APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

INTERIM REMEDIAL ACTION

QUALITY ASSURANCE PROJECT PLAN

for

OPERABLE UNIT 2
B BUILDING SOLVENT STORAGE SHED AREA

MOUND PLANT
MIAMISBURG, OHIO

Prepared for

EG&G MOUND APPLIED TECHNOLOGIES
P.O. Box 3000
Miamisburg, Ohio 45343

Prepared by

ICF KAISER ENGINEERS
4501 Erskine Road - Suite 100
Cincinnati, Ohio 45242

May 1994

OPERABLE UNIT 2

B BUILDING SOLVENT STORAGE SHED AREA

QUALITY ASSURANCE PROJECT PLAN

DEPARTMENT OF ENERGY, MOUND PLANT

MIAMISBURG, OHIO

Approved by _____ Date
EG&G MAT ER Progject Manager, Mound Plant - Gary Coons

Approved by Keith E — 5/4/94 Date
ICF Kaiser Engineers Project Manager - Keith Egan

Approved by _____ Date
ICF Kaiser Engineers QA Officer - Dick McCracken

Approved by _____ Date
ICF Kaiser Engineers Project Coordinator - Brad Spackman

Approved by _____ Date
ETG Team Manager - Jay Erickson

CONTENTS

1. INTRODUCTION 1-1
1.1. OVERVIEW 1-1
1.2. ENVIRONMENTAL RESTORATION PROGRAM DESCRIPTION 1-2
1.3. MOUND PLANT ER PROGRAM 1-3
1.4. REGULATORY BASIS OF INTERIM REMEDIAL ACTION 1-4
1.4.1. Removal Actions and Interim Remedial Actions 1-5
1.4.2. Regulatory Basis of IRA of B Building Solvent Storage Shed Area 1-5
1.5. PROJECT DESCRIPTION 1-7

2. PROJECT ORGANIZATION AND RESPONSIBILITY 2-1
2.1. FIELD TEAM RESPONSIBILITIES 2-1
2.2. LABORATORY RESPONSIBILITIES 2-3
2.3. QUALITY ASSURANCE RESPONSIBILITIES 2-4

3. QUALITY ASSURANCE OBJECTIVES 3-1
3.1. ACCURACY 3-1
3.2. PRECISION 3-1
3.3. REPRESENTATIVENESS 3-2
3.4. COMPARABILITY 3-2
3.5. COMPLETENESS 3-2
3.6. QUANTITATION LIMIT 3-3

4. SAMPLING PROCEDURES 4-1
4.1. GENERAL PROCEDURES FOR SAMPLING 4-1
4.1.1. Instructions to Field Personnel 4-1
4.1.2. Sample Control and Documentation 4-2
4.1.3. Sample Containers, Preservation and Holding Times 4-2
4.1.4. Sample Shipment 4-2
4.1.5. Equipment Decontamination 4-2
4.2. SOIL/SEDIMENT SAMPLING 4-2
4.3. SOIL VAPOR SAMPLING 4-3
4.4. OTHER FIELD ACTIVITIES 4-3
4.5. SUMMARY OF SAMPLING ACTIVITIES 4-4

5. SAMPLE CUSTODY 5-1
5.1. FIELD CUSTODY PROCEDURES 5-1
5.2. LABORATORY CUSTODY PROCEDURES 5-3
5.3. SAMPLE HANDLING, PACKAGING, AND SHIPPING 5-3
5.4. DOCUMENTATION 5-3

6. LABORATORY ANALYTICAL METHODS 6-1
6.1. GENERAL 6-1
6.2. LABORATORY ANALYTICAL METHODS 6-2
6.2.1. Volatile Organic Compounds 6-2
6.2.2. Geotechnical Parameters 6-2

7. CALIBRATION PROCEDURES AND FREQUENCY 7-1
7.1. FIELD EQUIPMENT 7-2
7.2. LABORATORY EQUIPMENT 7-2

8. INTERNAL QUALITY CONTROL CHECKS 8-1
8.1. SCREENING AND FIELD MEASUREMENTS 8-1
8.2. FIELD SAMPLING 8-1
8.3. LABORATORY ANALYSES 8-2

9. DATA REDUCTION, VALIDATION AND REPORTING 9-1
9.1. FIELD AND TECHNICAL DATA 9-1
9.2. LABORATORY DATA 9-1
9.2.1. Laboratory Data Reduction 9-1
9.2.2. Laboratory Data Validation 9-2
9.2.3. Laboratory Data Reporting 9-3

10. PERFORMANCE AND SYSTEM AUDITS 10-1
10.1. TECHNICAL PERFORMANCE AUDITS 10-1
10.2. FIELD PERFORMANCE AUDITS 10-1
10.3. PROJECT SYSTEM AUDITS 10-4
10.4. LABORATORY AUDITS 10-4

11. PREVENTIVE MAINTENANCE 11-1
11.1. FIELD EQUIPMENT 11-1
11.2. LABORATORY EQUIPMENT 11-2

12. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS 12-1

13. CORRECTION ACTION PROTOCOLS 13-1
13.1. FIELD CORRECTIVE ACTION 13-1
13.2. LABORATORY CORRECTIVE ACTION 13-1
13.3. CORRECTIVE ACTIONS RESULTING FROM AUDITS 13-6

14. QUALITY ASSURANCE REPORTS TO MANAGEMENT 14-1

15. REFERENCES 15-1

APPENDICES

Appendix 1 Standard Operating Procedures

FIGURES

2.1. Project Organization 2-2

10.1. Sample Audit Checklist Form 10-3

13.1. Corrective Action Report 13-2

TABLES

1.1. Analytical Data Quality Objectives 1-9

3.1. Summary of Quality Control Procedures for Field Screening and Field Measurements . 3-4
3.2. Summary of Quality Control Procedures for Field Activities and Laboratory Measurements: Surface Water/Groundwater and Soil/Sediment Samples 3-5
3.3. Laboratory Control Limits for Matrix Spikes, Matrix Spike Duplicates, and Surrogate Spikes: Surface Water/Groundwater and Soil/Sediment Samples 3-6
3.4. Sample Collection Requirements 3-7

6.1. Analytical Methods, Parameters, and Quantitation Limits: Surface Water/ Groundwater and Soil/Sediment Samples 6-3

13.1. Corrective Actions to Specific Field Activities 13-3

1. INTRODUCTION

1.1. OVERVIEW

ICF Kaiser Engineers (ICF KE) has been retained to conduct a Removal Action at the B Building Solvent Storage Shed Area at the U.S. Department of Energy (DOE) Mound Plant in Miamisburg, Ohio. The Removal Action is being conducted under DOE's Streamlined Approach for Environmental Restoration (SAFER) program. This Quality Assurance Project Plan (QAPjP) is provided to delineate the purpose, policies, standard operating procedures, and organization of the ICF KE Quality Assurance (QA) Program as it applies to these activities. Implementation of the QA program ensures the validity of data collected in support of project activities. Accurate data obtained during sampling and subsequent chemical analyses will provide the information required to establish defensible conclusions and recommendations concerning this site.

Quality assurance (QA) is defined as the overall system of procedures for assuring the reliability of data produced in conjunction with project activities. A QAPjP is required for all projects involving sample collection or analysis to ensure that the accuracy, precision, and comparability of submitted data is of a known and documented level. This QAPjP utilizes quality control measures for the routine application of criteria that will achieve prescribed standards of performance for sampling and analysis of environmental media. The intended use of a QAPjP for field sampling operations is to establish and define various QA program requirements as they relate to field sampling, and environmental monitoring activities associated with the B Building Solvent Storage Shed Removal Action. The plan provides general procedures that delineate how field and laboratory data of known and accepted quality will be generated.

An overall system of quality assurance consists of two elements: quality control and quality assessment. Quality control is a system of procedures performed to control the quality of the data produced in conjunction with project activities. Quality assessment is a program of activities to evaluate the performance of implemented quality control procedures and the quality of the data produced in conjunction with project activities.

This QAPjP describes the quality control procedures for sampling activities (sampling procedures in Section 4 and sample custody in Section 5), for field screening and field measurements (Section 3), and for laboratory analyses (Section 6). Specific quality control steps, defined as quality control checks, for

these activities are discussed in Section 8. The standards of performance, defined as acceptance criteria, for these checks are presented in Section 3. Quality control procedures for calibration of field and laboratory instrumentation are outlined in Section 7. The procedures for data reduction, validation, and reporting are included in Section 9. As part of the quality control program, preventive maintenance procedures for equipment and instrumentation are summarized in Section 11. Corrective actions for the planned field and laboratory activities are necessary for a quality control program in order to keep the quality of generated data under control. The corrective actions for these activities are provided in Section 13.

Quality assessment activities for this removal action include evaluation of field and laboratory quality control data, performance and system audits, and issuing of quality assurance reports to management. Procedures for these activities are described in Sections 12, 10, and 14, respectively. The references are discussed in Section 15.

In fulfilling its role of ensuring that the goals of the project are met, the quality assurance program relies on the structure of the project organization and on the effectiveness of key individuals in carrying out their responsibilities. This report describes the project organization and identifies the individuals who are responsible for assessing the collection and generation of data and for ensuring that this data is of defined quality (Section 2).

The intended use of data and the associated acceptance criteria for data quality will be determined before the data collection effort begins. Reported data will include, when appropriate, statements of precision, accuracy, representativeness, completeness, and comparability. Data processing procedures will be documented, reviewed, and revised, as required to meet project data quality requirements.

1.2. ENVIRONMENTAL RESTORATION PROGRAM DESCRIPTION

The Environmental Restoration (ER) Program, formerly known as the Comprehensive Environmental Restoration Program and, before that, the Comprehensive Environmental Assessment and Response Program (CEARP), was initiated by the U.S. Department of Energy (DOE) Albuquerque Operations Office (AL) in 1984 to fulfill its obligations under the following environmental laws:

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 300);
- The Resource Conservation and Recovery Act (RCRA) (40 CFR 260-270);
- The National Environmental Policy Act of 1969 (NEPA) (volume 83, page 852 of the U.S. Statutes and Chapter 42, Section 4321 of the U.S. Code); and
- The Atomic Energy Act of 1954 (AEA) (volume 68, page 1919 of the U.S. Statutes and Chapter 42, Section 2011 of the U.S. Code).

The ER Program Removal Action consists of four phases patterned after the U.S. Environmental Protection Agency (EPA) CERCLA program. Phase I, preliminary assessment/site inspection, was completed at Mound Plant in 1992 and reported in the reconnaissance sampling report (DOE, 1992). Phase II, the remedial feasibility study (FS) was conducted in 1993 and reported in the B Building Solvent Storage Shed Action Memorandum (DOE, 1994). Phase III remediation design (RD), will design the remedial alternative chosen in the FS of Phase II. Phase IV, remedial action (RA) will implement the remedial alternative chosen in Phase II. This removal action is being conducted as Phase IV. The basis for the remedial action is discussed in Section 1.4.

1.3. MOUND PLANT ER PROGRAM

Mound Plant was placed on the CERCLA (Superfund) National Priorities List (NPL) in November, 1989. Pursuant to that status, a CERCLA Section 120 Federal Facility Agreement (FFA) was signed between DOE and EPA (Administrative Docket Number V-W-90-C-075), and became effective October 12, 1990. Because of this, the RI/FS process at Mound Plant follows the methodology that the Superfund program has established for characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and for evaluating potential remedial options. This approach is a flexible process that is tailored to specific circumstances of individual sites and can be adjusted as additional information becomes available.

The goal of the ER Program at Mound Plant is to reduce adverse impacts on public health and the environment by:

- Reducing releases of hazardous or radioactive materials, and
- Bringing all inactive wastes sites requiring remediation into compliance with existing state and federal regulations and requirements.

