference
SM	site manager
SOP	standard operating procedure
South Minneapolis	South Minneapolis Neighborhood Residential Soil Contamination
USEPA	United States Environmental Protection Agency
WAM	work assignment manager

SECTION 1

Project Management

1.1 Introduction

The U.S. Environmental Protection Agency (USEPA) requires parties conducting environmental monitoring and measurement efforts mandated or supported by USEPA to participate in a centrally managed Quality Assurance Project Plan (QAPP). Parties generating data under this program must implement procedures so that the precision, accuracy, representativeness, completeness, and comparability of their data are known and documented. To meet this objective, a written QAPP must be prepared covering each project to be performed. All project participants, including subcontractors, must follow the procedures and protocols outlined in the QAPP.

This QAPP presents the organization, objectives, functional activities, and specific quality assurance (QA) and quality control (QC) activities for the remedial investigation/feasibility study (RI/FS) work being conducted at South Minneapolis Neighborhood Residential Soil Contamination (South Minneapolis) site.

This section provides an overall approach for managing the project, including:

- Project organization, roles, and responsibilities
- Problem definition and background information
- Project description and schedule
- Data quality objectives (DQOs) and criteria for measurement data
- Instructions for special training requirements/certification
- Instructions for documentation and records management

1.2 Project Organization

At the direction of USEPA Region 5, CH2M HILL is responsible for all phases of RI/FS work at the South Minneapolis site in accordance with the statement of work dated November 14, 2005, for Work Assignment No. 250-RICO-B58Y, Contract No. 68-W6-0025. The QA and management responsibilities of key project personnel are defined below and shown in Figure 1.

1.2.1 USEPA Region 5 Work Assignment Manager

USEPA's work assignment manager (WAM) has overall responsibility for all phases of the RI/FS. The WAM is also responsible for the review and approval of this QAPP. Timothy Prendiville is the WAM for the South Minneapolis site.

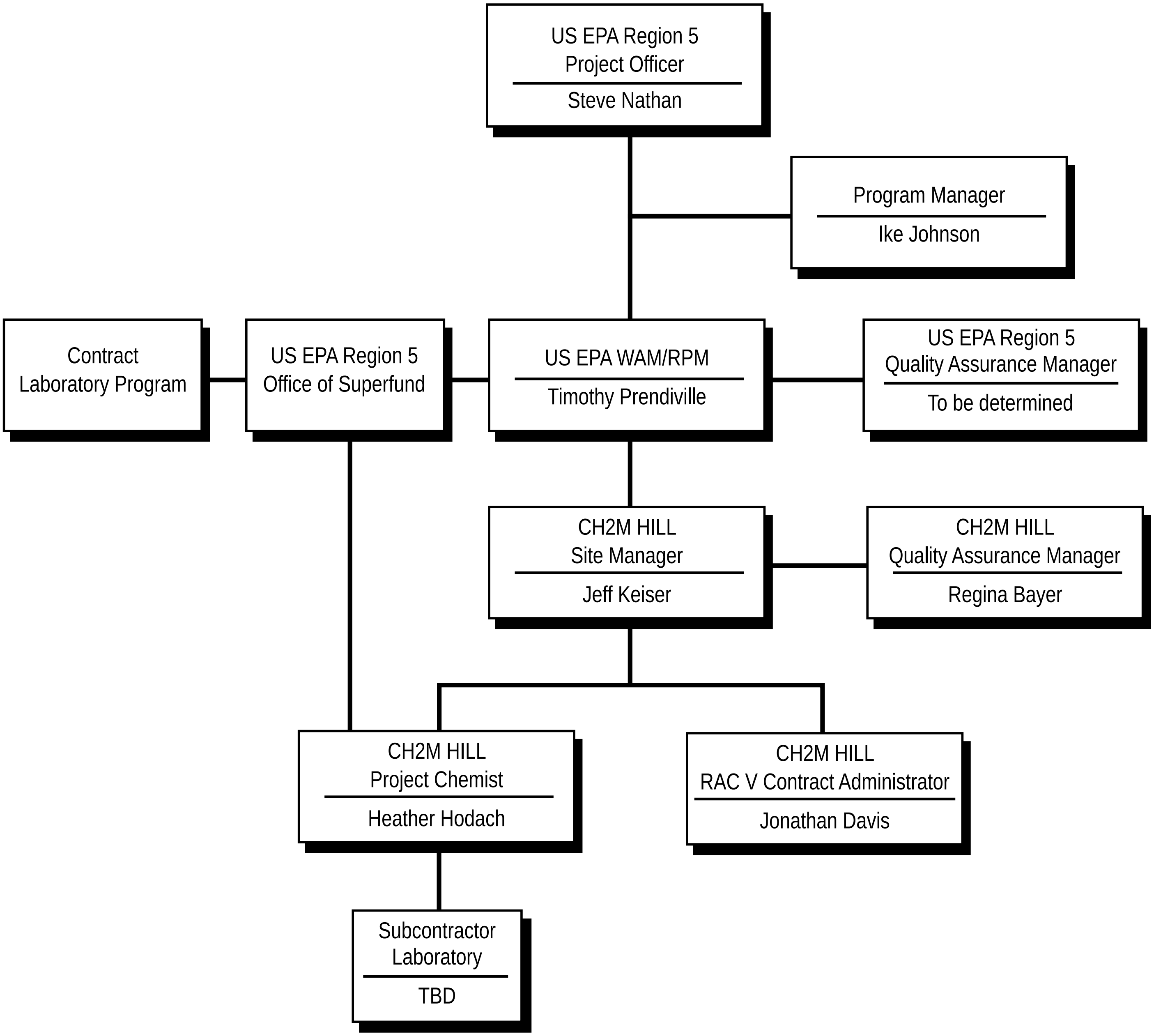


FIGURE 1
Project Organization Chart
South Minneapolis Soil Contamination Site
Remedial Investigation

ES022006006MKE 336752.PP.02 Org Chart 2-8-06mjl

1.2.2 USEPA Region 5 Quality Assurance Reviewer

The USEPA representative is responsible for reviewing and approving this QAPP. The representative is also responsible for overseeing the USEPA data validation effort of the Contract Laboratory Program (CLP) routine analytical services data.

1.2.3 CH2M HILL Program Manager

Ike Johnson, CH2M HILL's program manager, has overall responsibility for meeting USEPA's objectives and CH2M HILL's quality standards, as well as technical QC and project oversight.

1.2.4 CH2M HILL Quality Assurance Manager

Gina Bayer, CH2M HILL's quality assurance manager (QAM), will remain independent of direct job involvement and day-to-day operations. The QAM has the following responsibilities:

- Directing the QA review of the various phases of the project, as necessary
- Directing the review of QA plans and procedures
- Providing QA technical assistance to project staff, as necessary

The QAM also has direct access to management staff to resolve QA disputes, as necessary.

1.2.5 CH2M HILL Site Manager

Jeff Keiser is CH2M HILL's site manager (SM) responsible for implementing the project. As such, he is authorized to commit the resources necessary to meet project objectives and requirements. His primary function is to achieve the technical, financial, and scheduling objectives of the project. He will report directly to the USEPA Region 5 WAM and will be the major point of contact for matters concerning the project. The SM has the following responsibilities:

- Defining project objectives and developing a detailed work plan and schedule
- Establishing project policy and procedures to address the specific needs of the project as a whole, as well as the particular objectives of each task
- Acquiring and applying technical and corporate resources to meet budget and schedule constraints
- Orienting field leaders and support staff to the project's special considerations
- Monitoring and directing other team members
- Developing and meeting ongoing project or task staffing requirements, including mechanisms for reviewing and evaluating each task product
- Reviewing the work performed on each task to ensure quality, responsiveness, and timeliness

- Reviewing and analyzing overall task performance with regard to the planned schedule and budget
- Reviewing external reports (deliverables) before their submission to USEPA Region 5
- Representing the project team at meetings and public hearings

1.2.6 CH2M HILL Assistant Site Manager

Beth Rohde, the CH2M HILL assistant site manager (ASM) for the work described in this QAPP will assist the SM in producing a quality work product within the authorized schedule and budget. To accomplish this goal, the ASM will:

- Organize, direct, and control personnel and resources in the absence of the SM or as he delegates tasks
- Monitor subtask progress, quality, and adherence to authorized budgets and schedules
- Become a second point of communication with the USEPA contract management team—that is, the WAM, project officer (PO), contracting officer (CO), and the response action contract (RAC) management team, including the project manager (PM), QAM, and contracts administrator (KA) as necessary to keep them informed of the work progress

1.2.7 CH2M HILL Review Team Leader

As review team leader, Jeff Danko supports the SM in site management activities and coordinates CH2M HILL internal reviews. He will be involved in ongoing planning work.

1.2.8 CH2M HILL Project Chemist

Heather Hodach, CH2M HILL's project chemist, is responsible for tracking data and overseeing the data evaluation. Her specific responsibilities include the following:

- Scheduling the analytical laboratories
- Coordinating activities with laboratories and data validators
- Overseeing data validation and the production of results tables
- Evaluating data usability
- Overseeing the tracking of samples and data from the time of field collection until results are entered into a database

1.3 Problem Definition/Background Information

The South Minneapolis site is located in Minneapolis, Minnesota, in Hennepin County. Between 1989 and 2005, soil sampling investigations conducted by the Minnesota Department of Health (MDH), the Minnesota Department of Agriculture (MDA), and USEPA indicated the presence of elevated concentrations of arsenic. The site was originally defined as bounded to the west by 16th Avenue South, to the south by East 31st Street, to the east by Hiawatha Avenue, and to the north by East 25th Street. However, air dispersion modeling conducted by USEPA has indicated that the site may encompass a larger area as shown in Figures 1 and 2 of the Field Sampling Plan (FSP). The site is located primarily in an urban residential area, with some areas of commercial and industrial businesses.

1.4 Site History

From the 1930s through the 1960s, the former Reade Manufacturing property adjacent to Hiawatha Avenue produced arsenic-containing pesticides on the property. The former Reade Manufacturing property is now referred to as the CMC Heartland Light Yard (CMC Heartland) site after the real estate firm from Chicago, Illinois. Previous assessment of the CMC Heartland property indicated the presence of arsenic concentrations as high as 5,200 milligrams per kilogram (mg/kg) in surface soils. An entity called 2800 Hiawatha LLC purchased the property from CMC Heartland on August 8, 2005.

In the late 1990s, the MDA requested that clean fill be placed over the site to prevent further dispersal of arsenic-impacted soil from the site. Remediation of arsenic-impacted soil was conducted in 2004 and 2005 by CMC Heartland and US Borax. Further remediation was conducted by 2800 Hiawatha LLC when the site was developed in 2005. Remediation involved excavation, stabilization, and offsite disposal of arsenic-impacted soil.

1.5 Project Description and Schedule

1.5.1 Project Description

The objective of the remedial investigation is to define the nature and extent of contamination and assess if residual arsenic contamination poses potential risks to human health and the environment and to determine whether remedial actions are necessary.

Previous investigations determined that arsenic is present at levels that pose an imminent threat to human health and the environment. The analytical objectives are to collect data of sufficient quality for evaluation whether further removal action is necessary. Removal actions were previously performed when total arsenic concentrations exceeded 95 mg/kg. The action limit for removal actions will be evaluated as part of the risk assessment.

1.5.2 Project Schedule

CH2M HILL will begin sampling April 3, 2006. The sampling will take place in four 10-day sessions to complete sampling at the end of May 2006. This will include collection of composite surface soil samples and subsurface soil samples. Due to time constraints, the last 10-day session of samples will be analyzed and validated on a quick-turn schedule in order for final data to be submitted to CH2M HILL by June 15, 2006. Section 2 describes the sampling schedule and analyses in detail.

1.6 Data Quality Objectives and Criteria for Measurement Data

DQOs are qualitative and quantitative statements that specify the quality of data required to support decisions made during or after site-related activities. Project-specific DQOs are developed using the seven-step process presented below.

1.6.1 Step 1: State the Problem

It has been determined through previous investigations that soil at and around the South Minneapolis site, primarily within Phillips neighborhood, is contaminated with arsenic. The purpose of this project is to conduct an RI/FS of the South Minneapolis site in order to select a remedial action to eliminate, reduce, or control risks to human health and the environment. The goal is to collect the necessary amount of data to complete the human health risk assessment and ecological risk assessment, which will be presented in the RI/FS report.

The primary decision maker for this project is the USEPA WAM, who is responsible for all phases of the RI/FS activities at the South Minneapolis site.

1.6.2 Step 2: Identify the Decision

The remedial investigation has the following general objectives:

- Review previously collected data to evaluate the arsenic distribution to assess the spatial distribution and whether the arsenic results are the result of a random process, and to identify potential variability trends.
- Define the extent of contamination to assess if residual contamination poses potential risks to human health and/or the environment and to determine whether remedial actions are necessary.
- Conduct a screening level ecological investigation to observe and evaluate potential ecological habitat and receptors.

1.6.3 Step 3: Identify the Inputs to the Decision

Site Characterization

- Collect five-point composite soil samples at each proposed surface soil location from depths ranging from 0 to 3 inches below ground. The proposed locations consist of 2,920 residential properties with separate composite samples for the front and back yards, totaling approximately 5,840 sample locations. Approximately 400 contingency samples are expected. QA/QC samples will also be collected, resulting in approximately 7,190 samples.
- Collect subsurface soil samples at each of 60 proposed boring locations. Approximately 18 contingency samples are expected. Soil samples will be collected at 1-foot intervals from ground surface to 5 feet and another sample will be collected at 10 feet below ground surface. QA/QC samples will also be collected, resulting in approximately 440 samples.

1.6.4 Step 4: Define the Study Boundaries

The boundaries for this investigation are based upon the USEPA air dispersion model, also including any block bisected by this dispersion model. The USEPA air dispersion model includes all properties within a 0.75-mile radius from the former Reade Manufacturing property (FSP Figures 1 and 2), and 100 percent of the properties within the USEPA air dispersion model will be sampled, excluding properties within the boundaries of the dispersion model previously sampled by USEPA, MDA, and/or MDH.

1.6.5 Step 5: Develop a Decision Rule

Exceedance Levels

Arsenic concentrations in the soil samples will be compared to one half the background concentration levels. The project action limit determined for soil is summarized in Table 3.

1.6.6 Step 6: Specify Limits on Decision Errors

The probability of sampling and measurement errors at any site under investigation necessitates developing sampling guidelines and collecting QC samples. Field errors are minimized by having each member of the field team follow the same standard field operating procedures (FOPs) for sampling. Sampling techniques are discussed in detail in the FSP. QC samples are used to verify the accuracy and precision of the data. When a QC sample is outside the established control limits, the data will be qualified, and field corrective action will be implemented if applicable (for example, when field duplicates are outside of the established control limits). All field QC data will be evaluated against the DQOs prior to its use.

Decisions made on data that accurately reflect site conditions allows for remedial action evaluation and modification to achieve a reduction in risks to human health and the environment. Consequences of incorrect data decisions might include further migration of contaminants and potential increased risk to human health and the environment. The likelihood for incorrect decisions is minimized through controlling sampling and measurement errors through adherence to procedures as specified in this QAPP and the FSP.

1.6.7 Step 7: Optimizing the Design

The sampling design objective includes sampling 100 percent of the properties within the USEPA air dispersion model, excluding properties previously sampled. The results of these samples will be evaluated for usability and assessed to determine the human health and ecological risks presented by arsenic contamination and exceedances of the 95 parts per million (ppm) removal criteria. The data summaries and risk assessments will be used to select an appropriate remedial action to eliminate, reduce, or control human health and environmental risks.

1.6.8 Measurement Performance Criteria

The measurement performance criteria will be checked on several levels using:

- Built-in QC standards
- Senior review
- Management controls

The measurement data must abide by specific QC standards. Data that do not meet these standards are qualified accordingly. The analytical data and the QC results will be checked by the laboratory as stated in the USEPA CLP contract and CH2M HILL's project chemist.

CH2M HILL staff members with relevant technical experience will review all documents that pertain to the project's quality standards. The field team leader (FTL) will supervise activities to assess whether FOPs are being followed during field sampling activities. Section 3 describes specific QC checks and corrective action measures.

1.7 Instructions for Special Training Requirements/Certification

As noted in Section 1.2, Project Organization, project team members with the necessary experience and technical skills were chosen to perform required project tasks.

The CLP will meet the project-specific requirements and USEPA specifications. Project team members performing fieldwork will be required to show proof of meeting 29 Code of Federal Regulations 1910.120.