The FFA between the DOE and the EPA contains both the procedural and substantive requirements for RI/FS work (Administrative Docket Number V-W-90-C-075). As of January, 1991, a similar agreement was being negotiated between the DOE and the Ohio EPA.

As part of the Mound Plant Site-wide ER Program, the OU-9 Site-wide Quality Assurance Project Plan was developed as an umbrella document to provide consistency in approach for quality assurance activities across the individual operable units and minimize redundancy in the preparation quality assurance project plans for the individual OUs to meet regulatory compliance. This quality assurance project for the B Building Solvent Storage Shed is a subset of the larger document and addresses the anticipated unique site-specific QC requirements for the B Building Solvent Storage Shed Removal Action.

1.4. REGULATORY BASIS OF INTERIM REMEDIAL ACTION

Section VII.D of the 1990 Federal Facilities Agreement (FFA) indicates that nothing in the FFA shall alter the Department of Energy's (DOE) authority with respect to removal actions conducted pursuant to Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA). Section 104.(a)(1) of CERCLA as amended grants the following response authorities:

> Whenever (A) any hazardous substances is released or there is a substantial threat of such a release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare, the President is authorized to act, consistent with the national contingency plan, to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant, or contaminant at any time (including its removal from any contaminated natural resource), or take any other response measure consistent with the national contingency plan which the President deems necessary to protect the public health or welfare or the environment.

Executive Order 12580 delegates to the DOE authority to conduct emergency and non-emergency removal actions with respect to releases or threatened releases from DOE facilities; thus, wherever

CERCLA refers to the President's authority, that authority has been delegated to the Secretary of Energy for DOE facilities.

1.4.1. Removal Actions and Interim Remedial Actions

Section 104.(a)(2) of CERCLA, as amended, states that "any removal action undertaken by the President under this subsection (or by any other person referred to in section 122) should, to the extent the President deems practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release concerned."

In the FFA, DOE agreed to conduct IRAs. Section VI.J of the FFA defines IRAs as follows:

> "Interim Remedial Actions" or "IRA" shall mean all discrete response actions implemented prior to a final remedial action which are consistent with the final remedial action and which are taken to prevent or minimize the release of hazardous substance, pollutants or contaminants so that they do not migrate or endanger public health, welfare or the environment.

Both removal actions and IRAs are response actions implemented prior to a final remedial action, and both must be consistent with the final remedial action. Accordingly, removal actions undertaken by DOE under the authority granted by Section 1049(a)(1) of CERCLA, as amended, and Executive Order 12580; and performed according to 40 CFR 300.415, shall be referred to as IRAs throughout the remainder of this report.

1.4.2. Regulatory Basis of IRA at B Building Solvent Storage Shed Area

Subpart E of the National Contingency Plan (NCP) establishes methods and criteria for determining the appropriate extent of response authorized by CERCLA when there is a release of a hazardous substance into the environment or there is a release into the environment of any pollutant or contaminant that may present an imminent and substantial danger to the public health or welfare (40 CFR 300.400(a)). Limitations on appropriate responses are established by 40 CFR 300.400(b):

> Unless the lead agency determines that a release constitutes a public health or environmental emergency and no other person with the authority and capability to respond will do so in a timely manner, a removal or remedial action under Section 10 of CERCLA shall not be undertaken in response to a release:

(1) Of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found;

(2) From products that are part of the structure, and result in exposure within, residential buildings or business or community structures; or

(3) Into public or private drinking water supplies due to deterioration of the system through ordinary use.

On April 20, 1993, ICF Kaiser Engineers (ICF KE) submitted an IRA Technical Memorandum to EG&G Mound Applied Technologies (EG&G MAT) and the Dayton Area Office (DAO) of DOE. The purpose of the technical memorandum was to:

- Identify and document justification for implementation of an IRA at the B Building solvent storage shed area;
- Present the necessary steps required to properly plan and implement the IRA and provide an initial estimate of associated costs; and,
- Provide EG&G MAT and DOE sufficient information pertaining to estimated costs and schedule for funding purposes.

Based on existing site information pertaining to past waste management practices and previous investigations, the technical memorandum showed that a release of a hazardous substance had occurred in the B Building Solvent Storage Shed Area, and that the CERCLA response limitations outlined above did not apply, therefore, DOE was justified in proceeding with a removal site evaluation. The technical memorandum was similar in content and served the function of an EE/CA approval memorandum and served as the Removal Site Evaluation under 40 CFR 300.410.

The technical memorandum evaluated the following factors that should be considered when determining the appropriateness of a removal action as outlined by 40 CFR 300.415(b)(2):

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems.

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface which may migrate.

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

(vi) Threat of fire or explosion.

(vii) The availability of other appropriate federal or state response mechanisms to respond to the release.

(viii) Other situations or factors that may pose threats to public health or welfare or the environment.

The presence of soil containing elevated volatile organic compound concentrations in the area of the B Building solvent storage shed may, at a minimum, satisfy factors i and iv; thus, implementation of a removal action or IRA is appropriate. The overall objective of the IRA is to mitigate the migration of organic chemicals into the groundwater. As indicated in 40 CFR 300.415(b)(4), whenever a planning period of at least six months exists before on-site activities must be initiated, and the lead agency determines, based on a site evaluation, that a removal action is appropriate, the lead agency shall conduct an EE/CA.

At Mound facility, DOE is the lead agency, and DAO is its authorized representative. ICF KE was authorized by DAO to prepare the B Building Solvent Storage Shed EE/CA Report on August 10, 1993. The Draft (Revision 1) EE/CA Report was delivered to the respective agencies on October 22, 1993. DAO's response to USEPA comments were transmitted to both USEPA and OEPA on January 7, 1994. At that time DAO informed USEPA and OEPA that the removal has had less than a six month planning period and was being continued as a Time-Critical Removal Action. The EE/CA processes ended at that time. This Action Memorandum provides a written record of the decision to select Soil Vapor Extraction as the preferred IRA alternative for the B Building Solvent Storage Shed Area.

1.5. PROJECT DESCRIPTION

The B Building Solvent Storage Shed Removal Action has one main objective. The objective is to reduce the levels of solvents in the soil in the B Building Solvent Storage Area to levels that are protective of human health. Preliminary remedial action goals have been calculated that are protective of human health by various exposure pathways. These pathways include inhalation of ambient air, ingestion and inhalation of wind transported particulates, and ingestion of groundwater from the aquifer below the site. The

development of the preliminary remedial goals were documented in a technical memorandum (ICF 1994).

The investigation tasks performed under the removal action have two main objectives. First initial soil sampling will be conducted when installing extraction wells. The samples will be analyzed for volatile organic compounds (VOCs) to establish baseline levels of the solvents in the soils. Geophysical analysis of the samples will be conducted to help refine the operating parameters of the soil vapor extraction (SVE) system. Second, soil vapor and soil samples will be collected to measure the operational efficiency of the SVE system and verify that the remedial goals have been met. Parameters to be analyzed in the field are listed in Table 1.1.

Objectives for data quality are discussed in the following sections of this QAPjP. However, analytical levels, as defined by the EPA's "Data Quality Objectives for Remedial Response Activities" (EPA 1987), may be assigned to the planned analyses. These analytical levels were designed by the EPA to serve as guidance for obtaining data of appropriate quality for its intended use. A general description of the typical types of analyses performed, the types of data uses, the limitations, and a generic description of data quality are provided for each analytical level (I, II, III, IV, and V) in the EPA guidance. The details of intended data usage for each task are presented in the Section 3 of this plan. These analytical levels have been applied to each set of parameters to be analyzed and are presented in Table 1.1 for each task of the investigation. The purpose for data collection and the media to be investigated for each task are also included in this table.

Table 1.1. Analytical Data Quality Objectives

Locations and Depths	
Proposed Soil Sampling Locations:	5 Initial Locations
Proposed Soil Vapor Locations:	13 Initial Locations (each of the 6 soil vapor probes will consist of 2 probes extending to different depths)
Proposed Geotechnical Locations:	17 initial locations
Data Use:	Extent
Analytical Parameter List	**Analytical DQO Level**
VOCs in Soil	III
VOCs in Soil Vapor	II
Geotechnical Parameters	**Analytical DQO Level**
Grain Size Distribution	II

2. PROJECT ORGANIZATION AND RESPONSIBILITY

Project organization and responsibility are divided among the DOE ER Program Group, which includes the following: the DOE Albuquerque Field Office (DOE AL); the DOE Dayton Area Office (DOA) and its operating contractor, EG&G Mound Applied Technologies, Inc. (EG&G MAT); and the ER Program EG&G MAT subcontractors. The currently identified EG&G MAT subcontractor for the B Building Solvent Storage Shed Removal Action is ICF Kaiser Engineers, Inc. (ICF KE). ETG Environmental, Inc. will install and operate the SVE system. The organization and responsibilities are discussed in the following section and shown in summary in Figure 2.1.

2.1. FIELD TEAM RESPONSIBILITIES

The ICF KE field team responsibilities for the B Building Solvent Storage Shed Removal Action will consist of assisting ETG in performing the field activities specified in the Field Sampling Plan. The ICF KE field team will have one identified position: the field oversight engineer. The field team oversight engineer is responsible for overseeing the field activities specified in the work plan and communicating progress and any issues to the ICF KE site manager. The field oversight engineer is also responsible for ensuring that the health and safety guidelines specified in the Health and Safety Plan are followed. He will be trained in first aid and CPR. It is the responsibility of the field oversight engineer to make sure safe work practices are implemented and to report all incidents that occur during the field activities.

The ETG field technicians are responsible for conducting the field activities, as specified in the B Building Solvent Storage Shed Removal Action Work Plan, under the supervision of the field team leader.

The ETG field team leader will serve as the sample document control administrator. He will be responsible for tracking the locations sampled and will ensure that samples are properly labeled and documented prior to shipment to the laboratory. The administrator will ensure that the sample control procedures specified in this QAPjP and the FSP are followed.

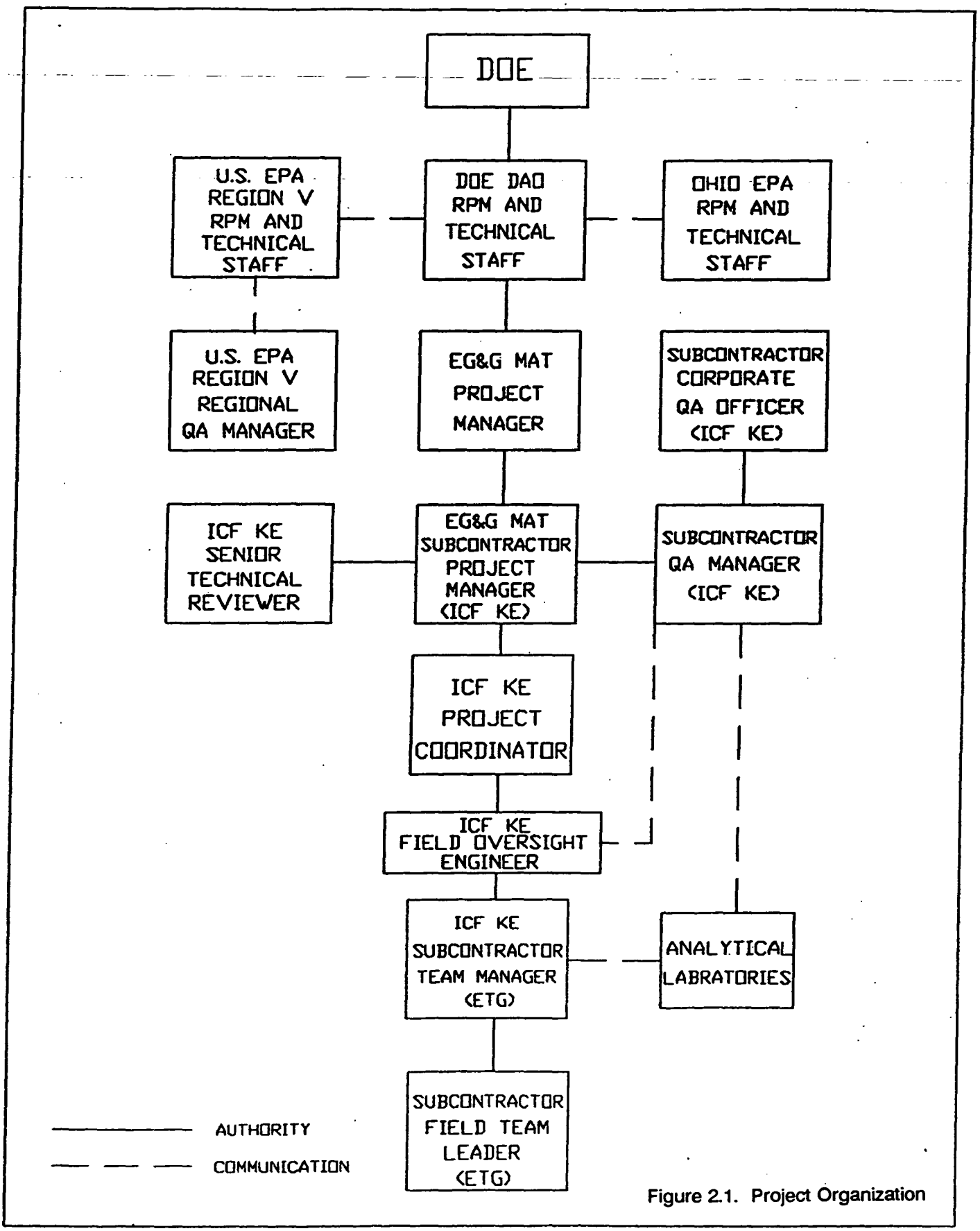

Figure 2.1. Project Organization

2.2. LABORATORY RESPONSIBILITIES

Laboratory responsibilities for this investigation will consist of performing analytical services according to guidelines presented in this QAPjP, reporting all laboratory nonconformances should they occur, and transmitting quality-assured data packages. Technical requirements for the project analytical laboratories will be detailed in Section 6. Section 6 will include the following QAPP topics: 1) analyses to be performed, 2) laboratory responsibilities, 3) laboratory sample custody procedures, 4) laboratory quantitation limits (outside the project required limits), 5) laboratory data reduction procedures, 6) laboratory data validation procedures, 7) preventive maintenance, and 8) specific procedures to assess precision, accuracy, and completeness (if different from the QAPP), 9) audits, 10) in-house QC checks, and 11) sample containers.

This section identifies the various general responsibilities within the analytical laboratories. The quality assurance program defined in this QAPjP takes precedence over equivalent sections in the laboratory quality assurance manuals, unless otherwise referenced. Sections of the laboratory quality assurance manuals may be referenced in Section 6 where they directly apply and when more information is available in the manuals.

The management of the laboratories identified for this program must assume the following general quality assurance responsibilities:

- Approve the quality assurance manual, project specific requirements, and standard operating procedures;
- Approve laboratory reports;
- Implement the quality assurance program (QAP) for the laboratory;
- Oversee the training program;
- Evaluate analytical techniques, instrumentation, and quality control procedures;
- Assure that project QAPjPs are implemented in the laboratory;
- Develop and approve corrective actions to out of control situations (as defined by the lab project QA plan);

Supervisors for a given analytical group will:

- Supervise analysts;
- Schedule analyses;
- Review analytical data;
- Schedule preventative and routine maintenance; and
- Report out of control and nonconforming situations to management (as defined by the lab project QA plan).

The laboratory quality assurance group will:

- Monitor the implementation of the QAPP;
- Prepare quality control samples to be inserted into the sample stream;
- Notify management of out of control situations (as defined by the lab project QA plan);
- Perform quality assurance audits;
- Perform quality assurance training program; and
- Perform statistical analyses on the quality control results.

The laboratory analysts/technicians will:

- Perform their assigned tasks in accordance with the established and requested protocols and procedures;
- Perform preventative and routine maintenance;
- Report out-of-control situations (as defined by the lab project QA plan); and
- Perform data processing.

2.3. QUALITY ASSURANCE RESPONSIBILITIES

Quality assurance for the environmental investigation is the responsibility of all ER Program personnel. Responsibilities include detailed monitoring and review of all procedures used to perform every aspect

of the remedial investigation. All personnel involved with the ER Program activities will strictly adhere to the implementation of the QAPP, Mound Plant ER Program SOPs, analytical laboratory procedures, data acceptance criteria, and data reporting schedules.

Primary responsibility for project quality rests with EG&G MAT's ER Program subcontractor, ICF KE, project manager. Specific responsibilities include the management of quality assurance issues as they relate to the ER Program, ensuring that nonconformances are corrected, and ensuring the overall quality, timeliness, and cost-effectiveness of the activities performed by ER Program EG&G MAT subcontractors. The project manager is also responsible for coordinating and maintaining consistency between this QAPjP and those of the various subcontractors at Mound Plant and across the ER Program as a whole.

The ICF KE Quality Assurance project officer (QAO) is independent of project line management to ensure no conflict of interest in implementing and monitoring the Quality Assurance/Control Program. The direct tie to ICF KE's Corporate QA Officer, Yvonne Fernandez, also ensures consistent interpretation and application of various QA guidance documents and programs (e.g., EPA, DOE, ASTM, USATHAMA, TQM, etc.). The ICF KE project QAO reports directly to the ICF KE Program Manager.

The responsibilities of the QAO for the project are:

- Development and implementation of the QAPP;
- Prepares and implements project QA procedures to provide controls consistent with the requisite quality of project deliverables. Identifies appropriate QA/QC source documents (such as EPA QAMS-005, DOE ER Program SOPs, ASME NQA-1) and applicable elements.
- Ensures, through document review, that the project execution documents, such as work plans, adequately reflect the guidance from the source documents.
- Verifies, through systems and performance audits at field and office locations, that published and approved QA/QC procedures are properly and completely followed and appropriate for the technical activities performed. All audits result in documentation of the findings, recommendations for improvement, and/or corrective measures for any deficiencies. Reports of surveillance, audits, and corrective actions are given to the Project Manager, his staff, and the Corporate Quality Assurance Officer.
- Ongoing review of individual quality assurance procedures;

- Ensuring that laboratory activities are consistent with the objectives and requirements of this QAPjP;
- Coordination of quality assurance training;
- Overall coordination of the quality assurance/quality control plan;
- Project quality assurance/quality control; and
- Periodic reports to management, including suggestions for performing and verifying corrective actions.

Although it is the QAO's responsibility to ensure compliance with this QAPjP, it is the responsibility of the installation and site managers to implement the quality assurance program and to maintain a strong line of communication with the QAO.

The QAO and the designated auditors will have the following qualifications at minimum:

- Bachelors degree in an appropriate scientific discipline and five years of work experience in RI/FSs with a focus on quality assurance, and
- Two years of experience in performing field activities (for field auditors), or
- Two years of experience in an environmental analytical laboratory (for laboratory auditors).

The QAO is also responsible for validating and assessing analytical data. Either the QAO or his or her designee will perform data validation. The following minimum qualifications are required to perform data validation:

- Bachelors degree in chemistry,
- Two years of work experience in an environmental analytical laboratory, and
- Two years of experience in performing data validation activities.

If a data reviewer having all three qualifications cannot be obtained with all reasonable attempts, a data reviewer having at least one of the qualifications will be obtained and the work product will be reviewed by an individual with all the minimum qualifications.

Subcontractors generating data for the RI are responsible for ensuring that the precision, accuracy, completeness, and representativeness of their data are known and documented. To ensure that responsibilities are uniformly met, each subcontractor will be required to adhere to this QAPjP and to Mound Plant ER Program SOPs.

An ER Program EG&G MAT subcontractor internal kickoff meeting will be held before field work begins to review the operable unit-specific project work and quality assurance plan(s) and procedures. The kickoff meeting will be attended by, at a minimum, the following ER Program EG&G MAT subcontractor personnel: the project manager or deputy project manager, the field manager, the project QAO, and all personnel assigned to the field effort. The meeting will be run and lead by the subcontractor project manager who will also establish the agenda. Attendance at this meeting will be documented by the subcontractor to provide evidence of quality assurance indoctrination for the field activities to be conducted during the RI at Mound Plant. Such documents are to be maintained by the QAO and filed in Mound Plant project files.

3. QUALITY ASSURANCE OBJECTIVES FOR DATA MEASURES IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

The overall quality assurance objectives for field sampling, field measurements, and laboratory analysis are to produce data of known and sufficient quality to support the evaluation of the effectiveness of the removal action. Specifically, the Data Quality Objectives (DQOs) for the B Building Solvent Storage Removal Action are:

- Obtain environmental data through the collection of a variety of sample matrices and concentration levels within the area to adequately characterize the baseline level of solvent contamination;
- Obtain environmental data of sufficient quality to verify the effectiveness of the removal action in accordance with CERCLA/SARA and the Mound Plant FFA.

The reliability of data generated in support of the B Building Solvent Storage Shed Removal Action will be assessed through the evaluation of statistical data quality indicators consisting of accuracy, precision, representativeness, comparability, and completeness. These indicators are used to qualify the data upon which ICF KE will base its conclusions and recommendations.

3.1. ACCURACY

Accuracy is defined as a measurement of the bias in a system. Potential sources of bias include: sampling process; field contamination; preservation errors; sample management; sample matrix; sample preparation; and analysis technique. Sampling accuracy for this project will be assessed through the evaluation of field blanks consisting of equipment rinse blanks and ambient air blanks. Analytical accuracy will be assessed through the evaluation of quality control samples and matrix spikes. All data will be validated in accordance with acceptable validation protocols.

3.2. PRECISION

Precision is a measurement of the reproducibility of data under a specified set of conditions. It is a quantitative measure of the variability of a group of measurements compared to the group mean measurement. Sampling precision will be assessed through the evaluation of duplicate samples. Analytical precision will be evaluated through the use of duplicate analyses. The analytical data acquired

from the laboratory will be validated to determine the impact of out-of-control conditions on sample results (as defined by the lab project QAP plan).

3.3. REPRESENTATIVENESS

Representativeness is a qualitative parameter indicating the degree to which sample data represent the characteristics of the population, parameter variations at a sampling point, or an environmental condition. All samples collected will be as representative of the sample matrix as practicable. Representativeness will be achieved by defining environmental and procedural conditions, sample locations, sample quantity, and analytical parameters. Poor environmental conditions will be avoided to the extent feasible through scheduling adjustments so that factors such as weather do not impact adversely on sample collection. In addition, sampling activities will be conducted in accordance with the SOPs listed in this QAPjP as Appendix 1. Deviations from these SOPs will be documented and justified in the quality assurance reporting activities.

Field screening measurements may also be used to assist in selecting samples for laboratory analysis. The SOP for soil sampling, for example, calls for using a photoionization detector (PID) or its equivalent to screen for total volatile organic compounds as one means to select those soil samples that will be sent to the laboratory for analysis.

3.4. COMPARABILITY

Comparability is a qualitative parameter defining the level of confidence with which one data set can be compared to another. Field screening and sample collection data will be reported on standardized forms and in a standardized logbook to facilitate comparison of data. ICF KE has ensured the consistency of analytical QA/QC procedures and reporting by the establishment of detailed laboratory specifications and field screening SOPs. All offsite analytical work will be performed in accordance with established EPA procedures, thus making the data comparable with previous and future analytical results.