1.8 Instructions for Documentation and Records

1.8.1 Field Sampling Documentation

Field sampling activities will be recorded in field logbooks and property worksheets (FSP Appendix A). Field logbook and property worksheet entries will be described with as much detail as possible so that persons going to the site may reconstruct a particular situation without reliance on memory. Modifications to field sampling protocols must be documented in the field logbook. The FTL is responsible for ensuring that modifications to sampling protocols are also documented.

The field logbooks to be used will be bound field survey books or notebooks. The property worksheets will be separate sheets to go out with the field crews, but will be copied and stored in a three-ring binder in a secure location when not in use. Logbooks will be assigned to the field crew, but stored in a secure location when not in use. Project-specific document numbers will identify each logbook, the title page of which will contain:

- The name of the person to whom the logbook is assigned
- The logbook number
- The project name
- The project start date
- The project end date

At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be documented. Measurements and samples collected will be recorded with a detailed description of the location of the station. The number of all photographs taken will also be noted. Equipment used to make measurements will be identified, along with the date of calibration.

The property worksheets will include the names of field crew members, address of property, property ID, sample location name, and sample collection date and time. One half to the property worksheet will have space to map the five-point composite sample collection points in relation to property markers and for global positioning system (GPS) coordinates.

All entries will be made in ink, and no erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and initialed. Blank pages will be noted as being intentionally blank.

Samples will be collected following the sampling procedures documented in the FOPs in the FSP. Sample collection equipment will be identified, along with the time of sampling, sample description, parameters being analyzed, and number of containers used. Unique sample identification numbers (IDs) will be assigned to each sample as described in the FSP. Field duplicate samples, which will receive a unique sample ID, will be noted in the field logbook.

Field personnel will provide comprehensive documentation of all aspects of field sampling, field analysis, and sample chain-of-custody (COC). This documentation constitutes a record that allows for the reconstruction of field events to aid in the data review and interpretation process. All documents, records, and information relating to the performance of the field work will be retained in the project file.

1.8.2 Data Reporting

For the purposes of this investigation, two data reporting levels have been defined:

- **Level 1—Field Data and Health and Safety Reporting**. This level of minimal or "results only" reporting is used for the field data and health and safety monitoring, as extensive supporting documentation is not generated or required.
- **Level 3—Analytical Reporting**. Full CLP-equivalent reporting is required for all nonfield data.

Field Data Reporting

Information collected in the field through visual observation, manual measurement, and field instrumentation will be recorded in field notebooks and/or property worksheets and then entered into an electronic data log. The FTL or project chemist will review the data for adherence to this QAPP and consistency. Any concerns identified as a result of this review will be discussed with the QAM, corrected if possible, and incorporated into the data evaluation process.

Field data calculations, transfers, and interpretations will be conducted by the field crew and reviewed for accuracy by the FTL or project chemist. The appropriate task manager will review field documentation, data reduction, and accuracy of data entries into the data log. The data logs and documents will be checked for:

- General completeness
- Readability
- Use of appropriate procedures
- Whether modifications to sampling procedures are clearly stated
- Appropriate instrument calibration and maintenance records
- Reasonability of data collected
- Correctness of sample locations
- Correctness of reporting units, calculations, and interpretations

Where appropriate, field data forms and calculations will be processed and included as appendixes to the reports generated. Original field logs, documents, and data reductions will be kept in the project file.

Laboratory Data Reporting

All laboratory data will be reported in accordance with the USEPA CLP contract.

1.8.3 Electronic Analytical Record Format

Due to time constraints of the project, CH2M HILL requests that an electronic deliverable, including laboratory results, reporting limits, method detection limits, and final validator qualifiers be generated.

1.8.4 Project Record Maintenance and Storage

Project records will be stored and maintained in accordance with CH2M HILL's Data Management Plan (DMP; see Section 2.9). Each project team member is responsible for filing all project information or providing it to the project assistant familiar with the project filing system. Individual team members may maintain separate files or notebooks for individual tasks but must provide such materials to the project file room upon completion of each task.

The general project file categories are as follows:

- Correspondence
- Nonlaboratory project invoices and approvals by vendor
- Original unbound reports
- Nonlaboratory requests for proposals (solicitations), bids, contracts, and statements of work
- Field data
- Data evaluation and calculations
- Site reports from others
- Photographs
- Insurance documentation
- Laboratory analytical data and associated documents/memos
- Regulatory submittals, licensing, and permitting applications
- Site and reference material

- Health and safety plans
- Figures and drawings

A project-specific index of file contents must be kept with the project files at all times.

SECTION 2

Data Generation and Acquisition

This section describes the procedures for acquiring, collecting, handling, measuring, and managing data in support of this sampling activity. It addresses the following data generation and acquisition aspects:

- Sampling process design
- Sample handling and custody requirements
- Sampling method requirements
- Laboratory analytical method requirements
- Laboratory QC requirements
- Field and laboratory instrument calibration and frequency
- Inspection and acceptance requirements for supplies and consumables
- Data acquisition requirements
- Data management
- Field and laboratory instrument and equipment testing, inspection, and maintenance requirements

2.1 Sampling Process Design

The sampling locations best fulfill the project objectives stated in Step 2 of the DQO process. The sampling design consists of surface soil sampling and subsurface soil boring samples. For more information on proposed sample locations and quantities, refer to FSP Table 1. Table 1 of this QAPP summarizes the number of samples and what they will be analyzed for. Sampling will be performed according to the methods identified in the FSP.

TABLE 1
Sample Summary
South Minneapolis Soil Contamination Site—Minneapolis, Minnesota

Parameter	Matrix	Method	Estimated Total Samples[a]
Arsenic	Soil	ILM05.3	7,630

a Estimated total number of samples is inclusive of field samples and QC samples for all sampling events

2.1.1 Sampling Method Requirements

The FSP contains the following FOPs for field sampling method and decontamination procedures:

- FOP-01, Surface Soil Sampling
- FOP-02, Direct Push Soil Sample Collection
- FOP-03, Sample Handling, Packaging, and Shipping
- FOP-04, Field Logbook
- FOP-05, Chain-of-Custody
- FOP-06, Decontamination of Personnel and Equipment

Before sampling at a station, reusable (nondedicated) sampling equipment will be rinsed first with Alconox, then with distilled water, and air dried. Equipment blanks (EBs) will be collected by passing high-performance liquid chromotagraphy–grade laboratory water over decontaminated sampling equipment. The EBs will be analyzed for the same parameters as the field samples to assess the effectiveness of the decontamination procedures. Details can found in the FOPs in the FSP.

2.2 Sample Handling and Custody Requirements

2.2.1 Sample Handling and Preservation

Table 2 summarizes the sample preservation and holding requirements.

TABLE 2
Sample Containers, Preservations, and Holding Times
South Minneapolis Soil Contamination Site—Minneapolis, Minnesota

Parameter	Container	Preservation/Storage	Maximum Hold Time
Soil			
Arsenic	One 4 oz. glass jar	None	180 days

Corrective actions will be taken as soon as a problem is identified. Such actions may include discontinuing the use of a specific bottle lot; contacting the bottle suppliers for retesting the representative bottle from a suspect lot; resampling suspect samples; validating the data, taking into account that the contaminants could be introduced by the laboratory (for example, common laboratory solvents, sample handling artifacts) as a bottle QC problem; and determining whether the bottles and data are usable.

2.2.2 Sample Identification System

CH2M HILL has devised a sample numbering system that will be used to identify each sample, including duplicates and blanks. Detailed sample-numbering information is located in Section 4.1.1, Sample Identification, of the FSP.

2.2.3 Sample Packaging

Sample handling, packaging, and shipping procedures are described in Section 4.1.4, Sample Handling, Packaging, and Shipping, of the FSP. Sample coolers will be shipped to arrive at the laboratory the morning after sampling (priority overnight) or will be sent by a courier to arrive the same day. The CLP coordinator will be notified daily of the sample shipments and the estimated date of arrival of the samples being delivered.

Airbills

If samples are shipped, airbills will be retained to provide a record for sample shipment to the laboratory. Completed airbills will accompany shipped samples to the laboratory and be forwarded along with data packages. The airbill number will be documented on the COC form accompanying the samples to the laboratory for sample-tracking purposes. Airbills will be kept as part of the data packages in the project files.

2.2.4 Sample Custody

Accurate records and control of sample and data custody are necessary to provide relevant and defensible data. COC is addressed during field sample collection, data analyses in the laboratory, and through proper handling of project files. Persons will be considered to have custody of samples when samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured to prevent tampering. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel. Section 4.1.1, Sample Identification, of the FSP further discusses custody in the field.

COC forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. Field personnel designated as responsible for sample custody will fill out COC forms at each sampling site, at a group of sampling sites, or at the end of each day of sampling. When samples are relinquished by the designated sampling person to other sampling or field personnel, COC forms will be signed and dated by the appropriate personnel to document the custody transfer. Original COC forms will accompany samples to the laboratory, and copies will be forwarded to the project files.

Field Custody Procedures

COC forms will be required for all samples. The sampling crew in the field will initiate COC forms. COC forms will contain the sample's unique ID, sample date and time, sample description, sample type, preservation (if any), and analyses required. Original COC forms, signed by the sampling crew, will accompany the samples to the laboratory (see example forms in Appendix A). A copy of relinquished COC forms will be retained with the field documentation. COC forms will remain with the samples at all times. Samples and signed COC forms will remain in the sampling crew's possession until samples are delivered to the express carrier (Federal Express), hand delivered to the laboratory, or placed in secure storage.

Laboratory Custody Procedures

CLP laboratory custody procedures are outlined in the contract between USEPA and the approved CLP laboratories.

Laboratory Sample Receipt

CLP laboratory sample receipt procedures are outlined in the contract between USEPA and the approved CLP laboratories.

Laboratory Sample Storage

CLP laboratory sample storage procedures are outlined in the contract between USEPA and the approved CLP laboratories.

Laboratory Logbooks

CLP laboratory logbooks will be maintained as outlined in the contract between USEPA and the approved CLP laboratories.

Laboratory Project File

CLP laboratory project file will be maintained as outlined in the contract between USEPA and the approved CLP laboratories.

Computer Tape and Hard Copy Storage

CLP laboratory electronic and hard copy files will be maintained as outlined in the contract between USEPA and the approved CLP laboratories.

2.3 Analytical Method Requirements

Once the samples have been properly collected and documented, the soil samples will be submitted to the CLP. Samples will be analyzed in accordance with USEPA methods.

Table 3 lists the required methodologies and quantitation limits for the analyses to be performed during the RI/FS.

TABLE 3
Analytes and Reporting Limits
South Minneapolis Soil Contamination Site—Minneapolis, Minnesota

Parameter	CAS Number	Project Action Limit[a]	Project Reporting Limit	Achievable Lab MDLs	Project Method
Soil					
Arsenic	7440-38-2	5.0 mg/kg	1.0 mg/kg	0.171 mg/kg	ILM05.3

[a] Project Action Limit for soil is derived from one half of the background arsenic level.
MDL = method detection limit
mg/kg = milligrams per kilogram

2.3.1 Analytical Standard Operating Procedures

The CLP laboratory will follow the USEPA CLP statement of work for multimedia, multiconcentration inorganic analysis (ILM05.3) as outlined in the contract between USEPA and the approved CLP laboratories.

2.4 Quality Control Requirements

The CLP laboratory will follow quality control requirements as outlined in the contract between USEPA and the approved CLP laboratories.

2.4.1 Quality Control Samples

Field QC samples will be collected to determine the accuracy and precision of the analytical results. The QC sample frequencies are stated below. Sampling activities will be conducted in accordance with the Health and Safety Plan and all sample-handling procedures will be in accordance with this QAPP. Table 2 summarizes sample containers, holding times, and preservation requirements.

EBs will be collected to monitor cleanliness of sampling equipment and the effectiveness of decontamination procedures. Contamination from the sampling equipment can bias the analytical results high or lead to false positive results being reported. EBs will be prepared by filling sample containers with laboratory-grade analyte-free water that has been passed through a decontaminated or unused disposable sampling device (see FSP, Appendix A, for the FOP on equipment decontamination). The required QC limits for EB concentrations are to be less than the method's reporting limit. EBs will be sampled from every batch of nondedicated piece of sampling equipment; this results in a frequency of one EB per lot number of soil scoops. The results from the EBs will be assessed for bias resulting from contamination. If bias is present, the usability of the associated analytical results will be further assessed and qualified, as appropriate. EBs will only be analyzed in the event that nondedicated sampling equipment will be used.

Matrix spikes and matrix spike duplicates (MS/MSDs) will be used to assess the effects of sample matrix interference on the precision and accuracy of analyte recovery. MS/MSD pairs will be analyzed at a frequency of one pair for every 20 samples.

Field duplicates are collected in the field from a single aliquot of sample to determine the precision and accuracy of the field team's sampling procedures. Field duplicates will be collected and analyzed at a frequency of one duplicate for every 10 samples. The precision criteria for the duplicate samples will be ±30 percent in soil samples with concentrations greater than or equal to 5 ppm. Soil samples with concentrations less than 5 ppm will use ±50 percent. There are two sets of precision criteria because at low levels (less than 5 ppm) there is a larger percentage of "noise" or background that may affect the precision of the results as compared to the effects at a greater concentration.

The CLP laboratory will follow accuracy and precision control limits as specified in the contract between USEPA and the approved CLP laboratories.

2.4.2 Data Precision, Accuracy, and Completeness

Field QA/QC samples and laboratory internal QA/QC samples will be collected and analyzed to assess the data's usability. Laboratory internal QA/QC samples will be analyzed as specified in the contract between USEPA and the approved CLP laboratories. Completeness is the percentage of usable data obtained during the sampling event and its acceptance criteria is project-specific.

Precision

The precision of laboratory analysis will be assessed by the USEPA validators as stated in their contract with USEPA.

Duplicate samples are not addressed by the USEPA validators; CH2M HILL will assess the duplicate sample precision upon receipt of the final validated data from USEPA. The precision criteria for the duplicate samples will be ±50 percent in soil samples. When this QC limit is exceeded, sample results will be qualified "J" as estimated in quantity.

Accuracy

The accuracy of laboratory analysis will be assessed by the USEPA validators as stated in their contract with USEPA.

Completeness

The data completeness of laboratory analyses results will be assessed by CH2M HILL for compliance with the amount of data required for decision making. Complete data are data that are not rejected. Data qualified with qualifiers such as a "J" or a "UJ" are still deemed acceptable and can still be used to make project decisions. The completeness of the analytical data is calculated using the equation

$$\% \text{ Completeness} = [(\text{Valid data obtained})/(\text{Total data planned})] \times 100$$

The percent completeness goal for this sampling event is 90 percent.

Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the site. Representativeness is a qualitative "measure" of data quality.

The goal of achieving representative data in the field starts with a properly designed and executed sampling program that carefully considers the project's overall DQOs. Proper location controls and sample handling are critical to obtaining representative samples.

The goal of achieving representative data in the laboratory is measured by assessing accuracy and precision. A laboratory will provide representative data when all of the analytical systems are in control. Therefore, representativeness is a redundant DQO for laboratory systems if proper analytical procedures are followed and holding times are met.

Comparability

Comparability is the degree of confidence to which one data set can be compared to another. Comparability is a qualitative "measure" of data quality.

The goal of achieving comparable data in the field starts with a properly designed and executed sampling program that carefully considers the project's overall DQOs. Proper location controls and sample handling are critical to obtaining comparable samples.

The goal of achieving comparable data in the laboratory is measured by assessing accuracy and precision. A laboratory will provide comparable data when all of the analytical systems are in control. Therefore, comparability is a redundant DQO for laboratory systems if proper analytical procedures are followed and holding times are met.

Sensitivity

Sensitivity is the ability of the method or instrument to detect the contaminant of concern and other target compounds at the level of interest. Appropriate sampling and analytical methods will be selected (Tables 1 and 2) that have QC acceptance limits that support the achievement of established performance criteria. See Table 3 for project action limits and laboratory reporting limits. Assessment of analytical sensitivity will require thorough data validation. Soil samples do not require stabilization before sampling.

2.5 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

2.5.1 Field Instrument Maintenance

There will not be any field instruments used that require maintenance.

2.5.2 Laboratory Equipment/Instruments

All laboratory equipment and instruments will be maintained and monitored as specified in the USEPA CLP contract.

2.6 Instrument Calibration and Frequency

2.6.1 Laboratory Instruments

Calibration procedures for the laboratory equipment will be as specified in the USEPA CLP contract.

2.7 Inspection/Acceptance Requirements for Supplies and Consumables

It is expected that several contractors will provide various services under multiple project tasks. The required services must meet the task scope, specified levels of quality, and the submittal schedule. Project contractors or vendors should have contractual arrangements with their material suppliers.