3.5. COMPLETENESS

Completeness is defined as the percentage of measurements that are judged to be valid measurements. Completeness goals for the ER Program have been established for field measurements, sample collection,

and laboratory analyses. The specific completeness goals for the project is 90%. It will be assumed that data will be generated in real time, and that a high degree of completeness will be obtained.

Appropriate procedures and quality control checks will be used so that known and acceptable levels of accuracy and precision are maintained for each data set. This section defines the project goals for accuracy, precision, completeness, representativeness, and comparability for measurement data. These goals are primarily expressed in terms of acceptance criteria for the quality control checks performed and are listed in Tables 3.1 through 3.3.

3.6. QUANTITATION LIMIT

Quantitation limit is a quantitative parameter defining the level of sensitivity of the analytical procedure. All offsite analytical work will be performed in accordance with established EPA procedures, thus ensuring the lowest possible quantitation limit. The important limit for this investigation is the soil quantitation limit to monitor that the soil has been remediated to the preliminary remedial goals. Preliminary remedial goals have been established and are presented in the following (ICF KE, 1994).

Trichloroethene	7.1 mg/kg
Toluene	1,761 mg/kg
1,1,1-Trichloroethene	148 mg/kg
Cis-1,2-Dichloroethene	91 mg/kg
Freon 113	36,056 mg/kg

Quantitation limits will be used that will ensure that the preliminary remedial goals have been met.

Table 3.1. Summary of Quality Control Procedures for Field Screening and Field Measurements

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SOP 1.12	Air Particulates	Factory Calibration	Yearly	± 10% of true value	Recalibrate or replace sensor
SOP 6.1	Flammability	Calibration with pentane (75%)	Daily	± 5% of true value	Recalibrate; check meter; replace probe or meter if necessary
SOP 6.2	Organic Vapor	Calibration with isobutylene (100 ppm)	Daily	± 2% of true value	Recalibrate, replace if necessary

Table 3.2. Summary of Quality Control Procedures for Laboratory Measurements

Analytical Method	Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
SW 8240	Volatile Organics in Soil	Matrix Spikes Matrix Spike Duplicates System Blank Calibration Tune GC/MS	1 per 20 1 per 20 1 per 20 Daily Daily	See Table 3.3 See Table 3.3 < 2 x CRQL ±10% of original Various depending on compound	Reanalyze samples Reanalyzes samples Check procedure Recalibrate Retune
EPA 600	Volatile Organics in Air	Duplicate Analysis System Blank Calibration Internal Standard	1 per 20 1 per 20 Daily Each Sample	See Table 3.3 < 2 X CRQL ± 10% original ± 10%	Reanalyze samples Check procedure Recalibrate Reanalyze
ASTM D4222	Grain Size of Soil	Duplicate Calibration	1 per 20 Yearly	See Table 3.3 ± 0.01 gm	Reanalyze samples Recalibrate

GC/MS Gas Chromatography/Mass Spectrometery
CRQL Contract Required Quantitation Limits

Table 3.3. Laboratory Control Limits for Matrix Spikes, Matrix Spike Duplicates, Duplicates and Surrogate Spikes

Analytical Method	Spiking Compounds	Spike Concentration	Advisory Limits		
			Percent Recovery	Relative Percent Difference (%)	
		Soil (ug/kg)	Soil	Soil	Air
SW 8240	Matrix Spikes/LCS				
Volatile Organics in Soil	1,1-Dichloroethene	30	60-136	≤ 28	NA
	Benzene	30	80-120	≤ 19	NA
	Chlorobenzene	30	90-115	≤ 2-	NA
	Toluene	30	78-129	≤ 21	NA
	Trichloroethene	30	79-120	≤ 16	NA
	Surrogates				
	1,2-Dichloroethane-d4	50	71-120	NA	NA
	Toluene-d8	50	84-121	NA	NA
	Bromofluorobenzene	50	69-120	NA	NA
EPA 600[a]	Laboratory Duplicate				
Volatile Organics in Air	NA	NA	NA	NA	≤ 15
ASTM 422	Laboratory Duplicate				
Grain Size	NA	NA	NA	≤ 30	NA

NA - Not Applicable

Notes: [a] The EPA method does not utilize matrix spikes or matrix duplicates. Relative percent difference will be based on duplicate analysis of the sample designated as the laboratory QA/QC sample.

Table 3.4. Sample Collection Requirements

Matrix	Analytical Method	Parameter	Sample Volume	Sample Container	Preservative	Holding Time
Soil	SW 8240	Volatile Organics in Soil	250 grams	Glass, Teflon lined lid	Chill to 4°C	14 days extraction 40 days analysis
Soil Vapor	EPA 600	Volatile Organics in Air	1 liter	Tedlar Bag	Store in Dark	3 days
Soil	ASTM D4222	Grain Size of Soil	250 grams	Glass, Teflon lined lid	Chill to 4°C	None

4. SAMPLING PROCEDURES

An environmental sample is defined as representative physical evidence collected from ground water, sediment, soil, or surface water matrices for subsequent chemical and/or physical analysis and monitoring. Data acquired from chemical and physical analyses will be used to characterize existing site conditions and to make inferences concerning the nature, extent, and degree of site contamination.

The B Building Solvent Storage Shed Removal Action investigation will follow standard operating procedures (SOPs) in collecting environmental samples and performing other specific field activities. Activities that will be performed as part of the investigation include the sampling of subsurface soils and soil vapor. Additional activities to be performed include water level measurements, drilling and logging, and health and safety screening. These activities are discussed in detail in the B Building Solvent Storage Shed Interim Remedial Action Work Plan and Field Sampling Plan (FSP). However, the procedures for these activities will be summarized in this section as part of the quality assurance plan for the investigations. The SOPs developed for the Mound Plant ER Program are listed in Appendix 1 of this QAPjP. The specific SOPs to be used for this project are listed in the Field Sampling Plan (Appendix B of the Work Plan). It should be noted that the Mound Plant ER Program SOPs have been revised in response to comments from both EPA Region V and Ohio EPA.

4.1. GENERAL PROCEDURES FOR SAMPLING

General procedures for all sampling activities address instructions to field personnel; sample control and documentation; sample containers; handling, packaging, and shipping of samples; and equipment decontamination.

4.1.1. Instructions to Field Personnel

Prior to beginning each type of sampling event, the field manager will meet with the assigned personnel and review the purpose and objectives. This meeting will provide final clarification and allow a review and discussion of the sampling event details. The procedures for instructions to field personnel can be found in Mound Plant ER Program SOP 1.1, General Instructions for Field Personnel (Field Sampling Plan, Appendix B of Work Plan).

4.1.2. Sample Control and Documentation

The steps required for sample control, sample identification, data recording, and chain-of-custody documentation are defined in Mound Plant ER Program SOP 1.3, Sample Control and Documentation (Appendix B of Work Plan).

4.1.3. Sample Containers, Preservation and Holding Times

Guidance in the selection of suitable containers for samples, requirements for container cleaning, required sample volumes, sample collection, holding times, and the recommended preservation techniques are defined in Mound Plant ER Program SOP 1.4, Sample Containers and Preservation (Appendix B of Work Plan).

4.1.4. Sample Shipment

Samples are to be shipped and prepared for shipment according to Mound Plant ER Program SOP 1.5, Guide to the Handling, Packaging, and Shipping of Samples (Appendix B of Work Plan).

4.1.5. Equipment Decontamination

All field sampling equipment will be decontaminated before and after use in accordance with Mound Plant ER Program SOP 1.6, General Equipment Decontamination (Appendix B of Work Plan).

4.2. SOIL SAMPLING

Subsurface soil sampling procedures to be followed for the removal action sampling are provided in Mound Plant ER Program SOPs 5.2 (revision 3) (DOE 1992), 5.3 (revision 2) (DOE 1992) and 5.8 (revision 1) (DOE 1991). These procedures consist of protocols for sampling with a stainless steel surface soil sampler. Soil and rock borehole logging and sampling procedures to be followed are also presented as Mound Plant ER Program SOP 5.1, Soil and Rock Borehole Logging and Sampling (revision 1) (DOE 1991).

4.3. SOIL VAPOR SAMPLING

Soil vapor sampling procedures to be followed for the removal action sampling are provided in Mound Plant ER Program SOP 5.4 (DOE 1992) and in ETG SOP "QA/QC Plan for Sampling Procedures" (Appendix B of Work Plan).

Soil vapor samples will be collected from semi-permanent soil probes and from ports on the extraction wells. Samples will be collected using Tedlar bags by the utilizing the pressure differential between the bag and the sample stream.

4.4. OTHER FIELD ACTIVITIES

Additional B Building Solvent Storage Shed Area field activities to be included as part of the quality assurance plan are water level measurements; drilling and logging; sample preservation; decontamination; sample storage, handling, and shipping; sample numbering; waste material handling; and specific analytical field measurements. Water level measurements of depth-to-water in extraction wells (if any) will be performed according to Mound Plant ER Program SOP 3.1, Water Level Measurement (revision 1) (DOE 1992). Drilling and logging procedures for soil and rock borings and monitor wells are specified in Mound Plant ER Program SOPs 4.1, (revision 2), 4.1.1 (revision 0), 4.2, 4.3, 4.4, and 5.1 (revision 1) (DOE 1992). The guidelines for handling and disposal of derived wastes for this project will follow the Mound Plant ER Program SOP 1.15, Guide to Management of Investigation-Derived Waste.

Table 3.4 in Section 3.0 includes the QA requirements for sample collection, holding times, preservation, and storage conditions. In addition, the following general SOPs will be employed during the field activities:

Activity	SOP	Revision	Reference
- Sample Containers and Preservation	1.4	4	DOE 1993
- Sample handling, packaging and shipping of samples	1.5	2	DOE 1993
- Equipment decontamination	1.6	2	DOE 1993
- Management of Investigation-Derived Material	1.15	2	DOE 1993
- Field Measurements	2.2	2	DOE 1993

Sample numbering will occur in accordance with the Mound Plant ER Program sample identification scheme, as described in Section 4.9 of the Field Sampling Plan (Appendix B of this Work Plan).

4.5. SUMMARY OF SAMPLING ACTIVITIES

The Field Sampling Plan for the B Building Solvent Storage Shed Removal Action, found in Appendix B of the Work Plan, includes the number of samples and their frequency. Samples will be collected for soil, soil vapor and wastewater. Soil samples will be collected using a split spoon sampler while soil vapor samples will be collected directly from the sample ports. Wastewater samples from the knockout drum will be collected with a bailer.

5. SAMPLE CUSTODY

A sample provides physical evidence of existing conditions at a site. It is essential that control of this evidence be established to ensure sample integrity. The sample control and documentation procedures given in SOP 1.3 (revision 1) (DOE 1992) will be followed during B Building Solvent Storage Shed Removal Action field activities. Sample collection procedures will be documented by sample location and number in a bound, sequentially page-numbered logbook and by implementing chain-of-custody procedures. Sample custody will be documented from the date and time a sample is collected through all transfers of custody until it is received by the laboratory. Once the sample has been received by the laboratory, internal laboratory sample tracking protocols will be initiated to document sample custody through final disposition, and will also track the analysis status of the sample. The information provided in this section is generic to all sampling activities. Specific information concerning sampling methods documentation and custody protocols is contained in the appropriate sampling method section of the B Building Solvent Storage Shed Removal Action Field Sampling Plan.

5.1. FIELD CUSTODY PROCEDURES

A detailed field logbook will be kept describing all activities accomplished in the field, such that project activities could be reconstructed without relying on communications with the field team participants. The Mound Plan ER Program SOPs 1.1 and 1.3 outline the proper use and the general document control procedures for field staff when using field log books. Entry specifications for each type of sampling procedure are provided in the SOPs for each individual sampling method or procedure. The following information, however, will be included in each field logbook at a minimum:

- Purpose of sampling;
- Location, description, and log of photographs of each sampling point;
- Details of the sample site;
- Identification of sampling team members;
- Sample matrix (i.e., soil, soil vapor, or wastewater);
- Number and volume of samples taken;
- Sampling methodology, including indication of grab or composite sample;

- Field calibrations record;
- Sample preservation, if applicable;
- Date and time sample was collected;
- Sample identification number(s);
- Field observations;
- Field measurements (e.g., dust, explosivity, and organic vapor); and
- Dated signature of the personnel responsible for the field logbook entries and observations.

Sample containers will either be hand delivered or shipped via Federal Express to the designated laboratory. All shipping containers returned to the laboratory will contain a chain-of-custody form documenting the contents. The form will be completed by a sampling team member with the following information recorded:

- Project name and site;
- Client name, address, and phone number;
- Sampler's name, firm, and phone number;
- Sample number, date, time of collection, and matrix;
- Analyses required;
- Preservative used, if applicable;
- Analysis turn-around time requested;
- Relinquishing agent's signature and date and time samples were relinquished; and
- Any other descriptive or explanatory information deemed pertinent by the sampler.

The steps necessary for sample control, sample identification, and data recording are defined in Mound Plant ER Program SOP 1.3, Sample Control and Documentation (Appendix B of Work Plan).

5.2. LABORATORY CUSTODY PROCEDURES

Sample custody files will be maintained by laboratory personnel. The designated sample custodian will accept custody of the shipped samples and verify that the information on the sample labels matches the information on the chain-of-custody records. The custodian will annotate his or her record with observations as to the condition of the shipping container and will enter the sample label data into the sample tracking system and a unique laboratory number will be assigned to each sample. The custodian will assure that all samples are transferred to the proper analyst or are stored in the appropriate secure area (as defined by the lab project QA plan). All documentation for sample custody and transfer will be readily available upon request.

Laboratory personnel will be responsible for the care and custody of samples from the time samples are received by the analyst until the unused portion of the sample is disposed of as waste after all necessary quality assurance checks have been completed. All identifying tags, data sheets, chain-of-custody forms, and other laboratory records shall be retained as part of the laboratory's permanent file.

5.3. SAMPLE HANDLING, PACKAGING, AND SHIPPING

Information and references that must be reviewed prior to the selection of appropriate packaging materials, shipping containers, and shipping labels are defined in Mound Plant ER Program SOP 1.5, Guide to the Handling, Packaging, and Shipment of Samples (Field Sampling Plan, Appendix B of Work Plan). The shipment of all samples during the B Building Solvent Storage Shed area investigation activities with follow current DOT/IATA regulations.

5.4. DOCUMENTATION

Records will be kept by the ER Program EG&G MAT subcontractor to document the quality assurance/quality control activities. The documentation records shall include the following:

- Communications
  - internal and external
- Quality Assurance/Quality Control
  - procedures
  - chain of custody

  - audit reports
  - laboratory quality control reports
  - deviation notification forms
  - non conformance/corrective action reports

- Technical information
  - analytical data
  - field data
  - field log books
  - graphic resources
  - data quality acceptance
  - calculations/evaluations
  - data review reports

- Management
  - schedule
  - budget
  - release site data base

- Health and Safety
  - plans/procedures
  - audit reports

- Documents
  - plans
  - reports

All file documentation will be maintained by the DOE or its subcontractor under the ER Program document control system.

6. LABORATORY ANALYTICAL METHODS

6.1. GENERAL

Standard EPA and ASTM analytical protocols will be employed in specifying and conducting laboratory analyses. Any method cited or used must describe, in detail, the exact sample handling and analytical procedures and materials required. The following items must be included in the procedure:

- Sample matrix;
- Principle of method;
- Sample size requirements;
- Detection limits;
- Interferences and corrective measures;
- Apparatus (including instrument parameters);
- Reagents;
- Calibration procedures;
- Sample preparation (i.e., extraction, digestion);
- Diagrams or tables that describe the method;
- Step-by-step analytical procedure;
- Details of calculation;
- Quality control requirements (i.e., blanks, spikes, replicates);
- Report requirements; and
- References.

6.2. LABORATORY ANALYTICAL METHODS

6.2.1. Volatile Organic Compounds

Soil vapor samples will be analyzed for halogenated and aromatic VOCs using Varion 3400 GC equipped with a Tracer and Varion PID The methodologies to be followed are based on the methodologies described in the "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air", EPA-600/4-84-0141, April 1984 for volatile organic compounds. A summary of the methods, parameters, and quantitation limits can be found in Table 6.1.

Soils will be analyzed for VOCs by EPA Method 8240 using a GC/MS as a means for compound identification. A summary of the methods, parameters, and quantitation limits can be found in Table 6.1.

6.2.2. Geotechnical Parameters

Soils will be analyzed for grain size distribution following ASTM Method D4222.

Table 6.1. Analytical Methods, Parameters, and Quantitation Limits Soil Vapor and Soil/Sediment Samples

Parameters	Analytical Methods		Quantitation Limits[a]	
	Soil Vapor	Soil Soil/Sediment	Soil Vapor ($\mu L/m^3$)	Soil ($\mu g/kg$)[b]
1. Volatile Organic Compounds (VOCs)				
1.1 Purgeable Halocarbons				
Vinyl chloride	GC EPA 600/4-84-0141	8240[b]	NA	10
Trichlorofluoromethane	GC EPA 600/4-84-0141	8240	NA	5
1,1-Dichloroethene	GC EPA 600/4-84-0141	8240	50	5
Methylene chloride (dichloromethane)	GC EPA 600/4-84-0141	8240	NA	5
1,1-Dichloroethane	GC EPA 600/4-84-0141	8240	50	5
Trichloromethane (chloroform)	GC EPA 600/4-84-0141	8240	NA	5
1,1,1-Trichloroethane	GC EPA 600/4-84-0141	8240	50	5
Carbon tetrachloride	GC EPA 600/4-84-0141	8240	NA	5
1,2-Dichloroethane	GC EPA 600/4-84-0141	8240	50	5
Trans-1,2-dichloroethene	GC EPA 600/4-84-0141	8240	50	5
Cis-1,2-dichloroethene	GC EPA 600/4-84-0141	8240	50	50
Trichloroethene	GC EPA 600/4-84-0141	8240	50	5
1,2-Dichloropropane	GC EPA 600/4-84-0141	8240	NA	5
Bromodichloromethane	GC EPA 600/4-84-0141	8240	NA	5
Dibromomethane	GC EPA 600/4-84-0141	8240	NA	5
2-Chloroethyl vinyl ether	GC EPA 600/4-84-0141	8240	NA	5
Cis-1,3-dichloropropene	GC EPA 600/4-84-0141	8240	NA	5
Trans-1,3-dichloropropene	GC EPA 600/4-84-0141	8240	NA	5
1,1,2-Trichloroethane	GC EPA 600/4-84-0141	8240	50	5
Tetrachloroethene	GC EPA 600/4-84-0141	8240	50	5
Dibromochloromethane	GC EPA 600/4-84-0141	8240	NA	5
1-Chlorohexane	GC EPA 600/4-84-0141	8240	NA	2
Chlorobenzene	GC EPA 600/4-84-0141	8240	50	5
1,1,1,2-Tetrachloroethane	GC EPA 600/4-84-0141	8240	NA	5
Bromoform	GC EPA 600/4-84-0141	8240	NA	5
1,1,2,2-Tetrachloroethane	GC EPA 600/4-84-0141	8240	NA	5
1,2,3-Trichloropropane	GC EPA 600/4-84-0141	8240	NA	5
Phenyl bromide (bromobenzene)	GC EPA 600/4-84-0141	8240	NA	50
Chlorotoluene	GC EPA 600/4-84-0141	8240	NA	5
1,3-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
1,4-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
1,2-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
Bis(2-chloroisopropyl)ether	GC EPA 600/4-84-0141	8240	NA	330

Table 6.1. Analytical Methods, Parameters, and Quantitation Limits Soil Vapor and Soil/Sediment Samples (Continued)

Parameters	Analytical Methods		Quantitation Limits[a]	
	Soil Vapor	Soil Soil/Sediment	Soil Vapor ($\mu L/m^3$)	Soil ($\mu g/kg$)[b]
Additional Compounds:				
Trichlorotrifluoroethane	GC EPA 600/4-84-0141	8240	NA	50
1.2 Purgeable Aromatic Compounds				
Benzene	GC EPA 600/4-84-0141	8240	50	5
Chlorobenzene	GC EPA 600/4-84-0141	8240	50	5
1,2-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
1,3-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
1,4-Dichlorobenzene	GC EPA 600/4-84-0141	8240	50	50
Ethylbenzene	GC EPA 600/4-84-0141	8240	50	5
Toluene	GC EPA 600/4-84-0141	8240	50	5
Xylenes	GC EPA 600/4-84-0141	8240	50	5

a For non-CLP analyses, these are expected method detection limits based on reagent grade water or a purified solid matrix. Actual quantitation limits may be higher depending upon the nature of the sample matrix. The limit reported on final laboratory reports will take into account the actual sample volume or weight, percent moisture (where applicable), and the dilution factor, if any. **The quantitation limits for the additional nonroutine analytes may vary, depending upon the results of the method validation study.**

b "U.S. EPA Contract Laboratory Program, Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration." Document No. OLMO1.8 Quantitation limits are contract-required quantitation limits (CRQLs) with the exception of additional organic compounds. The minimum quantitation limits will be reported by the laboratory.

c "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, U.S. EPA, November 1986. Medium Soil/Sediment CRQLs are 125 times the low soil/sediment CRQLs for volatile organic compounds.

7. CALIBRATION PROCEDURES AND FREQUENCY

Before any instrument is used as a measuring device, the instrument's response to known reference materials (traceable to an appropriate agency standard such as NIST, NBS, or ASTM) must be determined. The manner in which various instruments are calibrated is dependent upon the particular type of instrument and its intended use. All sample measurements must be made within the calibrated range of the instrument. For laboratory analyses, appropriate sample dilution is performed if the instrument response is greater than the upper end of the calibration range.

The contractor's Equipment Manager is responsible for ensuring that the following practices and procedures are implemented for all equipment under his/her control:

- Establishing a calibration and maintenance schedule for all measurement and testing devices in accordance with manufacturers' specifications. The method and interval of calibration will be contingent upon the type of device, stability characteristics, required accuracy, and other conditions affecting measurement control.

- Determine the proper range, type, and accuracy for the equipment-specific calibration test being performed based on the manufacturers instructions, the contractor's SOPs, and his or her experience with the equipment in use.

- Maintain a master calibration file in the corporate storage warehouse and record daily calibration checks in the field log books for each measurement and testing device that includes at least the following information:.

  - Name of device;
  - Device serial and/or identification number;
  - Frequency of calibration;
  - Date of last calibration;
  - Name of party performing last calibration; and
  - Due date for next calibration.

- Mark measurement and testing equipment with calibration due dates when possible. Otherwise, alternative methods of tracking a device's calibration due date (such as by serial number) shall be employed.

- Calibrate measurement and testing equipment in accordance with the manufacturers' specification or the requirements of a written SOP. Each instrument shall be calibrated prior to use, and documentation shall be available that substantiates the type and frequency of calibration.

- Employ appropriate methods to ensure proper handling, storage, and care of the test equipment in order to maintain required test accuracy.