2.8 Nondirect Measurements

This subsection describes the identity of the types of data needed for project implementation and decision making not obtained from direct measurements.

The project objectives are first identified, to assess what types of information are needed to implement a project plan to meet the objectives stated in Section 1. Typically, the data needed to achieve project objectives include site maps, sampling location selection and sample identifiers, laboratory method selection and detection limit verification, analytical parameter lists and critical values, field measurement lists, and a project schedule. This information is included in this QAPP.

The sampling design and rationale of the RI/FS sampling activities were based upon previously collected data. Site maps and other site characterization data were used in the selection of sample locations.

2.9 Data Management Plan

This DMP outlines the procedures for storing, handling, accessing, and securing data collected during this sampling event. Data gathered during this sampling event will be consolidated and compiled into a project database system that can be used to evaluate site conditions and data trends. This DMP will serve as a guide for all database users. The DMP is subject to future revision to allow the database management system to be modified as it is developed and maintained. This plan describes the following:

- The responsibilities of the project team for data management
- The Data Management System (DMS) to be established for the project
- The development of the base maps onto which the data will be plotted
- The types of data that will be entered into the DMS and the process of data entry

2.9.1 Team Organization and Responsibilities

The following are the team members and their responsibilities for the data management process:

- **Site Manager and Project Chemist—**Establishes the sample tracking system.
- **Project Chemist—**Tracks the COC forms and other sampling information. Oversees proper use of the USEPA Field Operations and Records Management System (FORMS) II Lite system and accuracy of the information entered. Reviews laboratory data for accuracy and quality and compares electronic outputs for accuracy to laboratory hard copies. Conducts tracking of samples, forwards tracking information and received data to the database manager, and identifies the data inputs (for example, sample numbers) to use in generating tables and plots. Reviews data outputs, such as result tables, before use in final documents and submission to client.
- **Database Manager—**Sets up DMS in consultation with the project chemist at the beginning of the data evaluation task. Oversees the data management process including data conversion/manual entry into DMS, QC of the entered data, and preparation of the required tables and plots of the data. Coordinates with person responsible for review of the entered data for QC purposes. Forwards all deliverables to the SM.

2.9.2 Sample Tracking

The project chemist is responsible for tracking samples to ensure that the analytical results for all samples sent for analysis are received. Copies of the COCs from the field team and/or FORMS II Lite exports are used to enter in/import sample IDs, collect date, and analyses. Samples being sent to the CLP will have their ship date tracked using the COCs from the field team; however, once the CLP receives the samples, they will be analyzed, then validated by USEPA's Environmental Services Assistance Team (ESAT) contractor. CH2M HILL will receive the validation summaries along with an EDD for all the sample data; the receipt of those deliverables will also be tracked. Validation qualifiers will be added to the database and results qualified accordingly.

2.9.3 Data Types

Activities performed at the site will involve accessing a number of different types of data collected or retained for various uses. The following provides a general description of the overall contents of the project database, as based upon the available data and the data to be collected.

Historical Data

Sources of historical data for the site include information collected by USEPA, MDA, and MDH to characterize onsite and offsite conditions. This information includes both chemical and physical data for the site. The historical data were reviewed by the SM/ASM, a risk assessor, and the database reviewed by a statistician.

Site Characterization Data

The QAPP, of which this DMP is a part, identifies additional data to be collected for further site characterization.

Data will be added to the project database as it become available. The data will include new data collected in the field and laboratory and reviewed by CH2M HILL. The data source will be noted in the database. Procedures for incorporating the data into the database are presented in subsequent sections of this DMP.

2.9.4 Data Tracking and Management

Every data set received from analytical laboratories will be tracked individually, as discussed in Section 2.9.2.

Hard Copy

CH2M HILL will receive hard copy validation reports with CLP Form I result forms from the USEPA ESAT contractors.

Data Input Procedures

Sampling information, analytical results, applicable QA/QC data, data validation qualifiers, and other field-related information will be entered into the project database for storage and retrieval during data evaluation and report development. The CLP results and qualifiers will be provided electronically to CH2M HILL by USEPA after the data has been validated. Printing validated data reports from the database and manually comparing them to the validated summary analytical forms received from the USEPA validators will confirm correct data entry.

Historical data, either in hard copy or electronic form, will be manually entered onto or formatted to standard EDD templates for database loading. The entry of other field-related data, as well as historical site data, will be confirmed by comparing the hard copy printouts from the database against the hard copies used to perform the data entry. All data entry confirmation procedures and results will be documented.

2.9.5 Computer Database

The technical data, field observations, laboratory analytical results and analytical data validation will be managed using EQuIS®, a third-party database system by Earthsoft Inc. that is used by USEPA Region 5 to store and analyze project data submissions. The core EQuIS applications are the chemistry and geology modules, each of which is associated with its own underlying Microsoft Access database. CH2M HILL currently owns licenses for the geology and chemistry modules. The EQuIS database system is based on a relational model, in which independent tables, each containing a certain type or entity of data, can be linked through selected fields that are common to two or more tables. This database design allows for the inclusion of historical data, and allows users to effectively conduct trend analysis and generate a variety of data reports to aid in data interpretation.

The database must be protected from unauthorized access, tampering, accidental deletions or additions, and data or program loss that can result from power outages or hardware failure. The following procedures will be adopted to ensure this protection:

- The master database will be stored on a network file server local to the installation of the EQuIS DMS. Members of the data management team involved in loading, modifying, or querying the database will be given access through EQuIS user accounts and passwords, as well as the appropriate network server permissions.
- Copies of the master database will be stored on the local area network file server for access by project staff through reporting tools developed to minimize possible database corruption by users. Whenever the master database is updated or modified, it will be recopied to the network to ensure that the current copy is available to users.
- Daily backups of the master database and its copies will be made to ensure that the data will not be lost due to problems with the network.

2.9.6 Documentation

Documentation of data management activities is critical because it provides:

- A hard copy record of project data management activities
- Reference information critical for database users
- Evidence that the activities have been properly planned, executed, and verified
- Continuity of data management operations when personnel changes occur

The DMP is the initial general documentation of the project data management efforts. Additional documentation will be maintained to document-specific issues, such as database structure definitions, database inventories, database maintenance, user requests, database issues and problems, and client contact.

2.9.7 Evidence File

The final evidence file will be the central repository for all documents that constitute evidence relevant to sampling and analysis activities. The CH2M HILL SM is the custodian of the evidence file and maintains the contents of the evidence files for the project, including relevant records, reports, logs, field notebooks, pictures, contractor reports, and data reviews in a secured area with limited access.

CH2M HILL will keep all records until project completion and closeout. As necessary, records may be transferred to an offsite records storage facility. The records storage facility must provide secure, controlled-access records storage. Records of raw analytical laboratory data, QA data, and reports will be kept by the subcontract laboratory for at least 7 years.

2.9.8 Presentation of Site Characterization Data

Depending on the data user needs, data presentation may consist of any of the following formats:

- Tabulated results of data summaries or raw data
- Figures showing concentration isopleths or location-specific concentrations

- Tables providing statistical evaluation or calculation results
- Presentation tools, such as ARCINFO, Surfer8, or similar analysis/presentation aids

Other data may also be collected during field efforts, such as soil types. This information will be stored in the project database. Other types of data elements may be added as the field investigation needs and activities evolve.

SECTION 3

Assessment and Oversight

3.1 Assessments and Response Actions

Field assessments will be performed to assess technical and procedural compliance with this QAPP. Performance and system audits are key to ensuring this compliance. The audits are conducted for the following purposes:

- Confirm that appropriate documents are properly completed and kept current and orderly
- Ensure measurement systems are accurate
- Identify nonconformance or deficiencies and to initiate necessary corrective actions
- Verify that field and laboratory QA procedures called for in this QAPP are properly followed and executed

The SM and FTL are responsible for ensuring conformance with FOPs (FSP Appendix A). Activities selected for audit will be evaluated against specified requirements, and the audit will include an evaluation of the method, procedures, and instructions. Documents and records will be examined as necessary to evaluate whether the QA program is effective and properly implemented. Reports and recommendations must be prepared on all audits and submitted to the QAM for retention in the project files.

3.1.1 Field Audits

Planning, scheduling, and conducting QA audits and surveillance are required to verify that site activities are being performed efficiently in conformance with approved plans, standards, federal and state regulatory requirements, sound scientific practices, and contractual requirements. Planned and scheduled audits may be performed to verify compliance with aspects of the QA program and to evaluate the effectiveness of the QA program. Audits include the following:

- Objective examination of work areas, activities, and processes
- Review of documents and records
- Interviews with project personnel
- Review of plans and standards

The FTL will conduct regular internal reviews of the sampling program during the investigation and pay particular attention to the sampling program with respect to representativeness, comparability, and completeness of the specific measurement parameters involved.

The FTL or a designee will review field documentation (COC forms, field daily sheets, and logbooks) as it is generated for accuracy, completeness, and compliance with QAPP requirements. The FTL will also periodically audit field sampling procedures for compliance with QAPP procedures. The auditor will check that the following are performed:

- Sampling protocols are followed.
- Samples are placed in proper containers.
- Samples are stored and transported properly.
- Field documentation is completed.

USEPA holds the right to perform field audits during sampling activities.

Field Corrective Action

Any project team member may initiate a field corrective action process. The process consists of identifying a problem, acting to eliminate it, monitoring the effectiveness of the corrective action, verifying that the problem has been eliminated, and documenting the corrective action.

Corrective actions include correcting COC forms, problems associated with sample collection, packaging, shipping, field record keeping, or additional training in sampling and analysis. Additional approaches may include resampling or evaluating and amending sampling procedures. The FTL will summarize the problem, establish possible causes, and designate the person responsible for a corrective action. The FTL will verify that the initial action has been taken and appears effective and will follow up to verify that the problem has been resolved.

Technical staff and project personnel will be responsible for reporting suspected technical or QA nonconformances or suspected deficiencies by reporting the situation to the FTL. The FTL will be responsible for assessing suspected problems in consultation with the QAM and the SM, and make a decision based on the situation's potential to impact data quality. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, the FTL will initiate a nonconformance report.

The FTL will be responsible for ensuring that corrective actions for nonconformances are initiated by:

- Evaluating all reported nonconformances
- Controlling additional work on nonconforming items
- Determining disposition or action to be taken
- Maintaining a log of nonconformances
- Reviewing nonconformance reports and corrective actions taken
- Ensuring that nonconformance reports are included in the final documentation in the project files

3.1.2 Laboratory Audits

Any CLP laboratory issues will be handled by USEPA in accordance with the USEPA CLP contract.

3.2 Reports to Management

In addition to the audit reports that may be submitted to the SM in accordance with this QAPP, the SM prepares a monthly progress report that addresses QA issues and corrective actions proposed or already taken. The progress report is submitted to the USEPA WAM. After sample results have been received from the laboratory and they have been evaluated, reduced, and tabulated, a data evaluation report will be submitted to USEPA that documents the field investigation.

SECTION 4

Data Validation and Usability

4.1 Data Review, Verification, and Validation

Data validation is the process by which data generated in support of a project are reviewed against the data QA/QC requirements. The data are evaluated for precision and accuracy against the analytical protocol requirements. Nonconformance or deficiencies that could affect the precision or accuracy of the reported result are identified and noted. The effect on the result is then considered when assessing whether the result is sufficient to achieve DQOs.

Deficiencies discovered as a result of data validation, as well as corrective actions implemented in response, will be documented and submitted in the form of a written report with supporting documentation supplied as check sheets. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA 2004) will be used as guidance on data validation procedures.

4.2 Validation and Verification Methods

The data validation process is conducted to assess the effect of the overall sampling and analysis process on the usability of the data. USEPA will perform data validation for all CLP-generated data for samples in a manner consistent with the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA 2004). Sample results will then be assigned a degree of usability based upon overall data quality.

The CH2M HILL project team will evaluate the data validation results. This evaluation will assess how the data, as qualified by the data validation, can be used on the project.

The data, after validation, will also be verified to assess if the correct samples were analyzed and the correct parameters were reported. The data are also verified to assess if the EDDs and the hard copy data deliverables are consistent with one another to assure an accurate database. Also, the data will be looked at in such a way as to see if the results make sense in comparison to what is anticipated. If the data are consistent with anticipated results, no corrective action will be deemed necessary; however, if the data obtained from the laboratory are not consistent with the anticipated results, an in-depth evaluation of the results may be necessary to interpret the deviation.

4.3 Reconciliation with Data Quality Objectives

The final activity of the data validation process is to assess whether the data fulfilled the planned objectives for the project. The final results, as adjusted for the findings of any data validation/data evaluation, will be checked against the DQOs. The data acquired from the additional site investigation should fulfill the project objective to fill in any data gaps left from previous site investigation and aid in determining the most appropriate remediation method.

The data collected from the RI/FS will be evaluated to assess if the project objectives have been met. The objectives will be met if all scheduled samples and data readings documented in this QAPP are obtainable, and all the data are deemed usable after validation and evaluation. If the objectives are not met, data collection will be required and implemented accordingly. If the data, after validation and evaluation, are sufficient to achieve project objectives, the QAM and SM will release the data and work may proceed.

SECTION 5

References

U.S. Environmental Protection Agency (USEPA). 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* OSWER 9240.1-45. USEPA 540-R-04-004.

U.S. Environmental Protection Agency (USEPA). 2005. *Statement of Work for Remedial Investigation/Feasibility Study–South Minneapolis Neighborhood Residential Soil Contamination Site.* USEPA 250-RICO-B58Y.

Appendix A
Chain-of-Custody and Sample Tag

USEPA Contract Laboratory Program
Generic Traffic Report / Chain-of-Custody Record

Case No.

DAS No. [redacted]

Region: 05	Date Shipped: [redacted]	Sampler (Signature) [redacted]	
Project Code: [redacted]	Carrier Name: [redacted]		
Account Code:	Airbill: [redacted]		
CERCLIS ID: [redacted]	Shipped to: [redacted]		
Spill ID: [redacted]		Relinquished By: [redacted]	Date / Time [redacted]	Received By:
Site Name/State: [redacted]		Relinquished By:	Date / Time	Received By:
Project Leader: [redacted]		Relinquished By:	Date / Time	Received By:
Action: [redacted]				
Sampling Co.: CH2MHill				

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ Preservative	STATION LOCATION	SAMPLE COLLECT DATE/TIME	SAMPLE No.	QC TYPE
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		--
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		--

Shipment for Case Complete? N	Sample(s) to be used for Laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number [redacted]

Analysis Key: Concentration: L = Low M = Low/Medium H = High Type/Designate: Composite = C Grab = G

[redacted]

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Contract Laboratory Analytical Services Support, 2000 Edmund Halley Dr, Reston, VA. 20191-3436 Phone: 703/264-9348 Fax 703/264-9222

TR Number: 05-405012729-040301-0001

F2V4.0

DESIGNATE

Grab

Comp.