7.1. FIELD EQUIPMENT

Applicable field instruments to be used during the investigation will be calibrated according to the specifications set forth in the respective Mound Plant ER Program SOPs (Field Sampling Plan, Appendix B of Work Plan). The respective Mound Plant ER Program SOPs for field equipment include the following:

3.1 Water Level Measurement
6.1 Health and Safety Monitoring of Combustible Gas Levels
6.2 Health and Safety Monitoring of Organic Vapors with a Photoionization Detector
6.3 Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector

Instruments will be calibrated at least once per day during field use. Table 3.1 in Section 3 summarizes the calibration procedures, frequency of calibration and acceptance criteria necessary for the calibration to be valid for applicable field measurements and field screening.

Records for each field instrument used as part of this program will be maintained to ensure its capability of providing accurate and precise measurements. Records will be maintained on instrument maintenance and calibration. Such records will be reviewed prior to their use in the field. Tracking of instrument records will be accomplished by assigning a unique number to each instrument that will correspond to its records file.

The field measurement and field screening instruments that may be used in the field during the environmental investigation are presented in the following subsections.

7.2. LABORATORY EQUIPMENT

Laboratory instrument calibrations typically consist of two types, initial calibration and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over that range is commonly expressed as a correlation coefficient (e.g., for UV-visible/infrared spectrophotometry) or by a response factor, amount/response (e.g., for GC, GC/MS, or high-performance liquid chromatography).

Continuing calibration usually includes measurement of one or more calibration standards. The response is compared to the initial measured instrument response. Continuing calibration is performed at least once per operating shift for laboratory analyses.

Instrument calibration procedures for CLP analyses will be performed according to the CLP SOW for inorganic and organic analyses. For non-CLP analyses, calibration procedures will be performed as described in the approved analytical method and are described in the approved laboratory SOPs. Calibration procedures for all laboratory analyses, along with frequency and acceptance criteria, are summarized in Table 3.2 in Section 3.

8. INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks are performed as part of a field investigation in order to monitor and assess the quality of the data generated. Quality control checks are used to evaluate the accuracy and precision of field screening, field measurements, sampling technique, and laboratory analyses. Acceptance criteria for the quality control checks, and corrective actions to be taken if criteria are not met, have been established for this program so that data of known quality is obtained (Table 3.2 of Section 3). The following subsections summarize those internal quality control checks.

8.1. SCREENING AND FIELD MEASUREMENTS

Quality control procedures for screening and field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings and by calibrating the instruments (when appropriate) with either internal references or external standards. The frequency of these checks and acceptance criteria are presented in Table 3.1 of Section 3.

8.2. FIELD SAMPLING

Field conditions and sampling techniques for soil and soil vapor can be assessed by the collection of equipment (rinsate) blanks, ambient blanks, and duplicate samples for selected laboratory analyses. Blank samples will not be labeled as such so that laboratory bias is minimized. The laboratory will be kept from using these samples for internal quality control by indicating which samples are to be used for internal quality control on the chain-of-custody record.

Ambient and equipment blanks monitor environmental conditions or sampling technique in order to detect potential sample contamination. Equipment (rinsate) blanks are used to evaluate the decontamination technique of soil and soil vapor sampling equipment that is not dedicated to a given sampling location. Equipment blanks for soil are prepared by filling sample bottles with organic-free, deionized water (ASTM Type II quality) that has been routed through a decontaminated sampling device. For soil vapor samples, equipment blanks (ambient) are prepared by passing ambient air through the sampling equipment. Ambient air acts as an equipment blank because the concentrations of the contaminants of concern are lower than the method detection limits (EPA, 1990d).

Collection of duplicate samples will be used to measure the precision of the sampling technique. A duplicate sample is collected for every sample group. A relative percent difference is calculated for the duplicate sample analysis as defined in Section 3 and is used to evaluate sampling precision. Monitoring analytical precision is discussed in the following section, Laboratory Analyses. Acceptance criteria for precision of duplicate field samples has not been established. A high variation in soil sample results for the primary and duplicate sample is common due to the nonhomogeneous nature of soils; therefore, duplicate soil sample results will be assessed accordingly.

8.3. LABORATORY ANALYSES

Internal quality control checks for CLP analyses are specified in the organic SOW (EPA 1990a) and the most current inorganic SOW (EPA 1990b). These quality control checks are summarized on Table 3.2 along with frequency and acceptance criteria. Corrective actions to be taken, if any acceptance criteria are not met, are specified in the EPA CLP SOWs for organic and inorganic analyses.

Internal quality control checks for non-CLP analyses are specified in the analytical method and in Table 3.2. Additional quality control checks for some analyses will be performed and are also summarized in Table 3.2. Frequency of the checks, acceptance criteria, and corrective actions (as presented in Table 3.2) are based on guidance in the analytical method. Laboratory established control limits may be specified (once a lab is selected) if they exceed those given in the method or if no limits are given in the method. Quality control samples that will be evaluated for the data quality indicators include:

- **Method Blanks.** A method blank for soil samples is defined as a volume of deionized distilled laboratory water, or in some cases a purified solid matrix analyzed using the same reagents and procedures as used on the environmental samples. A method blank for soil vapor samples is defined as a volume of clean, hydrocarbon free gas. Data obtained from method blank samples indicate whether environmental samples may have been contaminated during the sample handling and analytical process. A method blank will be processed daily at the beginning of the analytical batch sequence.

- **Surrogate Spikes.** Surrogate compounds are organic constituents similar in chemical composition, extraction, and chromatography to the analytes of interest, but which are not normally found in environmental samples. An assessment of surrogate recoveries provides information on the accuracy and precision of the analytical method. Surrogate compound spikes will be required for GC/MS analysis and will be spiked into all soil samples.

- **Matrix Spikes and Duplicates.** Matrix Spike and Matrix Spike Duplicate analyses are performed to evaluate the effect of the sample matrix upon the analytical methodology. Method precision and its relationship to the specified matrix is determined through an assessment of matrix spike recoveries.

- **Calibration Check Samples.** These are standard sample solutions analyzed to determine instrument calibration accuracy. The calibration check standard solution is developed separately from the working standards used to initially calibrate the instrument.

9. DATA REDUCTION, VALIDATION, AND REPORTING

9.1. FIELD AND TECHNICAL DATA

The field and technical (non-laboratory) data that will be collected during the RI effort at Mound Plant can generally be characterized as either objective or subjective data. Objective data include all direct measurements such as field screening/analytical parameters and water level measurements. Subjective data include descriptions and observations made in the field by the field sampling team member for things such as sample texture, nonhomogeneity, the change in color or degassing upon the addition of preservative to a sample, etc. Test boring and well logs include both types of data, in that the data recorded in the field are descriptive but can be reduced using the standardized lithologic coding system.

9.2. LABORATORY DATA

9.2.1. Laboratory Data Reduction

The computation of analytical results from the raw data generated is performed as prescribed in the various analytical methods. The step-by-step calculations are provided in the referenced analytical method. Data reduction procedures unique to the laboratories used are specified in the analytical laboratory project QA plan. Sample results will not be corrected for method blank results.

Laboratory data is stored separately for each project by the laboratory. Included in the file are calibration records, raw analytical data, processing of data, data validation, quality control samples results, data reports, and project-specific requirements. These records are kept for a minimum of 10 years. The EG&G MAT subcontractor and EPA Region V will be notified of intent to dispose of Mound Plant data.

The laboratory limits access to laboratory data files and the laboratory's electronic database. Only laboratory personnel as designated in their position description are allowed to access the files and the database. The database will be accessed by individual password only. Each individual will be limited to areas in the database which relate directly to their positional responsibilities.

9.2.2. Laboratory Data Validation

Data validation procedures performed in the laboratory are described in the analytical laboratory project QA plan. In addition to the data review performed by the appropriate laboratory, ICF KE will validate the analytical data.

Data Generated Under CLP

Validation by ICF KE will be performed on all CLP organic and inorganic analyses in a step-by-step approach. These data will first be evaluated against the requirements of this QAPjP. The CLP-generated data (TCL organic compounds) will then be evaluated according to EPA CLP validation procedures ("Laboratory Data Validation - Functional Guidelines for Evaluation of Organic Analyses, February 1, 1988," prepared by the EPA Data Review Work Group, latest revisions).

Non-CLP Data

The Mound Plant ER Program will use the criteria described in this section to evaluate the acceptability of all non-CLP data. Non-CLP analyses include volatile organic compounds in groundwater, radiological constituents, common anions, total nitrogen and phosphorous, total dissolved solids, total suspended solids, alkalinity, TOC, and explosives.

The evaluation of these analytical results will consist of the following components:

- Were the appropriate SOPs followed during sample collection?
- Were the samples containerized and handled as described in the FSP and SOPs?
- Were the appropriate number and type of field quality control samples collected?
- Are the data packages complete (subsection 9.2.3)?
- Did the field and laboratory quality control checks meet the established acceptance criteria (Section 3)?

9.2.3. Laboratory Data Reporting

Laboratory data reporting will be provided on electronic media (as ASCII files of a specified format) and in hard copy data reports. All data report packages (i.e., hard copy results and supporting data) received from the laboratory will be single copy, legible, paginated, reproducible, and unbound. Complete packages are shipped only with the electronic data deliverable in no greater than three laboratory batches in any given day of shipment. Only data report packages containing all results for a given field batch will be shipped. Laboratory batches cannot be any greater in size than the identified field batch.

The data report packages are reviewed by a supervisor of a given analytical group or his/her designee for the completeness requirements specified in this section and the analytical laboratory project QA plan. The supervisor's designee can not be the preparer of the data report package. At least one identical copy of the data package must be kept in the project files at the laboratory.

Contents of Data Reports

Laboratory data reports will contain sufficient data to verify each aspect of the analysis, including sample preparation, instrument calibration, sample analysis, and calculation of the final result. All laboratory data report packages for each type of analysis will contain a case narrative that summarizes the following information on the given set of samples analyzed:

- Date of issue;
- The laboratory analysis performed;
- Any deviations from the stated analytical method;
- The laboratory batch number;
- The laboratory SOP number and revision date;
- The instrument settings and columns used;
- The number of samples and the sample matrices;
- A reference to the quality control procedures performed for the specific methods used, including the reference to the acceptance criteria used.;

- The contents of the laboratory report;
- The project name and number;
- The condition of the sample received (e.g., whether preserved and packaged properly);
- Whether sample holding times were met and identification of those samples for which they were not met;
- Any observations that may have had an impact on the analyses;
- Any technical problems affecting the analysis and corrective actions taken;
- Laboratory quality control checks that did not meet the project criteria (as specified in the QAPP) and/or laboratory criteria (include any corrective actions taken and any known possible reasons for the results); and
- The laboratory manager's signature approving the issuance of the data package.

A copy of the chain-of-custody form with all relinquished signatures will accompany each data package.

10. PERFORMANCE AND SYSTEM AUDITS

Audits may consist of two types, system audits and performance audits. The purpose of a system audit is to determine whether appropriate project systems such as equipment, instruments, procedures, qualified personnel, etc., are in place. Performance audits are used to indicate whether those systems are functioning properly and capable of meeting project requirements. Internal audits will be conducted by the EG&G MAT subcontractor's project QAO or the subcontractor's designated auditor to verify the existence of a quality control system and evaluate the level of compliance with that system for quality control measures, standards, records, and project documentation and control.

The QAO or the subcontractor's designee will be responsible for conducting audits. The auditor must have a working knowledge of Mound Plant and of the associated operable unit, and a detailed understanding of the QAPjP, associated SOPs, and the FSP. The auditor is also expected to have an understanding of technical issues related to the field and laboratory sampling program. Finally, the QAO or the designated auditor must exhibit experience with quality assurance audits.

10.1. TECHNICAL PERFORMANCE AUDITS

Technical performance audits will be conducted by the ICF KE QAO or assigned qualified personnel of ICF KE on an ongoing basis during the project, as field data are generated, reduced, and analyzed. These audits will be scheduled and executed as part of work on each operable unit. All numerical analyses, including manual calculations, mapping, and computer modeling, will be documented and will be the subject of performance audits in the form of quality control review, numerical analysis, and peer review. Technical peer review is the responsibility of the Mound Plant ICF KE project manager and will be performed for project data reductions, analyses, and reports.

10.2. FIELD PERFORMANCE AUDITS

The ICF KE's QAO or the designated auditor will perform at least one internal field performance audit during each phase (i.e., drilling, soil sampling, soil vapor sampling, etc.) of the investigation. Field sampling and associated activities will be audited at least once. The purpose of field performance audits is to ensure that the methods and protocols detailed in this QAPP are being consistently adhered to in the field.

Field performance audits will be performed using an audit checklist of the format presented in Figure 10.1. The QAO will base the audit questions on all procedures to be followed in the field, as found in the Work Plan, Field Sampling Plan, and other applicable guidance documents. The field performance audit will include a review of the following activities:

- Soil and soil vapor procedures;
- Field measurements and field screening procedures;
- Field logbook documentation;
- Sample labeling, handling, and custody procedures;
- Decontamination and storage of equipment;
- Completion of ER Program field forms;
- The number and type of quality control samples collected; and
- Drilling procedures.

These activities will be reviewed for their adherence to the procedures established in the FSP, Mound Plant ER Program SOPs, and the QAPP. Audit questions will be developed by the QAO. These checklists are used to ensure completeness of the review and to document the results of the audit.

As part of the field audit, field operation records will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures. Items reviewed will include, but are not limited to, field equipment calibration records, daily field logs, and chain-of-custody documentation. Upon audit completion, an audit report containing observations and any findings and associated corrective actions will be submitted to the ER Program EG&G MAT installation coordinator, ICF KE project manager, and installation manager. These reports will be delivered to EPA upon their request.

EPA Region V, the Region V Central Regional Laboratory, and/or the Region V Central District Office are responsible for performing external audits of field activities.

SAMPLE AUDIT CHECKLIST

FACILITY	AUDITOR(S)	DATE

ACTIVITY/REQUIREMENT	AUDIT QUESTIONS	ANSWER			AUDITOR COMMENTS
		Yes	No	N/A	

SAMAUDCK/PANTEX/3-30-89

Reference: Operable Unit 9, Quality Assurance Project Plan, June 1993

Figure 10.1. Sample Audit Checklist Form

10.3. PROJECT SYSTEM AUDITS

The DOE or its subcontractor director of quality assurance may periodically, on an unannounced basis, call for a corporate project audit (system audit). The project manager must respond by submitting the project QAPjP, and the auditor will then determine whether the QAPjP is in place. The auditor will also determine whether the audits called for in the QAPjP have been, and are being, conducted. Certain projects are identified by the director of quality assurance for a more formal audit on a scheduled basis.

Those audits evaluate, in depth, the implementation of the QAPjP in the project as it applies to field and laboratory data analysis and reduction procedures. The division operations manager, in the role of division quality assurance officer, may ask the director of quality assurance to perform an audit or may personally conduct the audit.

10.4. LABORATORY AUDITS

Due to the short duration of the analytical portion of the investigation, no audits of the laboratory will be performed.

11. PREVENTIVE MAINTENANCE

Proper preventive maintenance of field and laboratory equipment is a necessary element in achieving equipment reliability and minimizing equipment downtime.

11.1. FIELD EQUIPMENT

Field equipment will be properly calibrated, properly charged, and in good general working condition before the beginning of each working day. The required equipment checks and their frequency for each type of field equipment to be used are defined in Mound Plant ER Program SOPs 3.1, Water Level Measurement (revision 1), 6.1, Health and Safety Monitoring of Combustible Gas Levels (revision 1), 6.2, Health and Safety Monitoring of Organic Vapors with a Photoionization Detector (revision 1) 6.4, Total Alpha Surface Contamination Measurements (revision 0), and 6.7, Near Surface and Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER (revision 0). Table 3.1 in Section 3 summarizes the checks to be performed during the B Building Solvent Storage Shed Area investigation. Any nonoperational field equipment will be removed from service and returned to the supplier, and a replacement will be obtained. Field equipment will not be repaired in the field. Maintenance records will be maintained for each field instrument according to a unique number affixed to the instrument. These records will be reviewed prior to their use in the field to ensure that instrument maintenance and calibration are up-to-date.

All field instruments will be properly protected against inclement weather conditions during the field investigation. Each instrument is specially designed to maintain its operating integrity during variable temperature ranges that are representative of ranges that will be encountered during cold-weather working conditions. At the end of each working day, all field equipment will be decontaminated following Mound Plant ER Program SOPs, taken out of the field, and secured in a cool, dry room for overnight storage.

All subcontractor equipment (e.g., drill rigs and water trucks) will arrive at the site in proper working condition each day. Before the start of work each day, the field supervisor will inspect all equipment for fluid leaks. Cables on drill rigs will also be inspected. If a leak is detected or a cable is frayed, the equipment will be removed from service for repair or replacement.

11.2. LABORATORY EQUIPMENT

The ability to generate valid analytical data requires that all analytical instrumentation be properly maintained. All analytical laboratories used for the B Building Solvent Storage Shed program will have a full service contract or an equivalent maintenance program on all major instruments. Specific preventive maintenance programs for each laboratory are presented in the laboratory specifications attachments.

12. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The procedures to assess precision, accuracy, and completeness are presented in Section 3 of this QAPjP. The definition and acceptance criteria are used to assess precision, accuracy, and completeness can be found in Section 3 (Tables 3.1 through 3.3). Precision will be assessed from measurements duplicates taken of the same measurement at different times. The relative percent difference (RPD) will be used to establish a time profile of method performance. The equation for RPD is provided below.

$$RPD = \frac{|(A-B)|}{(A+B)/2} * 100$$

Where:

A = Original Concentration

B = Duplicate Concentration

When sufficient data has been collected, an average RPD and standard deviation will be calculated for reporting and quality control limit delineation. The standard deviation is defined as the square root of the variance of a set of values and is calculated using the equation:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (Xi - \bar{X})^2}{n-1}}$$

where: Xi = Individual Measurement

$\bar{X}$ = average of the individual measurements

n = Number of individual measurements

In the laboratory, control charts will be maintained to provide a timely assessment of precision for measurement functions. Warning and control limits will be established for all measurements. The warning limits will be reported as the mean + 2 standard deviation units, and the control limits will be reported as

+ 3 standard deviation units. The control charts and the associated control limits will be updated following the last twenty points or annually, whichever occurs first.

Accuracy will be assessed from measurements of known concentrations of reference materials. The assessment for accuracy will be independent of the routine calibration process (e.g., reference materials will be obtained from independent source and will be prepared independently). The percent recovery will be used to assess accuracy using the following equation:

$$P = \frac{A - B}{T} (100)$$

where:

P = Percent recovery

A = Analytical result from spiked sample

B = Independently measured background level

T = True value

In the laboratory, control charts will be maintained to provide a timely assessment of accuracy for measurement functions. Warning and control limits will be established for all measurements. The warning limits will be reported as the mean $\pm$ 2 standard deviation units, and the control limits will be reported as $\pm$ 3 standard deviation units. The control charts and the associated control limits will be updated following the last twenty points or annually, whichever occurs first.

The precision and accuracy requirements for CLP organic analyses and non-CLP analyses are given in Tables 3.2 and 3.3. All analytical data are reviewed relative to those criteria. For any quality control checks outside the acceptance criteria, the results will be assessed by the EG&G MAT's subcontractor for data usability. The acceptance criteria for field quality control checks do not take into account the interdependencies of the checks. Since many of the quality control checks are interrelated (e.g., both a method blank and a trip blank could have contaminants), each batch of analytical data will be assessed on a case-by-case basis. Field blank results associated with soil/sediment data will be used only to provide information on the potential for contamination to exist in the soil/sediment samples and will not be used for quantitative purposes.

The laboratory will review the results of laboratory quality control checks listed on Table 3.2. If the results are outside the acceptance criteria, then the corrective actions identified in Section 13 will be performed as needed.

The initial responsibility for monitoring the quality of an analytical system lies with the analyst. The analyst will verify that all quality control procedures are followed and that results of analysis of quality control samples are within acceptance criteria. If acceptance criteria limits are exceeded, appropriate corrective actions will be taken and out-of-control situations will be described in the analytical report case narrative.

Completion will be calculated using the following equation:

$$C = \frac{No}{Ne}(100)$$

where:

C = Percent completion
No = Number of acceptable data points obtained
Ne = Number of acceptable data points expected

Acceptance of data is based on the data meeting the precision and accuracy criteria and passing data validation.

13. CORRECTIVE ACTION PROTOCOLS

13.1. FIELD CORRECTIVE ACTION

The initial responsibility for monitoring the quality of field measurements and observations lies with the field personnel. The field manager is responsible for verifying that all quality control procedures are followed according to the Mound Plant ER Program QAPP. This requires that the field manager assess the correctness of field methods and their ability to meet quality assurance objectives. If a problem occurs that might jeopardize the integrity of the project or cause some specific quality assurance objective not to be met, it is the responsibility of all field project staff to report it. Field project staff must report all such suspected problems by initiating a corrective action report (CAR) and submitting it to the field manager (Figure 13.1). The field manager will submit the CAR to the site manager, the project manager, and the project QAO for formal investigation. Corrective actions to selected problems are presented on Table 8.1. The field site leader will document the problem, develop the corrective action, and document the results, using the form shown in Figure 13.1. He or she will initiate the corrective action and identify and direct the appropriate personnel to implement the corrective action. Any data used subject to a CAR will be flagged. Copies of the documentation form will be provided to the site manager, the ICF KE project manager, and the project QAO. The project QAO will log all corrective action reports.

13.2. LABORATORY CORRECTIVE ACTION

The initial responsibility for monitoring the quality of an analytical system lies with the analyst. In this pursuit, the analyst will verify that all standard operating procedures and quality control procedures are followed according to the approved laboratory QA program and that the results of analysis of quality control samples are within acceptance criteria.

If his assessment reveals that any of the quality control acceptance criteria are not met, he or she must immediately assess the analytical system to correct the problem. The deficiency is reported to the appropriate supervisor, who will complete and sign a nonconformance memorandum form and notify the laboratory Quality Control Coordinator. Written laboratory nonconformances are reported to the Quality Assurance Director monthly.