Time

Month/Day/Year

Sample Number

Case # or Project Code

Samplers (signatures)

Station Number and Location

PRESERVATIVE: H_2SO_4 ☐ ICE ☐
HCL ☐ HNO_3 ☐ NaOH ☐ Other ☐

ANALYSES			
VOA		METALS	
ABN		CYANIDE	
PEST/PCB			
		Mercury	
Pesticides		Fluoride	
Herbicides		Nitrate/Nitrite	
PCB		TOC	
PCDD/PCDF		BOD	
2,3,7,8-TCDD		COD	
Ames Mutagen		TDS	
Asbestos		TSS	
Phosphorus		O&G	
Phenols		Sulfate	
PAH		Chloride	
TCLP		Sulfide	
TOX		Ammonia	
CBOD		Alkalinity	
Bio-Acute		Acidity	
Bio-Chronic		TKN	

Matrix:

Remarks:

USE FOR MS/MSD ☐

Tag Number	Lab Sample Number
5-036666	

FIELD SAMPLING PLAN

SOUTH MINNEAPOLIS NEIGHBORHOOD RESIDENTIAL SOIL CONTAMINATION SITE
Minneapolis, Minnesota

WA No. 250-RICO-B58Y/Contract No. 68-W6-0025

FEBRUARY 2006
Revised April 2006

Contents

Appendixes

Tables

Figures

Acronyms and Abbreviations

°C	degrees Celsius
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
B	back yard
bgs	below ground surface
CLP	Contract Laboratory Program
CMC	CMC Heartland Light Yard
EB	equipment blank
EDD	electronic data deliverable
F	front yard
FB	field blank
FOP	field operating procedures
FORMS	Field Operations and Records Management System
FSP	Field Sampling Plan
GPS	global positioning system
HPLC	high-performance liquid chromotagraphy–grade
ID	identification number
Legend	Legend Technical Services, Inc.
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
mg/kg	milligrams per kilogram
MPCA	Minnesota Pollution Control Agency
MS/MSD	matrix spike/matrix spike duplicate
NEIC	National Enforcement Investigations Center
OSWER	Office of Solid Waste and Emergency Response
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
REAC	Response Engineering and Analytical Contract
RI	remedial investigation
SB	subsurface boring sample
South Minneapolis	South Minneapolis Neighborhood Residential Soil Contamination
SS	surface sample
Tetra Tech	Tetra Tech EMI
USEPA	United States Environmental Protection Agency

SECTION 1

Introduction

This Field Sampling Plan (FSP) defines the procedures that will be used to perform the remedial investigation (RI) at the South Minneapolis Neighborhood Residential Soil Contamination (South Minneapolis) site, located in Minneapolis, Minnesota, in accordance with the statement of work for Work Assignment No. 250-RICO-B58Y. This FSP contains the following components:

- Section 1 describes the site location, project history and presents a general overview of the RI field activities.
- Section 2 describes the objectives: nature and extent of contamination, evaluation of risks to human health and the environment, and exceedances of the Agency for Toxic Substances and Disease Registry (ATSDR) criteria and approach for the sampling program, including contaminants of concern and the analytical program.
- Section 3 presents the field investigation program, including the field tasks, sampling equipment, and sampling procedures.
- Section 4 provides the general technical guidelines and procedures to be used during the RI. This section also identifies the sample identification, sample custody procedures, and quality assurance/quality control (QA/QC) requirements for sample collection, handling, and shipping.
- Section 5 provides the references cited in this document that were used to develop the model of existing conditions.
- Appendix A contains the field operating procedures (FOPs) for performing the sampling tasks, completing project forms, and decontamination activities.

1.1 Site Setting

The South Minneapolis site is located in Minneapolis, Minnesota, in Hennepin County. Between 1989 and 2005, soil sampling investigations conducted by the Minnesota Department of Health (MDH), the Minnesota Department of Agriculture (MDA), and U.S. Environmental Protection Agency (USEPA) indicated the presence of elevated concentrations of arsenic. The site was originally defined as bounded to the west by 16th Avenue South, to the south by East 31st Street, to the east by Hiawatha Avenue, and to the north by East 25th Street. However, air dispersion modeling conducted by USEPA has indicated that the site may encompass a larger area as shown in Figure 1. The site is located primarily in an urban residential area, with some areas of commercial and industrial businesses.

1.2 Site History

From the 1930s through the 1960s, the former Reade Manufacturing property adjacent to Hiawatha Avenue produced arsenic-containing pesticides on the property. The former Reade Manufacturing property is now referred to as the CMC Heartland Light Yard (CMC Heartland) site after the real estate firm from Chicago, Illinois. Previous assessment of the CMC Heartland property indicated the presence of arsenic concentrations as high as 5,200 milligrams per kilogram (mg/kg) in surface soils. An entity called 2800 Hiawatha LLC purchased the property from CMC Heartland on August 8, 2005.

In the late 1990s, the MDA requested that clean fill be placed over the site to prevent further dispersal of arsenic-contaminated soil from the site. Remediation of arsenic-impacted soil was conducted in 2004 and 2005 by CMC Heartland and US Borax. Further remediation was conducted by 2800 Hiawatha LLC when the site was developed in 2005. Remediation involved excavation, stabilization, and offsite disposal of arsenic-impacted soil.

1.3 Previous Investigations and Remediation

This section summarizes investigations conducted to date at the South Minneapolis site.

1.3.1 1989—Minnesota Department of Health Investigation

In 1999, MDH recommended soil sampling in residential areas due to elevated concentrations of arsenic at the CHC Heartland site. Prevailing summer winds were determined to be toward the northwest; therefore, the residential area, located directly downwind of the CMC Heartland property, became the focus of the sampling effort (USEPA, 2005).

1.3.2 2001—Minnesota Department of Agriculture

In June 2001, MDA in conjunction with MDH conducted a limited sampling event that included collecting soil samples at depth intervals of 0 to 3 inches and 3 to 6 inches below grade at 22 properties in the Phillips neighborhood. Results of the 2001 MDA sampling event indicated arsenic concentrations (24 to 210 mg/kg) in soil at 10 of the 22 properties sampled, primarily from the 0- to 3-inch depth interval. MDA and MDH established 4 to 5 mg/kg as the background arsenic concentration in the sampling area. Based on the June 2001 sampling event and neighborhood concerns, MDA and MDH determined that more extensive sampling in the Phillips neighborhood was warranted.

1.3.3 2003—Minnesota Department of Agriculture

In September 2003, under contract to MDA, Delta Environmental Consultants Inc. conducted a second, more extensive sampling event in the Phillips neighborhood. The objective of the sampling event was to obtain statistically valid data in an attempt to attribute the elevated arsenic concentrations in the Phillips neighborhood to wind deposition of impacted soil from the CMC Heartland property. The sampling design was developed as a grid overlain on the Phillips neighborhood with the majority of samples falling on residential properties. MDA collected 277 samples from 242 sampling locations.

The results of the MDA sampling event identified 35 samples with arsenic concentrations greater than or equal to the Minnesota Pollution Control Agency (MPCA) unrestricted land use standard of 10 mg/kg. Eleven samples contained arsenic concentrations at least 10 times the unrestricted land use standard (100 mg/kg), and four samples contained arsenic concentrations exceeding 250 mg/kg, with a maximum concentration of 635 mg/kg.

1.3.4 2004-2005—USEPA REAC

Based on the sampling conducted in the Phillips neighborhood, USEPA, upon consultation with MDH and ATSDR, determined that an imminent threat to human health existed related to the elevated arsenic concentrations in surface soils. USEPA and ATSDR determined that an arsenic concentration equal to or greater than 95 mg/kg in surface soils posed an acute risk to human health and warranted emergency removal actions.

Based on the multiple sampling events conducted in the Phillips neighborhood, 30 properties were identified that exceeded the 95 mg/kg criteria. To mitigate this threat, removal activities included excavating the top 12 inches of soil from the yard, and the top 18 inches of soil from play areas and gardens. Excavation activities commenced on 29 of the 30 properties on October 19, 2004, and were completed on December 2, 2004, prior to arrival of inclement weather. USEPA remobilized to the site in May 2005 to complete excavation at the 30th property.

On average, 106 cubic yards of arsenic-impacted soil was removed from each property. Post-excavation soil samples were collected by USEPA's Response Engineering and Analytical Contract (REAC) contractor. REAC collected four-point composite samples from each major portion of that the property that had been remediated (front yard and back yard typically). The samples were submitted to Legend Technical Services, Inc. (Legend) for analysis to document the residual concentrations of arsenic in each yard. Regardless of post-excavation sampling results, the properties were backfilled to pre-existing grade with clean topsoil and seeded with grass seed following removal of impacted soil.

1.3.5 2005—USEPA START

In August 2005, Tetra Tech EMI (Tetra Tech), under contract to USEPA, sampled 540 additional properties in the Phillips neighborhood to ensure that 100 percent of the residential properties most likely to be impacted by wind deposition from the CMC Heartland site were evaluated for potential impacts. Another 60 properties, distributed in a grid pattern over a 1-mile radius surrounding the CMC Heartland property were also sampled in an effort to identify other areas that may be impacted. That sampling found another 30 properties with arsenic concentrations above 95 mg/kg. Two of those properties were located outside of the 100 percent sampling area.

1.4 Overview of the Field Sampling

The remedial investigation has the following objectives:

- Define the nature and extent of contamination
- Assess whether residual arsenic contamination poses potential risks to human health and the environment
- Determine whether remedial actions are necessary

The specific sampling objectives and data collection rationale and methodologies for the different media are discussed in detail in the following sections.

SECTION 2

Sample Rationale

2.1 Project Objective

The overall objective of the project is to conduct field sampling of the South Minneapolis site in order to select a remedial action to eliminate, reduce, or control risks to human health and the environment. The goal is to collect the minimum amount of data necessary to complete a human health risk assessment and determine if additional removal activities are warranted.

2.2 Conceptual Site Model

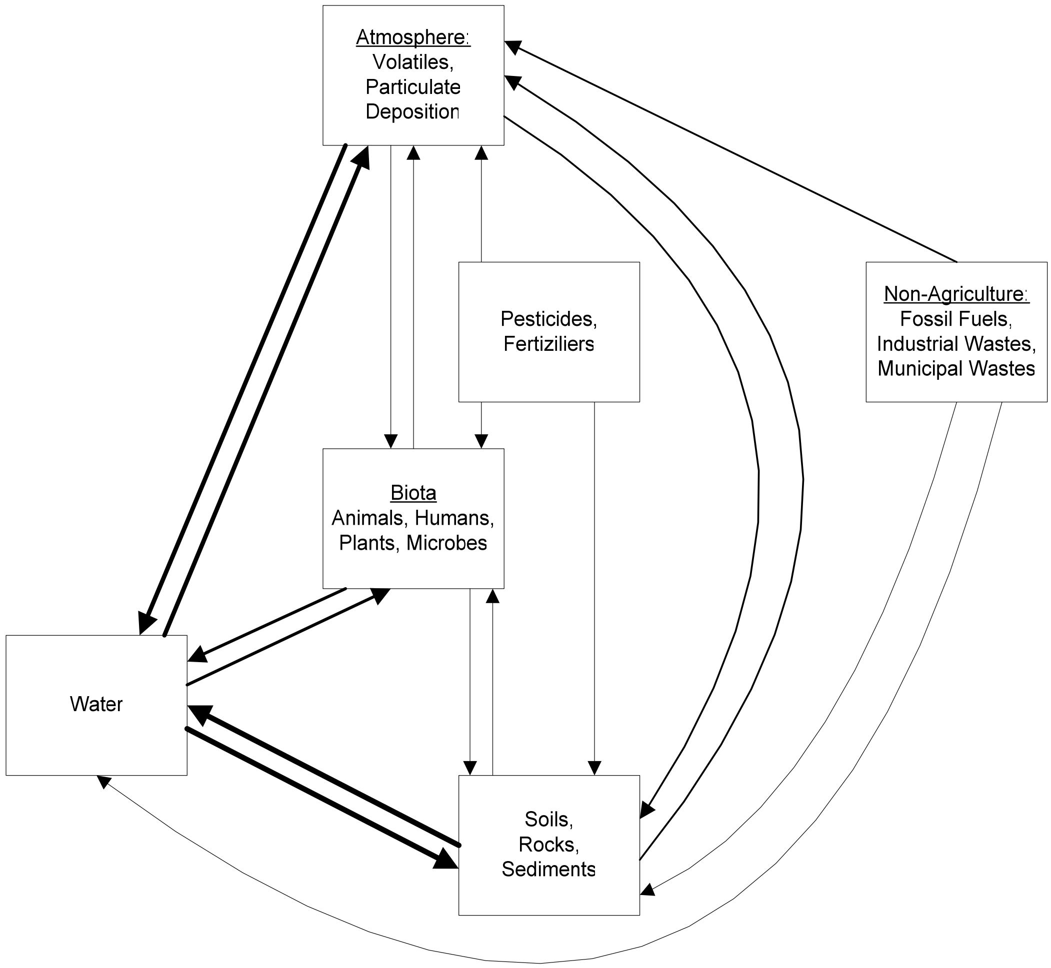
Arsenic was present in the form of arsenic trioxide (As_2O_3) in arsenical pesticides manufactured at Reade Manufacturing from the 1930s to 1960s. The arsenical pesticides are believed to have been transported by aerial dispersion while loading the pesticide on railcars. An aerial dispersion model performed by the USEPA Fields Group identified a potential boundary within which deposition of the arsenical pesticides may have occurred. The scope of this FSP includes sampling within the model boundary to identify arsenic impacts in residential properties.

Arsenic is mobile in the environment through different mechanisms. Arsenic can be transferred through oxidation, reduction, adsorption, dissolution, precipitation, and volatilization (Nriagu, 1994). A simplified model of the arsenic transfer cycle is provided below. The bolder arrows indicate the more dominant mechanisms.

The human health risk assessment will evaluate potential exposures by residents from three potential pathways:

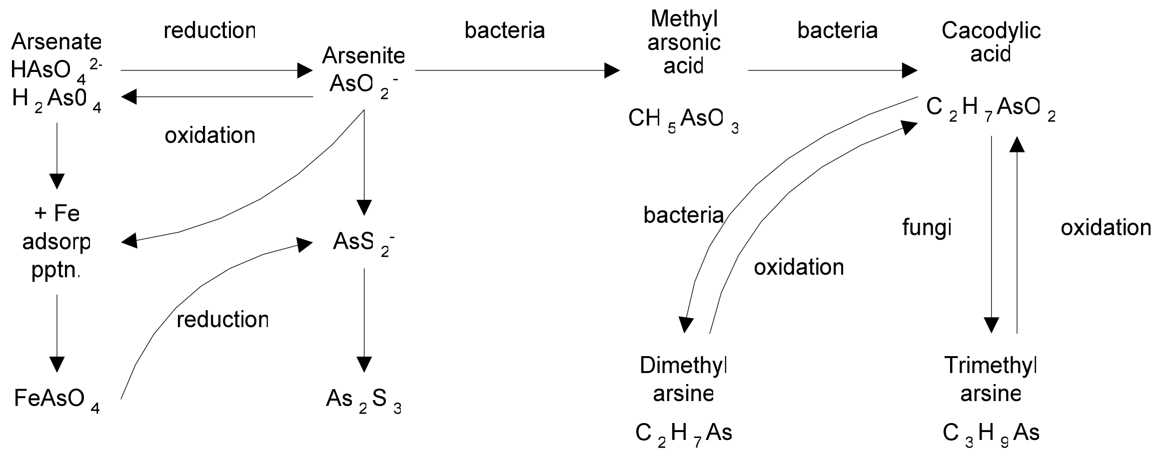
- Direct contact
- Inhalation
- Ingestion

Groundwater will not be evaluated as an exposure route. Remedial actions performed at the CMC Heartland site (former Reade Manufacturing site) included excavation of highly contaminated soils to minimize loading to the groundwater. A municipal water supply is used in the area, and private wells have not been identified during previous investigations.



Cyclic transfer of arsenic
modified from Arsenic in the Environment Part I: Cycling and Characterization, Nriagu, 1994

In soils, arsenic can be subjected to oxidation, reduction, and methylation reactions in either the trivalent or pentavalent state (Nriagu, 1994). The chemical transformations of arsenic in soils are illustrated below.



Transformations of arsenic in soils
modified from Arsenic in the Environment Part I: Cycling and Characterization, Nriagu, 1994

A conversation with Mr. Eric Crecelius, an industry expert on arsenic at Battelle/Marine Sciences Laboratory, confirmed that arsenic may no longer be present in the soils in the original valence state. Due to the potential transformations which can occur, analysis will be performed for total arsenic.

Mr. Crecelius indicated that if it was possible to determine a relationship with another pesticide constituent (for example, a trace metal), then this second constituent could be sampled for with the arsenic, and the fingerprint could be used to determine nature and extent. The USEPA Fields Group had previously performed a small-scale study using X-ray florescence and offsite laboratories. Even though the study was limited, the evaluation of the results did not indicate that a correlation between arsenic and other metals exists.

2.3 Analytical Program

In developing the general chemical analytical program for the South Minneapolis site FSP, the project objectives and the following elements were considered:

- Identification of constituents of concern with respect to historical operations and the results of previous investigations
- Fate and transport of the constituents of concern in the environment
- Determination of appropriate and acceptable analytical methodology that meets the data quality objectives, including site-specific applicable or relevant and appropriate requirements
- Determination of an effective analytical program with appropriate QA/QC requirements

2.3.1 Constituents of Concern

Constituents of concern are those most likely to contribute a risk as a result of exposure. Based on the results of the previous investigations, the primary contaminant at the site is arsenic. Due to the mobility and transformation of arsenic to different valence states, analysis will be performed for total arsenic.

2.3.2 Analytical Objectives

Previous investigations determined that arsenic is present at levels that pose an imminent threat to human health and the environment. The analytical objectives are to collect data of sufficient quality to determine whether further removal action is necessary. Removal actions were previously performed when total arsenic concentrations exceeded 95 mg/kg. The action limit for future removal actions will be evaluated as part of the risk assessment.

2.3.3 Laboratory Analysis

Samples will be analyzed by a Contract Laboratory Program (CLP) laboratory procured by USEPA for total arsenic. The samples collected as part of the field investigation will be collected as outlined in the Quality Assurance Project Plan (QAPP).

2.4 Investigation

CH2M HILL conducted site visits conducted and existing data from the previous investigations were evaluated and used to develop the preliminary conceptual model of the existing site conditions. The *Final Work Plan* (CH2M HILL, 2006) recommends additional investigations as described in this FSP. Table 1 presents specific sampling objectives and approaches developed based on the preliminary conceptual model.

TABLE 1
Summary of Sample Locations and Rationale for Sampling
South Minneapolis Neighborhood Residential Soil Contamination Site—Minneapolis, Minnesota

Overall Object of Sampling	Media	General Location Description	Collection Method and Analysis	Sample Depth	Rationale for Sampling
Characterize distribution of total arsenic in surficial soils*	Soil	Residential parcels within the aerial dispersion model (Figure 1), which includes 2,920 previously unsampled properties. This involves a front and back yard sample from each property.	Five-point composite sample from the front yard and five-point composite sample from the back yard. Analysis: total arsenic (Method 6010B/6020).	0–3 in*	Determine spatial distribution to evaluate properties with elevated concentrations which may require future remedial actions.
Characterize vertical distribution of arsenic in soils	Soil	Select residential parcels within the aerial dispersion model (Figure 2), which includes 60 properties with samples collected from ground surface to a depth of 10 feet. Properties will be selected in the field along the transects shown on Figure 2	Grab sample by direct push soil sampling. Analysis: total arsenic (Method 6010B/6020).	0–1 ft 1-2 ft 2-3 ft 3-4 ft 4-5 ft 10 ft	Characterize vertical extent on properties with background, moderate, and elevated concentrations. Samples will be collected on transects from the site to determine if any directional trends exist in the vertical extents. The depth of 10 feet represents the vertical extent which may be encountered during residential foundation construction.

* The sample will be collected after the surface vegetation is removed.

SECTION 3

Field Investigation Program

The specific investigation objectives were developed based on observations during the site visits, available information on past activities and suspected source areas, and available soil analytical data.

3.1 Objectives

The field investigation has the following objectives:

- Perform site reconnaissance activities, including coordinating access with property owners and identifying sampling locations
- Sample surface and subsurface soil from residential areas within the limits of the USEPA air dispersion model

3.2 Tasks

The following tasks will be performed to complete the field investigation objectives:

- Mobilization
- Site preparation
- Surface soil sampling
- Direct push subsurface soil sampling
- Surveying
- Disposal of investigation-derived waste
- Demobilization

3.3 Field Operations and Procedures

This section provides an overview of the equipment, operations, and procedures that will be used during the field sampling effort. It also references specific FOPs in Appendix A that provide step-by-step procedures for conducting the field task. In the instances where FOPs are not referenced, the text of that section serves as the FOP.

3.3.1 Mobilization

This task consists of mobilizing equipment and personnel before the sampling event.

3.3.2 Site Preparation

The following activities will be performed as part of site preparation:

- Review property maps and other data to assess the properties to be sampled

- Conduct health and safety briefing of field team members
- Transport field supplies and monitoring equipment to the site
- Perform site reconnaissance activities to verify property usage, sizes, and other factors which may influence sampling
- Contact local utilities to get underground clearance for direct push soil sampling locations
- Confirm the analytical schedule with the CLP laboratory
- Schedule the mobilization of the direct push rig to the site
- Schedule the mobilization of survey equipment to the site with the surveying subcontractor
- Order field supplies and sample containers
- Coordinate with MDA to identify property owners where sampling is proposed; MDA will obtain access for the sampling activities

3.3.3 Sampling

Surface Soil Sampling

Surface soil samples will be collected from the front and back yards of previously unsampled properties within the USEPA air dispersion model boundaries. Surface soil sampling procedures are described in FOP-01, Surface Soil Sampling in Residential Areas (Appendix A).

A five-point composite of soil will be collected at each proposed composite soil sample location. The locations of the composite points will be from near the corners and the center of the front or back yard. Samples will be collected with sterilized and individually wrapped 2-ounce plastic scoops. If grass is present, grass will be removed with the disposable scoop prior to collection of the soil sample. The soil will be composited in disposable plastic bags that can be sealed. The depth of the soil samples will range from 0 to 3 inches below ground surface (bgs). The composite soil sample will be submitted to an offsite CLP laboratory for total arsenic analysis.

The five-point composites for replicate will be collected as shown on Figure 1 of FOP-01.

Sample locations will be evaluated so that samples are not collected immediately adjacent to or under wooden decks, landscaping timbers, telephone poles, wooden picnic tables, or other treated lumber. Samples will also not be collected from areas covered by woodchips, mulch, gravel, or other materials.

Field sampling teams will use a hand-held global positioning system (GPS) unit to locate the center of the five-point composite sample. Data sheets will be completed in the field for each property. Information on the data sheets will include a sketch of the property showing approximate property dimensions with the house, driveway, and five-point composite locations identified; street address; sample identification number (ID); GPS coordinates for the center of the five-point composite; date and time; and any comments or observations of the field sampling team. A sample data sheet is attached in FOP-01, Surface Soil Sampling in Residential Areas (Appendix A).

In order to correlate this data with previous investigations, approximately 5 to 10 percent of the previously sampled properties may be resampled. Properties where removal actions have taken place will not be resampled.

Subsurface Soil Sampling

At selected properties, subsurface samples will be collected using a direct push soil sampling techniques (for example, Geoprobe®). A nominal 1-inch-outside-diameter sampler will be driven to the desired sampling depth. Samples will be collected from five locations at the selected properties. Samples will be collected at 1-foot intervals to a depth of 5 feet. One additional sample will be collected at 10 feet bgs. The samples will be submitted to the CLP laboratory for total arsenic analysis. Subsurface soil sampling procedures are described in FOP-02, Direct Push Soil Sample Collection (Appendix A).

Four properties with arsenic concentrations exceeding 95 mg/kg were identified during previous investigations, but removal actions have not yet been implemented. These four properties will have subsurface samples collected prior to removal actions. Additional properties on transects at various distances from the CMC Heartland site will be identified as potential locations for subsurface sampling. The selected locations will be used to evaluate vertical trends at various distances and directions from the site and trends at properties with background, moderate, and elevated arsenic concentrations.

A CH2M HILL field representative will supervise the direct push sampling and log each boring. Soil samples will be classified in general accordance with the Unified Soil Classification System, American Society for Testing and Materials (ASTM) D2488.

3.3.4 Surveying

During subsurface soil sampling activities, a survey crew will be onsite to provide obtain coordinates and ground surface elevations at each boring location. Coordinates for the surface samples will be collected with hand-held GPS units during sampling activities.

3.3.5 Dispose of Investigation Derived Waste

Personal protective equipment and disposable sampling equipment generated during the site investigation will be disposed in solid waste receptacles. Soils generated during surface soil or direct push soil sampling will be placed back at the sample location or archived. Liquids generated during decontamination of the downhole direct push sampling equipment will be disposed in the sanitary sewer.

3.3.6 Demobilization

At the completion of fieldwork, personnel, equipment, and supplies will be demobilized from the site.

SECTION 4

General Field Operations

4.1 Sample Management

This section describes the procedures to be implemented to containerize, preserve, ship, and otherwise handle environmental samples in a manner that will maintain sample integrity. The use of these techniques will provide representative samples and will reduce the possibility of sample contamination from external sources.

4.1.1 Sample Identification

A sample numbering system will be used to identify each sample, including duplicate and blank samples. The sample number will be a unique identifier, required by Earthsoft's EQuIS® Site Management software and compatible with USEPA's EDMAN electronic data deliverable (EDD) format.

Each sample, regardless of analytical protocol, also will be assigned a CH2M HILL site-specific identifier that will contain a property- and sample-specific location identifier, indicating where the sample was obtained. Subsurface soil samples will also use a numbering system that will include the sample depth.

The sample number and station location identifier will be included on the sample tag and the traffic report/chain-of-custody record.

The site-specific identifier is based on the following system:

- **Block ID—**As shown in Figure 1, a sampling grid has been established for the site identifying each block with a unique ID. The grid separates the site into four quadrants from the CMC Heartland site. Blocks are identified by the number of blocks they are located in each direction relative to the site. The block ID begins with the north/south direction followed by a single-digit number of blocks in that direction from the site. This is repeated for the east/west direction with a two-digit number of blocks in that direction from the site. For example, a block located four blocks north and seven blocks west of the CMC Heartland site would be identified as N4W07.
- **Property ID—**The property ID begins with the five-digit block ID (for example, N4W07) followed by a property-specific designation within that block. The property-specific designations are generally assigned starting with 1, generally at a corner of the block, and increasing clockwise around the block (for example, N4W07-1).
- **Sample location—**Sample location identifiers will define the sample location within the property. The property ID will be followed by a single letter to identify the sample location as follows:
  - **F—**front yard

  - **B—**back yard

- **Sample type—**This identifier is the unique name of the sampling location (for example, soil boring, surface soil). The location name will vary depending on the reason for sampling and the number assigned to that location. Two letters will indicate one of the following types of sample locations:

  - **SB—**subsurface boring sample
  - **SS**—surface sample

- **Depth indicator—**Depth indicator codes, if applicable, will follow the station location as indicated below:

  - **Subsurface soil samples—**The sample depth will be appended to the sample type SB and consist of a hyphen followed by the starting and bottom depth intervals separated by an underscore. This indicator will provide the depth that represents the start and end of the sample interval in feet below ground. For example, the sample depth designation will be "_2-3" for the sample collected from an interval of 2 to 3 feet below ground. A subsurface soil sample taken from the depth of 2 to 3 feet in the front yard of property 1 in the block located four blocks north and seven blocks west of the CMC Heartland site would be identified as N4W07-1F-SB_2-3.

- **QA/QC identifier**—Field QA/QC samples will be identified using the following identifiers:

  - Field duplicates and replicates, which are associated with the same sample location as the native sample, are identified with a "D or R" (for "replicate") appended to the end of the ID. For example, the duplicate may be labeled N4W07-1F-SB_2-3R.

  - Equipment blanks, which are not associated with an individual location, are numbered sequentially. Different equipment will be used for each sampling type, so individual equipment blank sequences will be used for each sample type. Equipment blanks will be collected at a frequency of one sample per case of 100 sample scoops for surface sampling and one sample per week for the subsurface boring sampling. Equipment blanks will first be identified by the sample type as follows:

    - **SB—**subsurface boring sample
    - **SS—**surface sample

    The sample type indicator will be followed by a dash and EB for equipment blank with the sequential number. The first equipment blank for surface samples would be SS-EB-1.

  - Field blanks, which are not associated with an individual location, are numbered sequentially. Field blanks will also be collected for the different sampling types since the work will be performed in different areas. Field blanks will be collected at a frequency of one field blank per week for each sample type that is being performed that week. Field blanks will first be identified by the sample type as follows:

    - **SB—**subsurface boring sample
    - **SS—**surface sample

The sample type indicator will be followed by a dash and FB for field blank with the sequential number. The first field blank for surface samples would be SS-FB-1.

- **Laboratory QA/QC samples—** A sample collected for laboratory QC (such as a laboratory spike sample) is considered to be a single sample. Consequently, all laboratory QC samples are assigned a single sample ID. Laboratory QC samples are not identified in the sample ID but rather are called out on the chain-of-custody form in the *Samples to be used for laboratory QC* field and on the sample tag.

4.1.2 Sample Containers

Contaminant-free sample containers will be purchased from an approved vendor or prepared by the contracted laboratory. Sample containers for laboratory analyses will meet or exceed the requirements specified in Office of Solid Waste and Emergency Response (OSWER) Directive #9240-05A, *Specifications and Guidance for Obtaining Contaminant-Free Containers* (April 1990). Containers used for sampling will not contain target inorganic contaminants exceeding the level specified in the document referenced above. Specifications for containers will be verified by checking the supplier's certified statement and analytical results for each lot.

Equipment (field) blanks will be used to monitor for contamination. Corrective actions will be taken as soon as a problem is identified and may include the following:

- Discontinuing the use of a specific container lot
- Contacting suppliers for retesting the representative container from a suspect lot
- Assessing decontamination procedures
- Resampling suspect samples
- Validating the data

Table 2 summarizes the containers needed for the field investigations to be performed as part of the field sampling.

TABLE 2
Sample Containers, Preservations, and Holding Times
South Minneapolis Neighborhood Residential Soil Contamination Site—Minneapolis, Minnesota

Parameter	Container	Preservation/Storage	Maximum Hold Time
Soil			
Total Arsenic	One 4 oz glass jar	Cool 4^{o}C	180 days

4.1.3 Sample Preservation and Holding Times

Sample containers, preservatives and sample holding times will meet the requirements set forth by USEPA. Sample containers will be certified by the laboratories or vendors as precleaned. All samples for chemical analysis will be shipped to the laboratory in coolers. Ice will be used to maintain the internal cooler temperature at 4 ± 2 degrees Celsius (°C) during sample collection and shipment to the laboratory. Table 2 summarizes the preservation/storage requirements and holding times for the analyses to be performed.

4.1.4 Sample Handling, Packaging and Shipment

Sample handling, packaging, and shipping procedures are described in FOP-03, Sample Handling, Packaging, and Shipping (Appendix A).

Sample coolers will be shipped to arrive at the laboratory the morning after sampling (priority overnight) or will be sent by courier to arrive the same day. The laboratory will be notified of the sample shipment and the estimated date of arrival of the samples being delivered.

4.2 Field Activity Documentation and Logbook

CH2M HILL will use several procedures to document the location, media, and parameters of samples collected in the field. A bound field logbook will be maintained to record the acquisition of each sample; sampling locations be photographed; chain-of-custody forms for all environmental samples and field QC samples be completed; parameter data generated as a result of sampling activities be maintained on file; and sampling locations be surveyed relative to the state datum (and Universal Transverse Mercator coordinates) in addition to noting the sample locations on property-specific data sheets with respect to permanent landmarks or site features. The following describes the sample documentation methods that will be used at the South Minneapolis site.

4.2.1 Field Logbook

A field sampling logbook will be initiated at the start of the first onsite activity and maintained to document field activities throughout the field effort in accordance with FOP-04, Field Logbook (Appendix A).

4.2.2 Photographic Documentation

The field team leader or designee will selectively photograph field activities to complement descriptions of field activities in the field logbook. The following information will be recorded in the logbook when photographs are taken:

- Date and time
- Exposure number/roll number or digital file name
- Location of the photograph
- Description and identification of the subject
- The initials of the person who took the photograph

Photographs will be maintained by CH2M HILL for reference during the project. When CH2M HILL submits the final report to USEPA, it will deliver the captioned photographs in an album.

4.2.3 Sample Chain-of-Custody

For samples collected for analysis, USEPA chain-of-custody protocols will be followed, as described in the *National Enforcement Investigations Center (NEIC) Policies and Procedures*, USEPA-330/9-78-DDI-R, Rev. June 1985 (OSHA et al. 1985). Chain-of-custody forms will be completed through the use of USEPA's Field Operations Reporting Management System

(FORMS) II Lite software. Custody procedures are described in Section 2.3.2 of the QAPP. The protocol for filling out the chain-of-custody is provided in FOP-05, Documentation/Chain-of-Custody Procedure (Appendix A).

4.3 Field Logs and Data Sheet Documentation

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, data sheets, and/or forms and then entered into an electronic data log. Data will be reviewed by the field team leader for adherence to the QAPP and consistency of data. Any concerns identified will be corrected and incorporated into the data evaluation process.

Field data calculations, transfers, and interpretations conducted by the field team will also be reviewed by the field team leader. The field data logs and documents will be checked for the following:

- General completeness
- Readability
- Use of appropriate procedures and modifications to sampling procedures are clearly stated
- Appropriate instrument calibration and maintenance records (as appropriate)
- Reasonability of data collected
- Correctness of sample locations
- Correctness of reporting units, calculations, and interpretations

Where appropriate, field data forms and calculations will be processed and included in appendixes to the appropriate report. Original field logs, documents, and data reductions will be kept in the project file.

4.4 Quality Control Sample Procedures

The offsite laboratory identified in the QAPP will have a QC program to ensure the reliability and validity of the analyses being performed. Field sampling precision and bias will be evaluated by collecting field duplicate and equipment blanks for laboratory analysis. Ambient environmental conditions will be evaluated by collecting a field blank. The number of QA/QC samples and rate of collection are summarized in Table 3 and discussed in detail in the following sections.