Page ___ of ___

MOUND PLANT ER PROGRAM
CORRECTIVE ACTION REPORT

[1]Responsible Organization	[2]Date	[3]☐ QF No. ___	[4]Work Order No. ___-___
[5]Identified During	[6]Persons Contacted	[7]Manager	Notified/Date
[8]Requirement			
[9]Finding/Condition Adverse to Quality			
[10a]Significant Condition Adverse to Quality ☐ Yes ☐ No		[10b]Hardware Related ☐ Yes ☐ No Tags applied ☐ Yes ☐ No	
[11]Issue Date			
[12]Initiator Date	[13]Validation Date	[14]QA Manager Date	
[15]Impact On In-Process or Completed Work			
[16]Root Cause of the Adverse Condition			
[17]Remedial Correction Action		Committed Completion Date:	
[18]Corrective Action to Prevent Recurrence		Committed Completion Date:	
[19]Response Prepared By Signature: Date:		[20]Project Manager Approval Signature: Date:	
[21]Response Evaluation ☐ Accept ☐ Reject Comment ___		[22] QA Manager ___ Date ___ QA Officer ___ Date ___	
[23]Verification of Correction Action ☐ Accept ☐ Reject Comment ___		[24] QA Manager ___ Date ___	
[25]Closure QA Manager ___ Date ___		[26] QA Officer ___ Date ___	
[27] Tending Codes: ___			

Figure 13.1. Corrective Action Report

Table 13.1. Corrective Actions to Specific Field Activities

Problem	Corrective Action
Broken sample container	Notify laboratory to determine if enough sample volume, with correct preservation and bottle type is available from other bottles collected for the location. If not, then resample the location.
Incorrect parameters requested	Notify field manager and laboratory and correct.
Samples collected in wrong container	Notify field manager and laboratory. Resample the location for the parameters which were sampled incorrectly.
Discrepancy in or incomplete chain-of-custody form	Document the discrepancy. Notify the field manager and laboratory.
Missing ER Program field form	Take available information from field log and transcribe to the form. Note on form the missing data and attach memo documenting the missing information.
Incorrect sample packing	Laboratory will notify the contact in the EG&G MAT subcontracting firm. Field manager will be notified.
Missing information or incorrect information in field log book.	Responsible field personnel will make correction on the current page of the logbook and will refer to the page with incorrect or missing information.
Incorrect format used in field logbook	Note in logbook at which point it was discovered. Begin using correct format.
Required quality control sample not collected in a given day	Notify field manager. Collect additional quality control sample.
Misidentified sample location	Notify field manager. Contact laboratory and have them not analyze samples. Sample the correct location.
Field instruments and equipment not decontaminated according to the Mound ER Program SOPs	Remeasure parameter or perform the activity again with a properly decontaminated instrument or equipment.
No or incomplete decontamination between samples collected during drilling	Responsible field personnel will note in logbook if discovered during the activity and will correct. The QAM will include nonconformance in the monthly quality assurance report. Evaluate sample data for usability.

Table 13.1. (Continued)

Problem	Corrective Action
No or incomplete decontamination drilling equipment between sample locations	Responsible field personnel will note in logbook if discovered during the activity and will correct. The QAM will include nonconformance in the monthly quality assurance report. Evaluate sample data for usability.
Chain-of-custody form not sent with samples	If chain-of-custody seals are not broken, notify field manager. Fax copy and send originals overnight to laboratory. Resample if chain-of-custody seals are broken prior to receipt by laboratory.
Measurement of internal temperature of samples outside specified range	Notify field manager. Resample all associated samples as determined necessary.
Health and safety field screening measurement missed	Notify field manager and site safety coordinator.

The nature of the corrective action obviously depends on the nature of the problem. For example, if a continuing calibration verification is determined to be out of control, the corrective action may require recalibration of the analytical system and reanalysis of all samples since the last acceptable continuing, calibration standard. Specific corrective actions to exceeded acceptance criteria for laboratory quality control checks are summarized in Table 3.2. Corrective actions to be taken for CLP analyses (TCL VOCs) are presented in the CLP SOW for organic analyses. If samples analyzed under the CLP procedures exceed holding times, the laboratory will analyze new samples at no cost to the client.

The laboratory reports all sample variances (e.g., insufficient sample size, extract loss during concentration, sample matrix problems, solvent contamination) in a nonconformance report which contains the following information:

- Client name,
- Project name,
- Operational unit and task,
- Date of occurrence,
- Analysis method,
- Laboratory batch number,
- Affected client sample IDs,
- Nature of nonconformance,
- Criteria not met,
- Responsible analyst or technician,
- Corrective action taken,
- Signature of project manager,
- Signature of section/unit manager, and
- Signature of QA coordinator.

13.3. CORRECTIVE ACTIONS RESULTING FROM AUDITS

The project QAO and audit team will prepare a formal report of all audit proceedings. The programmatic impact of a negative finding, such as the lack of or failure to use an appropriate procedure, will be determined by the project QAO and reported to the individuals identified in section 10. A corrective action plan and schedule will be requested, and the project manager will be responsible for ensuring that action to correct the problem has been developed and initiated, and any special expertise has been made available. The ICF KE project manager will also be responsible for implementing the corrective action and ensuring that no additional work, dependent on the activity, is performed until the problem is corrected. Corrective action may include reanalyzing the samples (if holding time permits), resampling, and evaluating and amending the sampling and analytical procedures.

The ICF KE project manager will approve the corrective action and will be responsible for ensuring that the corrective action adequately addresses the problem. The project QAO will ensure that corrective actions for problems are implemented by

- Evaluating all reported problems,
- Controlling additional work on the related activity,
- Maintaining the log of CARs, and
- Ensuring CARs are included in the site documentation files.

Following implementation of satisfactory corrective action, the project QAO will conduct follow-up activities sufficient to verify this implementation. Such confirmation will be documented, along with any further recommendations, in a formal closeout report for the audit. The closeout report will be distributed to the individuals identified in Section 14, as appropriate.

14. QUALITY ASSURANCE REPORTS TO MANAGEMENT

Quality assurance reports to management will consist of prior notification of activities and reports on activities. Reports will encompass both routine reports and special reports, including written reports and memoranda documenting data assessment activities, results of data validations, audits, nonconformances, corrective actions, and quality notices. The management hierarchy receiving some or all of the reports will include DOE DAO (the RPM), the EG&G MAT ER Program Project Manager, the DOE AL Program Manager, and the ICF KE project manager. Reports may be distributed to RI/FS subcontractors at the discretion of the DOE RPM and the ICF KE project manager.

Prior notification of all quality assurance activities will be provided to all managers through the vehicle of monthly progress reports that also contain information about all B Building Solvent Storage Shed Area activities, and through special trip notices that notify managers of contractor and subcontractor travel. Monthly progress reports will routinely discuss upcoming activities, including field work and scheduled audits. Any of the managers listed above may use the notification to identify the need for, and schedule quality assurance audits in connection with, scheduled field work.

Monthly reports will also describe the progress, the completion, and sometimes the results of quality assurance activities. Descriptions of the completion of activities will serve as notice to all managers of the availability of quality assurance reports. Results of quality assurance activities may be summarized for inclusion in monthly reports. Each quality assurance activity shall be documented in a report separate from any summary or description included in the monthly progress report.

15. REFERENCES

ASTM. 1991. Annual Book of ASTM Standards, Section 11, Water and Environmental Technology, Volume 11.02 Water (II).

DOE. 1986. "Phase 1: Installation Assessment Mound [DRAFT]." Comprehensive Environmental Assessment and Response Program. U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM. April 1986.

DOE. 1991. "Standard Operating Procedures." Mound Plant, Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM. January 1991.

DOE. 1992. "Reconnaissance Sampling Report, Soil Gas and Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill, Draft." Mound Plant, Environmental Restoration Program, U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM. December 1992.

DOE. 1993. "Remedial Investigation/Feasibility Study Operable Unit 9, Site-wide, Quality Assurance Project Plan, Revision 3 (Final)." Mound Plant, Environmental Restoration Program, U.S. DOE, Albuquerque Operations Office, Albuquerque, NM. June 1993.

DOE. 1994. "B Building Solvent Storage Shed Removal Action Memorandum." Mound Plant, Environmental Restoration Program, U.S. DOE, Albuquerque Operations Office, Albuquerque, NM. February 1994.

EPA. 1983. "Methods for Chemical Analysis of Water and Wastes." U.S. Environmental Protection Agency, EPA-600/4-79-020. March 1983.

EPA. 1984. "Compendiem of Methods for the Determination of Toxic Organic Compounds in Ambient Air", U.S. Environmental Protection Agency, EPA-600/4-84-0141, April 1984.

EPA. 1986. "Test Methods for Evaluating Solid Waste." *Laboratory Manual Physical/Chemical Methods, SW-846*, Volumes 1A, 1B, and 1C, third edition. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. November 1986.

EPA. 1987. Data Quality Objectives for Remedial Response Activities. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response and Office of Waste Programs Enforcement. Report No. EPA 540/G-87/003. Washington, D.C. March 1987.

EPA. 1990a. "U.S. EPA Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration." Document No. ILM01.0 including revisions 1.1 through 1.8. U.S. Environmental Protection Agency. March 1990.

EPA. 1990b. "U.S. EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration." Document No. ILM01.0. U.S. Environmental Protection Agency. March 1990.

EPA. 1990c. "Specifications and Guidance for Obtaining Contaminant - Free Sample Containers." U.S. EPA Office of Solid Waste and Emergency Response. April 1990.

EPA. 1990d. "Total Air Monitoring (TAM) Network Results" U.S. Environmental Protection Agency. January 1990.

ICF KE. 1994, "Determination of Preliminary Remedial Goals at the B Building Solvent Storage Shed Area, Draft", ICF Kaiser Engineers, February 1994.

APPENDIX 1
LIST OF STANDARD OPERATING PROCEDURES

NOTE: The actual SOPs can be found in Appendix A of the OU-9 QAPP. The actual SOPs to be used for this project can be found in the Field Sampling Plan, Appendix B of the Work Plan.

MOUND PLANT ER PROGRAM

LIST OF STANDARD OPERATING PROCEDURES

SECTION 1 - GENERAL

1.1 General Instructions for Field Personnel
1.2 General Surface Geophysics
1.3 Sample Control and Documentation
1.4 Sample Containers and Preservation
1.5 Guide to the Handling, Packaging, and Shipping of Samples
1.6 General Equipment Decontamination
1.7 Sampling for Removable Alpha Contamination
1.8 Personnel Decontamination - Level D Protection
1.9 Personnel Decontamination - Level C Protection
1.10 Personnel Decontamination - Level B Protection
1.12 Air Particulate Sampling with a Real-Time Aerosol Monitor
1.15 Guide to Waste Management

SECTION 2 - WATER SAMPLING

2.1 Presample Purging of Wells
2.2 Field Measurements on Ground and Surface Water Samples
2.3 Sampling Monitoring Wells with a Bladder Pump
2.4 Sampling Monitoring Wells with a Bucket-Type Bailer
2.5 Sampling Monitoring Wells with a Submersible Pump
2.6 Sampling Monitoring Wells with a Peristatic Pump
2.7 Sampling Commercial/Municipal/Domestic Wells
2.8 Sampling for Volatile Organics
2.9 Surface Water Sampling
2.10 Stream Flow Measurements Using Flumes, Velocity Cross Sectional Area, and Direct Volume
2.11 Stream Flow Measurements Using Weirs

SECTION 3 - HYDRAULIC TESTING

3.1 Water Level Measurements
3.3 Operational Check of Pressure Transducers Used in Measuring Water Levels in Wells

SECTION 4 - DRILLING AND LOGGING

4.1 Soil Boring
4.1.1 Methods to Control Communication of Subsurface Contaminants Within and Between Saturated Zones During Drilling and Well Installation
4.2 Rock Boring
4.3 Monitoring Well Installation
4.4 Monitoring Well Development
4.6 Test Pit Logging and Sampling
4.7 Piezometer Installation
4.8 Piezometer Development

SECTION 5 - SOIL SAMPLING

5.1 Soil and Rock Borehole Logging and Sampling
5.2 Soil Sampling with A Spade and Scoop
5.3 Subsurface Solid Sampling with Hand Auger and Thin-Wall Sampler
5.4 General Soil Gas Sampling and Field Chemical Analysis
5.8 Soil Sampling with a Stainless Steel Surface Soil Sampler
5.9 Sediment Sampling Procedures for Streams, Rivers, and Ponds

SECTION 6 - HEALTH AND SAFETY

6.1 Health and Safety Monitoring of Combustible Gas Levels
6.2 Health and Safety Monitoring of Organic Vapors with a Photoionization Detector
6.3 Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector
6.4 Total Alpha Surface Contamination Measurements
6.7 Near Surface and Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER
6.11 Beta-Gamma Radiation Measurements
6.15 Measurement of Gamma-Ray Field Using a Sodium Iodide (No. 1) Detector
6.16 Heat Stress Monitoring

NOTE: The actual SOPs can be found in Appendix A of the OU-9 QAPP.