TABLE 3
Total Proposed Number and Type of QA/QC Samples
South Minneapolis Neighborhood Soil Contamination Site—Minneapolis, MN

Description	Rate of Collection	Characterization and Background	
		Surface Soil	**Subsurface Soil**
Total samples		5,840	360
Contingency sample locations		400	18
Equipment blanks		69	2
Field blanks	1/week	8	2
Duplicates	10%	584	36
MS/MSDs	5%	292	18

4.4.1 Field Duplicates

Field duplicates will be used to measure the heterogeneity of the sample matrix and the precision of the field sampling and analytical process. Field duplicates will also be used to evaluate yard-specific duplication by using the same spatial configuration for the five-point composite, but rotating the configuration to allow different composite locations to be used. Duplicate samples will be collected at a frequency of one duplicate per 20 samples.

The sample containers will be labeled as described in this plan. Duplicates will be preserved and stored in the same manner as the field samples. The frequency of collection will be at least 5 percent.

4.4.2 Equipment Blanks

Equipment blanks will be collected and analyzed to determine whether decontamination has been adequately performed and that no cross-contamination of samples has occurred because of the equipment or residual decontamination solutions. A consistent volume of demonstrated analyte-free distilled and deionized water will be poured directly into or over the decontaminated sampling equipment and then collected in a sample container. The sample bottles will be labeled as described in the plan. The samples will be preserved and handled in the same manner as groundwater samples.

The frequency of equipment blank collection for surface soil sampling will be one sample for each case of sampling scoops. The frequency of equipment blank collection for direct push soil sampling will be one sample per week when these activities are performed.

4.4.3 Matrix Spike/Matrix Spike Duplicate

Matrix spike and matrix spike duplicate samples will be used by the laboratories to assess the precision and accuracy of sample analysis. The samples will be fortified by the laboratories in accordance with the specifications of the analytical methods. Two extra volumes of sample are required for each combination of samples. Sample containers will be filled and stored in the same manner as field duplicate samples. The frequency for collection of matrix spike/matrix spike duplicate samples will be at least 5 percent.

4.4.4 Temperature Blanks

A temperature blank will be included in each cooler to allow the laboratory receiving the shipment of samples to determine if the samples have been maintained at the proper temperature. Temperature blanks will consist of an unpreserved sample container filled with distilled water. One temperature blank will accompany each sample cooler being shipped to the laboratory.

4.5 Decontamination Procedures

Decontamination of personnel and equipment will follow the procedures in FOP-06, Decontamination of Personnel and Equipment (Appendix A). The potable water to be used in equipment decontamination will be distilled water purchased for the sampling event and mixed with Alconox®. Sampling equipment will be final rinsed with high-performance liquid chromotagraphy–grade (HPLC) laboratory water.

4.6 Disposal of Field Sampling-Generated Wastes

The waste materials generated during a field investigation are known as investigation-derived wastes. Materials that may become investigation-derived wastes requiring proper treatment, storage, and disposal include:

- Personal protective equipment (disposable coveralls, gloves, booties)
- Disposable equipment (plastic ground and equipment covers, aluminum foil, Teflon® tubing, broken or unused sample containers, sample container boxes, tape)
- Soil cuttings from direct push soil sampling
- Decontamination water

Management of investigation-derived wastes and materials will be performed consistent with the USEPA guidance *Guide to Management of Investigation – Derived Wastes*, 9345.3-03FS (January 1992). Disposable equipment (including personal protective equipment) will be disposed of in solid-waste containers. Water generated during equipment decontamination will be disposed of onsite. Soil cuttings associated with sampling will be returned to the sample location.

4.7 Field Monitoring Instrumentation

Arsenic is the only contaminant of concern for the South Minneapolis site and is not a volatile compound. Field monitoring is not planned during site investigation activities.

SECTION 5

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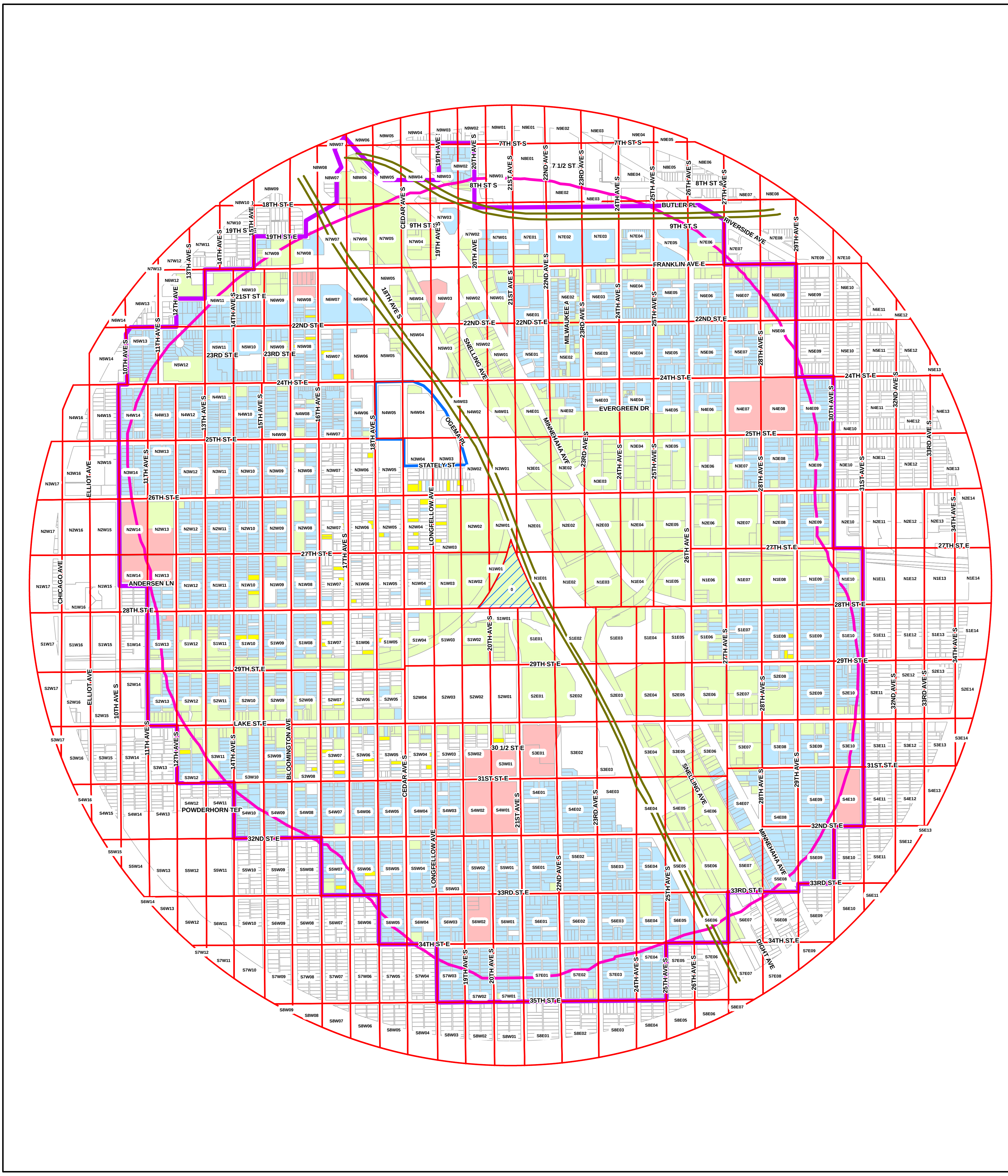
Figures



Legend

Parcels

Previously Sampled Properties, Two or more samples Collected

Soil Removal Summary

Removal Actions Performed

Parcels not sampled or Only One Sample Collected

Residential Properties

Commercial / Industrial Properties

Schools and Parks

Previously Collected Arsenic Samples

Arsenic Dispersion Boundary above 10 ppm

Revised 2006 Residential Soil Sample Boundary

Arsenic Dispersion Boundary

Little Earth

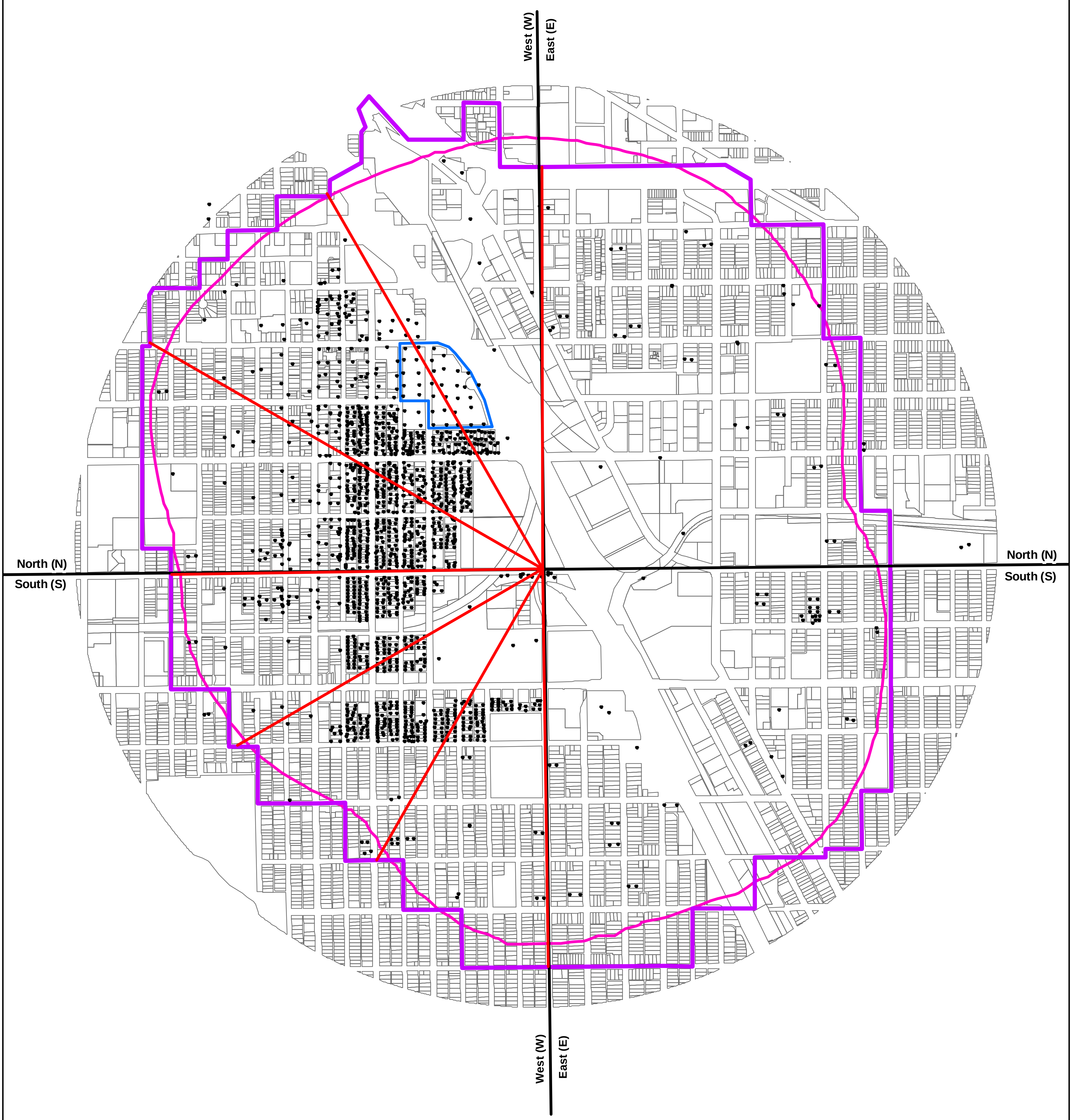
N

0 400 800 Feet

Figure 1
South Minneapolis Site
Field Sample Plan

CH2MHILL

File Path: E:\EPA\336752-South_Minneapolis\MXDs\CMC_Unsampled_Properties_StreetsTabloid_FSP.mxd, Date: April 18, 2006 11:26:48 AM, User: KBUCKVOL



Legend

Soil Boring Transects
Previous Sample Location
Property Parcels

Arsenic Dispersion Boundary above 10 ppm

Revised 2006 Residential Soil Sample Boundary
Arsenic Dispersion Boundary
Little Earth

N

0 600 1,200
Feet

Figure 2
South Minneapolis Site
Field Sample Plan
Soil Boring Transects

CH2MHILL

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Appendix A
Field Operating Procedures

APPENDIX A

Field Operating Procedures

The following field operating procedures to perform the field investigation at the South Minneapolis site are attached:

FOP	Number Title
FOP-01	Surface Soil Sampling in Residential Areas
FOP-02	Direct Push Soil Sample Collection
FOP-03	Sample Handling, Packaging, and Shipping
FOP-04	Field Logbook
FOB-05	Documentation/Chain-of-Custody Procedure
FOP-06	Decontamination of Personnel and Equipment

FIELD OPERATING PROCEDURE (FOP)-01

Surface Soil Sampling in Residential Areas

Purpose

The purpose of this FOP is to provide a general guideline for collecting surface soil samples at residential properties.

Equipment and Materials

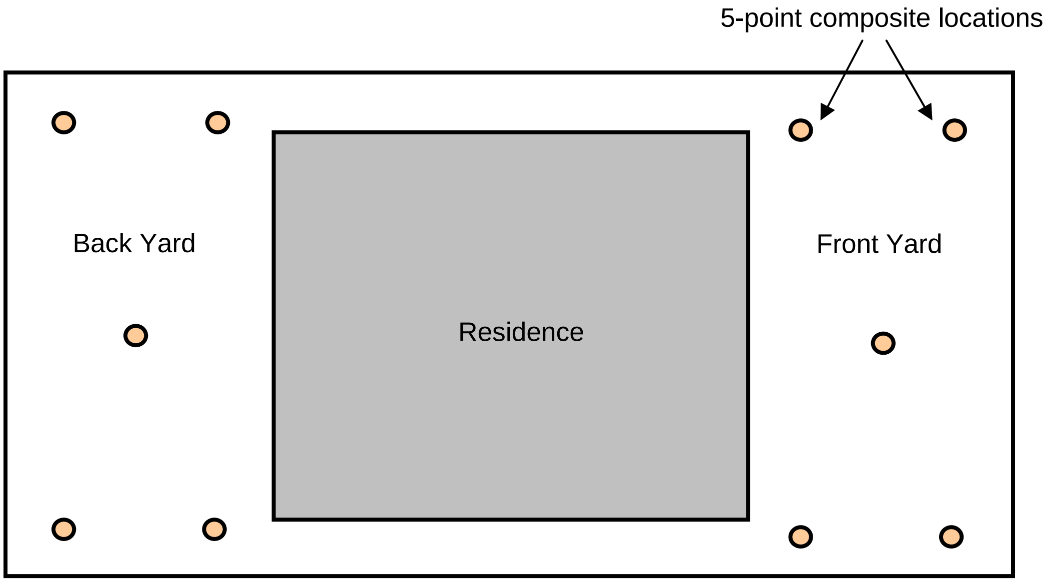
- 2-ounce presterilized scoops
- Plastic bags for sample compositing
- Clean latex or surgical gloves as specified in the Health and Safety Plan
- Precleaned sample containers, coolers, and other sampling supplies as referred to in the Field Sampling Plan
- Field notebook, sample data sheets, chain-of-custody forms, and custody seals
- Appropriate personal protective equipment

Procedures and Guidelines

Collect five-point composite samples from the front and back yards. Proposed sample locations are shown in Figure 1. Samples should not be collected immediately adjacent to or under telephone poles; landscape timbers; wooden picnic tables, chairs, playsets, or porches; or other treated lumber. Samples also should not be collected from areas covered with woodchips, mulch, gravel, or other material. Each discrete location for the composite sample should be from the same 0- to 3-inch depth interval.

From USEPA (2003)

FIGURE 1
Recommended Minimum Soil Sampling in Residential Yards
South Minneapolis Neighborhood Residential Soil Contamination Site—Minneapolis, Minnesota



Sample Collection

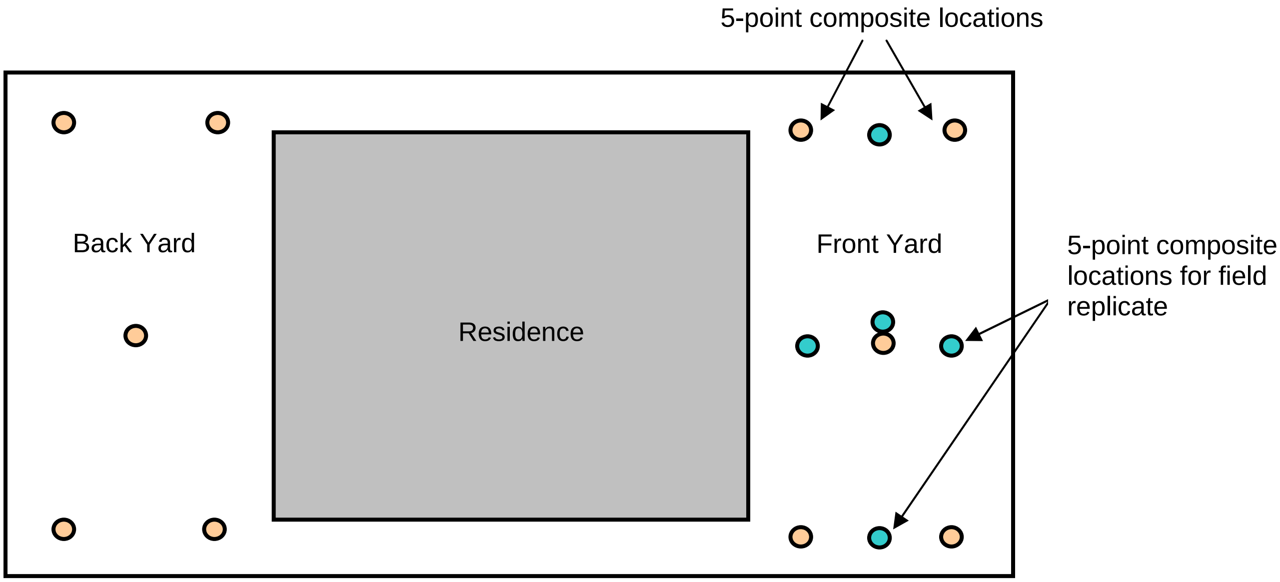
Composite samples should consist of equal amounts of soil from discrete locations. Collect the soil from each discrete location using a 2-ounce individually wrapped sterile scoop. Separate scoops are required for the front and back yard samples. The soil from the five composite locations will be emptied into a plastic bag and mixed thoroughly. The sample will then be placed in a 4-ounce soil jar, labeled, and prepared for shipment to the laboratory for analysis. Dispose of remaining sample volume in the general location from where it was collected, or archived, depending on the requirements of the project.

If grass is present at the sample location, lift the grass prior to collecting the soil sample from underneath. In some cases, material other than grass and/or soil will be encountered at a sample location. For example, wood chips and sand often are found in recreational areas of day-care and school playgrounds. Samples of the soil below the cover material should not be collected.

The sample locations should be sketched on the data sheet as shown in Figure 1. A data sheet is provided as Attachment 1 to this FOP. GPS coordinates for each sample location should be taken from the center of the five-point composite location and documented on the data sheet.

Field replicates will be collected using separate five-point composite locations. Figure 2 provides proposed locations for field replicate samples. Field duplicates will be performed by collecting a second sample from the composited grab sample.

FIGURE 2
Proposed Surface Soil Duplicate Sample Locations
South Minneapolis Neighborhood Residential Soil Contamination Site—Minneapolis, Minnesota



PROPERTY ID *STREET ADDRESS*

(Sketch property)

Front Yard

Sample ID______________________________ Sample Date/Time ________________________

5-Point Composite Center Coordinates N ____________________ E_______________________

Back Yard

Sample ID______________________________ Sample Date/Time ________________________

5-Point Composite Center Coordinates N ____________________ E_______________________

Observations

Treated lumber observed? ☐ No ☐ Yes *(show on sketch)*

Garden present? ☐ No ☐ Yes *(show on sketch)*

Signs of newer construction or landscaping activities? ☐ No ☐ Yes *(show on sketch)*

Sample Team ________________________________ _____________________________________

Comments

FIELD OPERATING PROCEDURE (FOP)-02

Direct Push Soil Sample Collection

Purpose

The purpose of this FOP is to provide a general guideline for the collection of subsurface soil grab samples using direct push (e.g., GeoProbe®) sampling methods.

Scope

The method described for direct push soil sampling is applicable for soil sampling at and below the ground surface. Specific equipment and responsibilities of direct push subcontractors are described in contracting documentation.

Equipment and Materials

- Truck-mounted hydraulic percussion hammer
- Sampling rods
- Sampling tubes and liners (for soil samples)
- Double hook-bladed knife or other tool for opening liners
- Clean latex or surgical gloves as specified in the Health and Safety Plan
- Precleaned sample containers, coolers, and other sampling supplies as referred to in the Field Sampling Plan
- Decontamination supplies including Alconox soap, distilled water, paper towels, and plastic sheeting
- Field notebook, sample data sheets, chain-of-custody forms, and custody seals
- Appropriate personal protective equipment
- Tool box
- 5-gallon buckets, with covers, to contain decontamination water

Procedures and Guidelines

Soil Sampling

1. Ensure sampling tubes and other nondedicated downhole equipment and sampling equipment are decontaminated in accordance with FOP-06, *Decontamination of Personnel and Equipment*.
2. Wear appropriate personal protective equipment, as required by the Health and Safety Plan. Change gloves between sampling locations.

3. Confirm all underground utility clearances have been obtained and maps of private utilities have been consulted.
4. Drive sampling tube to the desired sampling depth using the truck-mounted hydraulic percussion hammer.
5. Remove the rods and sampling tube from the borehole and, using the double hook-bladed knife or other tool, carefully split the liner to allow access for removing the sample from the tube.
6. Log the soil sample according to visual methods outlined in ASTM Method D 2487-98.
7. Soil samples will be separated and transferred into stainless steel bowls or disposable foil pans, homogenized by mixing within the bowl, and transferred to the appropriate sample container. Remove large pebbles and cobbles from sample before placing in jars.
8. Label, handle, and store the sample according to procedures outlined in the Field Sampling Plan. Record sampling data such as depth, time, and date as specified in the Field Sampling Plan. Discard unused sample according to the guidelines for investigation-derived waste.
9. Decontaminate all nondedicated downhole equipment (rods, sampling tubes, etc.) in accordance with FOP-06, *Decontamination of Personnel and Equipment*.
10. The location should be abandoned after all samples at that location have been collected, including any QA/QC samples.

Attachments

None.

Reference

ASTM Method D 2487-98.

Key Checks and Items

1. Verify that the hydraulic percussion hammer is clean and in proper working order.
2. Monitor that the direct push operator thoroughly completes the decontamination process between sampling locations.
3. Determine if a QC sample will be required at a sampling location (refer to the Field Sampling Plan). If additional sample volume is required, another direct push advancement to the same depth interval may be needed.
4. Boring cuttings will be returned to the borehole, rinse water will be disposed of on the ground.
5. Verify that the borehole made during sampling activities has been properly backfilled and the surface restored.

FIELD OPERATING PROCEDURE (FOP)-03

Sample Handling, Packaging, and Shipping

Purpose

The purpose of this FOP is to delineate protocols for the packing and shipping of samples to the laboratory for analysis.

Scope

This FOP is applicable to samples collected and prepared for analysis at an offsite laboratory.

Equipment and Materials

- Waterproof hard plastic coolers
- Resealable plastic bags
- Plastic garbage bags
- Absorbent packing material (not vermiculite)
- Inert cushioning material (not vermiculite)
- Ice
- USEPA Region 5 sample tags
- Chain-of-custody forms (generated by FORMS II Lite software)
- USEPA Region 5 custody seals
- Airbills and shipping pouches (e.g., Federal Express)
- Clear tape
- Strapping tape
- Mailing labels

Procedures and Guidelines

Prepare Bottles for Shipment

1. Arrange decontaminated sample containers in groups by sample number.
2. Check that sample container lids are tight.
3. Secure appropriate USEPA Region 5 sample tags around of container lid with string or wire.
4. Arrange containers in front of assigned coolers.
5. Affix appropriate adhesive labels to each container. Protect label with clear tape.
6. Enclose each sample in a clear, resealable, resealable plastic bag, ensuring that sample label is visible.

Prepare Coolers for Shipment

1. Tape drains shut, inside and out.

2. Affix “This Side UP” labels on all four sides and “Fragile” labels on at least two sides of each cooler.
3. Place mailing label with laboratory address on top of the coolers.
4. Place inert cushioning material (e.g., bubble wrap, preformed poly-foam liner) in the bottom of the cooler. Do not use vermiculite.
5. Place chain-of-custody records with corresponding custody seals on top of each cooler.
6. Place all the samples inside a garbage bag and tie the bag.
7. Double bag and seal loose ice in resealable, plastic, resealable plastic bags to prevent melting ice from leaking and soaking the packing material. Place the ice outside the garbage bags containing the samples. Place sufficient ice in cooler to maintain the internal temperature at 4 ± 2°C during transport.
8. Fill cooler with enough absorbent material (e.g., Perlite, kitty litter, etc.) and packing material to prevent breakage of the sample bottles and to absorb the entire volume of the liquid being shipped (offsite sample shipment only).
9. Sign each chain-of-custody form (or obtain signature) and indicate the time and date the cooler was custody sealed. Record the USEPA Region 5 custody seals on the chain-of-custody forms.
10. Seal the laboratory copies of the chain-of-custody forms in a large resealable plastic resealable plastic bag and tape to the inside lid of the cooler. Retain the USEPA Region 5 copies of the chain-of-custody forms for return to USEPA. Each cooler must contain a chain-of-custody form that corresponds to the contents of the cooler.
11. Close lid and latch.
12. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.
13. Tape cooler shut on both ends, making several complete revolutions with strapping tape. **Do not** cover custody seals.
14. Relinquish to carrier (e.g., Federal Express). Place airbill receipt inside the mailing envelope and send to sample documentation coordinator, along with the other documentation.

FIELD OPERATING PROCEDURE (FOP)-04

Field Logbook

Purpose

The purpose of this FOP is to delineate protocols for recording field survey and sampling information in a field logbook.

Scope

Data generated from the use of this FOP may be used to support the following activities: site characterization, risk assessment, and evaluation of remedial alternatives.

Equipment and Materials

- Field logbook
- Indelible black ink pen

Procedures and Guidelines

All information pertinent to a field survey or sampling effort will be recorded in a bound field logbook that will be initiated at the start of the first onsite activity. The field logbook will consist of a bound notebook with consecutively numbered pages that cannot be removed. The outside front cover of the logbook will contain the project (site) name and the specific activity (e.g., remedial investigation sampling). The inside front cover will include:

- Site name and USEPA work assignment number
- Project number
- Site manager's name and mailing address
- Sequential logbook number
- Start date and end date of logbook

Each page will be consecutively numbered, dated, and initialed. All entries will be made in indelible black ink, and all corrections will consist of line-out deletions that are initialed and dated. If only part of a page is used, the remainder should have an "X" drawn across it. At a minimum, entries in the logbook will include the following:

- Time of arrival and departure of site personnel, site visitors, and equipment
- Field observations (e.g., sample description, weather, unusual site conditions or observations, sources of potential contamination)
- Detailed description of the sampling location, including a sketch
- Details of the sample site (for example, ground elevation)

- Sampling methodology and matrix,
- Names of samplers and crew members
- Start or completion of borehole sample collection activities
- Type of sample (e.g., soil)
- Number, depth, and volume of sample collected
- Field sample number
- Requested analytical determinations
- Sample preservation
- Quality control samples
- Sample shipment information including chain-of-custody form number, carrier, date, and time
- Health and safety issues (including level of personal protective equipment)
- Signature and date by personnel responsible for observations

Sampling situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. Records should, however, contain sufficient information so that someone can reconstruct the sampling activity without relying on the collector's memory. The field team leader will keep a master list of all field logbooks assigned to the sampling crew.

FIELD OPERATING PROCEDURE (FOP)-05

Documentation/Chain-of-Custody Procedure

Purpose

The purpose of this FOP is to provide a definition of "custody" and describe protocols for documenting the transfer of custody from one party to the next (e.g., from the site to the laboratory). A documented custody trail is established through the use of sample tags and a USEPA chain-of-custody form which uniquely identifies each sample container, and who has possession of it from the sample's origin to its final destination. The chain-of-custody form also describes the sampling point, date, time, and analysis parameters.

Scope

Sample personnel should be aware that a sample is considered to be in a person's custody if the sample meets the following conditions:

- It is in a person's actual possession.
- It is in view after being in a person's possession.
- It is locked up so that no one can tamper with it after having been in physical custody.

When samples leave the custody of the sampler, the cooler must be custody-sealed and possession must be documented.

Data generated from the use of this FOP may be used to support the following activities: site characterization, risk assessment, and evaluation of remedial alternatives.

Equipment and Materials

- Computer with FORMS II Lite software loaded
- Printer with paper (8.5- × 11-inch) and ink cartridge (black or color)
- USEPA Region 5 sample tag
- FORMS II Lite-generated tag label (encouraged, but not mandatory)
- Indelible black ink pen

Procedures and Guidelines

Chain-of-Custody Forms

The chain-of-custody form must contain the following information:

- **Case number/client number:** If a CLP laboratory is used, enter the case number provided by USEPA's RSCC. If the CLP is not used, enter the SAS number provided by CH2M HILL's sample and analytical coordinator.

- **USEPA region:** Enter Region "5."
- **CERCLIS ID:** This site has not yet been listed and therefore has not been assigned a CERCLIS ID.
- **Spill ID:** For this project, use "B58Y."
- **Site name/state:** For this project, this will be "S. Minneapolis Site", "MN."
- **Project leader:** Enter the CH2M HILL site manager.
- **Action:** For this project, choose "Remedial Investigation."
- **Sampling co.:** "CH2M HILL."
- **Sample no.:** This is the unique number that will be used for sample tracking. For CLP, this number is taken from a block of numbers assigned by the USEPA RSCC. For non-CLP, the CH2M HILL sample and analytical coordinator will assign this number.
- **Matrix:** Describes the sample media (e.g., groundwater, soil, wipe, etc.).
- **Sampler name:** The name of the sampler or sample team leader.
- **Concentration:** Low (L), Low/Medium (M) or High (H).
- **Sample type:** "Grab" or "Composite."
- **Analysis:** This indicates the analyses required for each sample.
- **Tag no.:** This number appears on the bottom of the sample tag and includes a prefix ("5") followed by a series of numbers. The entire number must appear on the chain-of-custody form.
- **Preservative:** Document what preservative has been added to the sample (e.g., "HCl," "ice only," "none").
- **Station location:** This is the CH2M HILL station location identifier.
- **Sample collect date/time:** Use military time.
- **QC type:** This is for field QC only, and includes field duplicate, field blanks, equipment blanks, and trip blanks.
- **Date shipped:** The date that samples are relinquished to the shipping carrier.
- **Carrier name:** (e.g., "FedEx").
- **Airbill:** Airbill number used for shipping. (If samples are hand delivered to their destination, "hand delivered" should appear in this field.)
- **Shipped to:** This is the laboratory name and full address, including the laboratory contact. If the contact is not known, use "Sample Custodian."
- **Chain-of-custody record fields:** The sampler's signature must appear in the "Sampler Signature" and the "Relinquished By" fields. The date and time (military time) must also be included. If additional personnel were involved in sampling, their signatures should appear in the "Additional Sampler Signature(s)" field.

Although the samples are "relinquished" to the shipping carrier, the shipping carrier does not have access to the samples as long as the shipping cooler is custody sealed. Consequently, the shipping carrier does not sign the chain-of-custody form.

- **Sample(s) to be used for laboratory QC:** This identifies which samples are to be used for matrix spike/matrix spike duplicate analyses.
- **Indicate if shipment for case is complete:** Use "Y" or "N."
- **Chain-of-custody seal number:** Record the custody seal numbers that appear on the Region 5 custody seals that can be found on the shipping container. There is usually a minimum of two per shipping container.

Sample Tags

Each sample container will be identified with a uniquely numbered sample tag issued by USEPA Region 5. Each tag will contain the following information:

- Case/SAS number
- The unique sample number for sample tracking
- CH2M HILL station location (i.e., the sample identifier)
- Date of sampling
- Time the sample was collected (in military time)
- All parameters for which the sample will be analyzed
- Preservative used (if any)
- Sample type (grab or composite)
- Sample concentration (low, medium, high)
- Sample matrix (groundwater, soil, air, etc.)
- Signature of sample team leader
- Identification when sample is intended to be used by the lab for matrix spike/spike duplicate

Attachments

- Attachment 1: FORMS II Lite Quick Reference Guide
- Attachment 2: Chain-of-Custody Form, Sample Tag, Custody Seal

Key Checks and Items

- All sample containers must be properly tagged.
- Each cooler must have a chain-of-custody form and the samples in the cooler (as identified by the sample tags) must match what is on the chain-of-custody form.
- Each chain-of-custody form must be properly relinquished (signature, date, time).
- The custody seal numbers must be written on each chain-of-custody form.
- The shipping cooler must be custody sealed in at least two places.

FOP-05, Attachment 1
FORMS II Lite Quick Reference Guide

Getting Started

(a) Click on the **Start** button on the Windows Desktop and select **Program**s. Select **FORMS II Lite** and click on the FORMS II Lite item. The FORMS II Lite application will begin.
(b) Click **File** on the Main Menu bar. Click on the **New Site** item. The first data entry screen will appear.

Step 1 - Enter Site Information

a) Enter all relevant information necessary for chain-of-custody paperwork (in accordance with regional guidance). For CLP traffic reports (TRs) this includes:
   - Site name
   - State
   - EPA region number
   - CLP case number
   - Lead sampler

b) Click the **Next** button to proceed to Step 2.

Step 2 - Select Sampling Team

a) Select sampling team members from the **Unassigned Team Members** window by clicking on each name.
b) Click the **>** button. The selected name will move to the **SelectedTeam** window. Repeat until all team members for this sampling event are selected.
c) Click the **Add/Edit Team Members** button to add any remaining sampling team members' names that do not appear in the **Unassigned Team Members** window.
d) Enter the first and last name of each sampler. If you would like to add the sampler to the permanent list, click the **Add to Permanent List** box. After you have entered the samplers' names, click the **OK** button. These samplers will appear in the **Selected Team Members** window on the Select Sampling Team screen.
e) Click the **Next** button to proceed to Step 3.

Step 3 - Select Analysis

a) Select an analysis from the **Available Analyses** window by clicking on the analysis.
b) Click the **>** button. The selected analysis will move to the **Selected Analyses** window. Repeat until all analyses to be performed on samples collected for this sampling event are selected.
c) To edit Turnaround Time, click the **Edit Turnaround Days** button. The **Edit Project and Turnaround** screen will appear.
d) Click on the **Turnaround Time** drop down menu to select the number of days or type in a value. Click **Close** to close screen.
e) Click the **Next** button to proceed to Step 4.

Step 4 - Enter Station

a) Enter all relevant information necessary for chain-of-custody paperwork (in accordance with regional guidance). For CLP TRs this includes:
   - Station name and location
   - Sample matrix
   - Sample date/time
   - Sample type
   - Sampler name

b) The Sample Date/Time field is strictly military time. You may click on the System Date/Time checkbox to populate the current system date/time value into the sample date/time.

c) Click the **Add Station** button to enter the name of a new station and continue with the station locations. To enter a new station location associated with a previously entered station, click on the station name, then click the **Add Location** button, and enter the name of the new station location.

d) Click the **Next** button to proceed to Step 5.

Step 5 - Assign Bottles and Samples

a) Select the Station Location from the **Station/Location** window.

b) Select the analyses associated with the containers from the **Analysis** window. If more than one analysis is associated with a container, select the additional analysis(es) by holding down the control key, and clicking on the additional analysis(es).

c) Enter the number of bottles that will be assigned a specific analysis or set of analyses.

d) Enter the sample tag prefix and starting tag number. Click **Auto Increment Tag Number** if you wish to assign sequential tag numbers for your sampling event. Sample numbers are automatically and sequentially assigned for your sampling event and are unique per Station Location.

e) By default, CLP sample numbers are automatically used for CLP analyses. Note that FORMS II Lite generates CLP sample numbers using a BASE 32 system which differs from the CLASS generated CLP sample numbers.

f) Edit the sample number and other pertinent information for these samples in the space provided. After you have confirmed your entries, click the down arrow.

g) Repeat steps 5b through 5f until all desired analyses have been assigned to bottles.

h) Click the Next button to proceed to Step 6.

Generate Labels

a) Click the **Generate Labels** button in Step 5. The application automatically displays samples for the current Station Location. These are the samples for which labels will be generated. Click the appropriate checkbox at the bottom of the screen to select all samples for the station or site. Enter the number of labels to print next to each record if you need more than one.

b) Click the **Generate Labels** button and select the appropriate label template to view, then click **OK.** Edit an existing template by clicking the **Edit Label** button. If you wish to add a new label template, click the **Add New Label** button and follow the wizard to create a new template. Enter the number of blank labels to control printing on a label other than the first one on the page.

c) View the labels at the end of the edit label or new label process. If labels are not acceptable, close the view and edit the label template. If the labels are acceptable, print the labels.
d) Select **File** and then **Print** from the Main Menu bar. Select the desired number of copies to be printed and click the **OK** button to print the labels. Click **Close** to return to Step 5.

Step 6 - Select Samples and Assign Lab

a) Select a laboratory from the **Lab Code** drop down menu. If the laboratory where samples will be shipped does not appear in the list, click the **Add Lab** button and add the lab information.
b) Select samples from the **Unassigned Samples** window by holding down the [Ctrl] key and clicking on each sample that will be shipped to this laboratory. After you have selected all the samples for the laboratory, click the down arrow.
c) Repeat steps 6a and 6b until all samples have been assigned to laboratories.
d) Click the **Next** button to proceed to Step 7.

Step 7 - Select Labs and Assign Shipping

a) Enter the carrier, date of shipment and airbill number.
b) Select samples from the **Unassigned** window by holding down the [Ctrl] key and clicking on each sample that will be shipped using this airbill. After you have selected the samples to be shipped, click the down arrow.
c) Repeat steps 7a and 7b until all samples have been assigned airbill numbers.
d) Click the **Finish** button for system generated TRs. FORMS II Lite will then display a screen that enables you to view and print TRs for the site.
e) Click **Next** and proceed to Step 8 to customize TRs for specific sets of samples.

Step 8 - Customize Traffic Report

a) Confirm the last four digits of the TR number. (The first two digits represent the Region number, the next nine digits are a random number and the next six digits are the date the TR was created, and the last four digits are automatically incremented by the system but may be edited by the user.)
b) Select a shipment from the **Shipping** window. Select the samples from the **Samples** window that will be assigned to this TR. After you have selected the samples, click the down arrow. (NOTE: samples must be of the same program type and must have the same project code to be assigned to a single TR.)
c) Repeat steps 8a and 8b until all samples have been assigned.
d) Click the **Finish** button. FORMS II Lite will display a screen that will enable you to view, print, archive and export TRs. Follow the directions to print the TRs.

Quick Edit

a) On the **View/Print TR** screen displayed after completion of Step 8, click the **Quick Edit** button.

b) The user may edit most data fields, except those in red, prior to printing a TR. Also able to sort and filter any column and print a report.

Helpful Hints to Use FORMS II Lite 4.0

This Quick Reference Guide is designed to help FORMS II Lite users enter information for their sampling events and generate bottle labels and chain-of-custody paperwork.
FORMS II Lite provides users the flexibility to enter most of their information ahead of the sampling event.

FORMS II Lite allows users to:

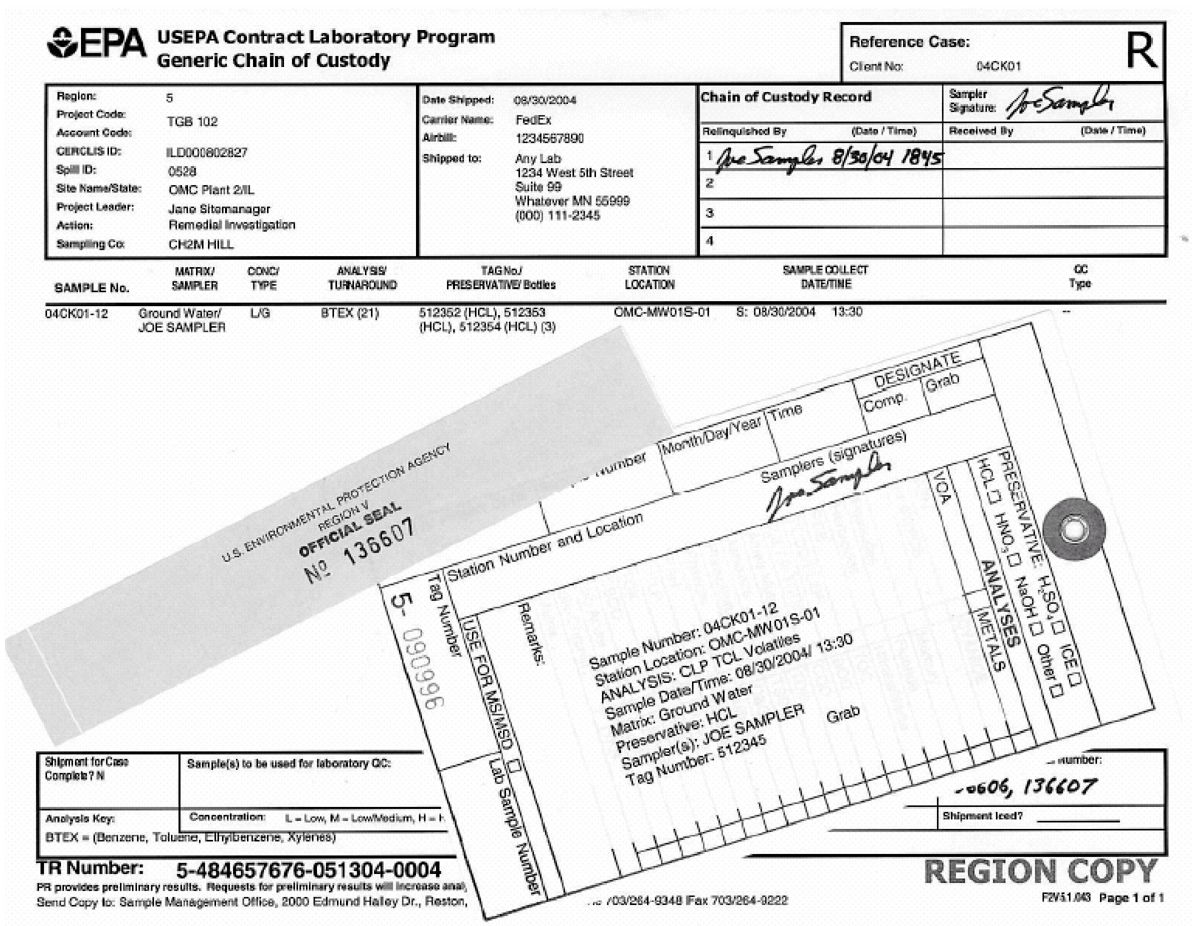
- Add values that are not included in the "list and pick" menus: Select **Admin** from the Main Menu bar, enter the password to log in. **Admin** now shows the user as being **(logged in**). Select **Reference Table**s, and choose the table that requires editing.
- Customize screens and disable non-key fields: While logged into **Admin** on the Main Menu Bar, select **Custom Features** and click on **Field Name**s. Field names and non-key fields can be renamed or hidden on the screen.
- Review the data entered throughout the data entry process by clicking on the **Quick View** button in Steps 4 through 8.
- Select multiple items by highlighting the first item, then hold down the [Ctrl] key and click on the additional items. Or simply click and drag to highlight multiple items.
- Sort data displayed in windows by clicking on the column label. Click on a second column label for a secondary sort.
- Specify more than one sampler's name for samples collected at a specific station location. In Step 4, select a sampler's name, then click within the data entry field after the name. Type a comma and type in the second name.
- Export Site information as either a text or (.dbf) file.
- **Note:** FORMS II Lite will not allow information that has been typed over to be saved as a separate file. Once a value in a field has been replaced (edited) with a new value, the original value is lost.

User Preferences

- The following features are maintained in **User Preferences** under **Admin** on the Main Menu bar and can be turned on or off.
- Select **Copy Station** to make the button available in Step 4 to duplicate the current station and its station location information. **Copy Location** duplicates station locations.
- Select the option **Use Default Number of Bottle**s, set in the Analysis Reference Tables, to populate the number of containers for each analysis in Step 5.

- Select **Assign All** to make the button available in Step 5 to assign each of the analyses to a separate container. Set the number of containers for each analysis in the bottles field or define through User Preferences.
- Select **One-Step Printing** to make this button available in Step 5 to print labels or tags with a single click. Label template, and number of copies are defined in User Preferences.

FOP-05, Attachment 2
Chain-of-Custody Form, Sample Tag, Custody Seal



USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case: R
Client No: 04CK01

Region:	5
Project Code:	TGB 102
Account Code:	
CERCLIS ID:	ILD000802827
Spill ID:	0528
Site Name/State:	OMC Plant 2/IL
Project Leader:	Jane Sitemanager
Action:	Remedial Investigation
Sampling Co:	CH2M HILL

Date Shipped:	08/30/2004
Carrier Name:	FedEx
Airbill:	1234567890
Shipped to:	Any Lab 1234 West 5th Street Suite 99 Whatever MN 55999 (000) 111-2345

Chain of Custody Record

Sampler Signature: Joe Sampler

Relinquished By	(Date / Time)	Received By	(Date / Time)
1 Joe Sampler	8/30/04 1845		
2			
3			
4			

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	QC Type
04CK01-12	Ground Water/ JOE SAMPLER	L/G	BTEX (21)	512352 (HCL), 512353 (HCL), 512354 (HCL) (3)	OMC-MW01S-01	S: 08/30/2004 13:30	--

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
OFFICIAL SEAL
No 136607

DESIGNATE
Comp. Grab
Month/Day/Year Time
Samplers (signatures) Joe Sampler
Station Number and Location
Tag Number 5- 090996
Remarks:
USE FOR MS/MSD ☐
Lab Sample Number
PRESERVATIVE: H_2SO_4 ☐ ICE ☐
HCL ☐ HNO_3 ☐ NaOH ☐ Other ☐
ANALYSES
VOA
METALS

Sample Number: 04CK01-12
Station Location: OMC-MW01S-01
ANALYSIS: CLP TCL Volatiles
Sample Date/Time: 08/30/2004/ 13:30
Matrix: Ground Water
Preservative: HCL
Sampler(s): JOE SAMPLER
Tag Number: 512345
Grab

Shipment for Case Complete? N
Sample(s) to be used for laboratory QC:
... Number: ...0606, 136607
Analysis Key: Concentration: L = Low, M = Low/Medium, H = H...
BTEX = (Benzene, Toluene, Ethylbenzene, Xylenes)
Shipment Iced?

TR Number: 5-484657676-051304-0004

PR provides preliminary results. Requests for preliminary results will increase anal...
Send Copy to: Sample Management Office, 2000 Edmund Halley Dr., Reston, ... 703/264-9348 Fax 703/264-9222

REGION COPY

F2V5.1.043 Page 1 of 1

FIELD OPERATING PROCEDURE (FOP)-06

Decontamination of Personnel and Equipment

Purpose

The purpose of this FOP is to provide general guidelines for the decontamination of personnel and downhole sampling equipment used in potentially contaminated environments.

Scope

This is a general description of decontamination procedures.

Equipment and Materials

- Distilled water
- 2.5 percent (w/w) Alconox®, Liquinox®, or equivalent phosphate-free detergent and water solution
- Large plastic pails or tubs for Alconox, Liquinox, or equivalent and water, scrub brushes, squirt bottles for detergent solution, methanol and water, resealable plastic bags, and sheets
- Garbage bags
- Unpowdered chemical-resistant gloves

Procedures and Guidelines

Personnel Decontamination

To be performed after the completion of tasks whenever the potential for contamination exists.

1. Remove and discard chemical-resistant gloves into a solid-waste container.
2. At the end of the workday, shower entire body, including hair, at home.

Downhole Sampling Equipment Decontamination

Downhole sampling equipment is decontaminated after each use soil boring location as follows:

1. Wear unpowdered chemical-resistant gloves.
2. Rinse and scrub with potable water.

3. Wash all equipment surfaces that came into contact with the potentially contaminated soil/water with detergent solution.
4. Rinse with potable water.
5. Rinse with distilled water.
6. Completely air dry or wipe dry with a clean paper towel. Wrap exposed areas with aluminum foil (shiny side out) or enclose equipment in clean plastic for transport and handling if equipment will not be used immediately.

Health and Safety Monitoring Equipment Decontamination

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with detergent solution, then a towel wet with alcohol solution, and finally two times with a towel wet with distilled water.

Sample Container Decontamination

The outside of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with detergent solution, or immerse in the solution *after the containers have been sealed.* Repeat the above steps using potable water.

Key Checks and Items

- Do not use acetone for decontamination.
- Clean with solutions of Alconox, or equivalent phosphate-free detergent, and distilled water.