QUALITY ASSURANCE PROJECT PLAN

FOR THE LIMITED SITE INVESTIGATION

TNT RAIL CAR LOADING AREA

@

PLUM BROOK ORDNANCE WORKS

JULY 2000

Prepared by:

U.S. ARMY CORPS OF ENGINEERS

LOUISVILLE DISTRICT

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ATTACHED DOCUMENTS

I. Field Sampling Plan (FSP) dated May 1999
II. Data Quality Objectives (DQOs) dated May 1999

ASSOCIATED DOCUMENTS NOT ATTACHED

I. Site Specific Health and Safety Plan dated May 1999

List of Acronyms

ASTM	American Standards for Testing Materials
BTEX	benzene, toluene, ethylbenzene, xylene
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CLP	Contract Laboratory Program
COC	Chain of Custody
CRL	Central Regional Laboratory
D&D	Decontamination & Decommissioning
DERP	Defense Environmental Restoration Program
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
ERIIS	Environmental Risk Information & Imaging Services
ERNS	Emergency Response Notification System
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Sites
gpm	gallons per minute
GSA	General Services Administration
HNO_3	acetic acid
IDW	Investigation-Derived Waste
INPR	Inventory Project Request
IT	IT Corporation
LeRC	Lewis Research Center
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
msl	mean sea level
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautical and Space Administration
NIST	National Institute of Standard Technology
NPL	National Priorities Lists
OEPA	Ohio Environmental Protection Agency
PA	Preliminary Assessment
PAWL	Pentolite Area Waste Lagoons
PBOW	Plum Brook Ordnance Works
PBRF	Plum Brook Reactor Facility

PBS	Plum Brook Station
PE	Pentaerythritol
PETN	Pentaerythritol tetranitrate
PID	Photoionization Detector
ppb	parts per billion
PRGs	Preliminary Remediation Goals
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SAS	Spectial Analytical Services
SI	Sight Investigation
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
SW846	Test Methods for Evaluating Solid Waste 1986
TAL	Target Analyte List
TCL	Target Compound List
TOC	Total Organic Carbon
TNT	trinitrotoluene
USACE	U.S. Army Corp of Engineers
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

SECTION 1

PROJECT DESCRIPTION

1.1 Introduction

The U.S. Army Corps of Engineers, Louisville District, has prepared this Quality Assurance Project Plan (QAPP) for a limited Site Investigation (SI) of the Rail Car Loading Areas site. The purpose of this SI is to evaluate the potential for contamination of the site due to past Army activities. The potential for contamination at the site was identified in an inventory Project Request (INPR) (Huntington District U.S. Army Corps of Engineers (USACE)). The References section of this document identifies the guidance documents and information used to evaluate the site history and environmental media and locations most likely affected. Field sampling and chemical laboratory analysis will be performed to evaluate the environmental media in the potential source area. Results of the laboratory analysis will be compared to risk-based, media specific screening criteria. USEPA Region 9 Preliminary Remediation Goals (PRGs) will be used as the screening criteria.

The Rail Car Loading Area is being addressed by the DOD under the Defense Environmental Restoration Program (DERP), of Formerly Used Defense Sites (FUDS). An associated Field Sampling Plan (FSP) and Data Quality Objectives (DQOs) evaluation, dated May 1999, are attached to this QAPP. A Site Specific Health and Safety Plan (SSHSP), dated May 1999 is also associated with this document, but is not attached.

1.2 Site Description

This section is addressed on Section 1.2 of the SI Field Sampling Plan, which is hereby incorporated into this QAPP through reference, and in the drawings which have been submitted along with the SI Field Sampling Plan.

1.2.1 Facility/Size and Borders

This section is addressed on Section 1.3 of the SI Field Sampling Plan, which is hereby incorporated into this QAPP through reference, and in the drawings which have been submitted along with the SI Field Sampling Plan.

1.2.2 Topography

Section 1.5 of the SI FSP plan provides information concerning the site's general topography.

1.2.3 Local Geography & Hydrogeology

Sections 1.6 and 1.7 of the SI FSP present information on the local geology and hydrogeology.

1.3 Past Data Collection Activities

A number of environmental investigations have been conducted at the PBOW; however, none were performed specifically for the Rail Car Loading Area. The investigations for the PBOW are listed in the References section of this document.

1.4 Current Status

The former PBOW is currently owned by NASA, that uses it as a training and research center (the Lewis Research Center at Plum Brook Station). NASA allows local law enforcement agencies to use the site as an outdoor range training area for small caliber weapons. No other activity is carried on in the area and the rail lines are no longer in use.

1.5 Project Objectives

The purpose of this investigation is to gather sufficient information to determine if environmental contamination at the site merits further study or other actions. Objectives of the investigation will be as follows:

- Evaluate the existence of contamination in previously identified on-site source areas. Data quality must be sufficient to be able to compare with the USEPA Region 9 health based screening criteria (Preliminary Remediation Goals (PRGs)).

- Collect sufficient data on potentially contaminated media to support a recommendation for further study, action, or coordinate with the OEPA to proceed toward a No Further Action (NFA) closure of the site.

The investigation will integrate existing data with information that will be gathered through direct field investigations.

The field investigation will include surface soil sampling, field screening and chemical laboratory analysis for evaluation of the site per the attached FSP.

If SI data suggests that site characterization information indicated that no further action is required at the site, activities will be coordinated with OEPA to proceed toward an NFA Decision Document. If, on the other hand, the SI data shows a need for further investigation or other action, work plans for the next action will be prepared and submitted to OEPA.

1.5.1 Specific Objectives and Associated Tasks

For this project, it will be necessary to gather sufficient information to determine the existence of contamination due to releases from the operation of the rail car loading area.

In order to assess the presence or absence of hazardous constituents at the sites, soil samples will be screened during this SI for likely constituents of concern. A limited number of samples may also be analyzed for soil characteristics. This information will be used to compare results to appropriate screening levels.

1.5.2 Project Target Parameters and Intended Data Usages

The list of target parameters includes SVOCs, TAL metals and explosives (nitroaromatics) as detailed in the attached FSP. The data will be compared to the USEPA Region 9 PRGs.

1.5.3 Quality Objectives and Criteria for Measurement Data

DQO are qualitative and quantitative statements derived from outputs of each step of the DQO process that:

* Clarify the study objective;
* Define the most appropriate type of data to collect;
* Determine the most appropriate conditions from which to collect the data; and

The DQO are then used to develop a scientific and resource-effective sampling design.

The DQO process allows decision-makers to define their data requirements and acceptable levels of decision during planning before any data are collected. DQOs are based on the seven step process described in EPA QA/G-4 (September 1994) document. The DQOs for this site are attached to this QAPP.

1.6 Sample Rationale

The sample rationale for sample locations (in respective media) is described in detail in Section 5 of the Field Sampling Plan.

1.6.1 Sample Network by Task and Matrix

Sample matrices, analytical parameters, and frequencies of sample collection can be found in sections 3 and 4 of the Field Sampling Plan.

1.6.2 Site Maps of Sampling Locations

Maps showing intended soil locations are included as figures in the Field Sampling Plan, which is

attached to this QAPP. It is possible, however, that depending on the nature of encountered field conditions some of these locations will be changed. The Site Manager, whose responsibilities are described in Section 2 of this QAPP, will be responsible for making such decisions.

1.6.3 Rationale of Selected Sampling Locations

The attached FSP and DQOs describe the rationale used to select sampling locations and depths. In general, sampling will be performed at locations most likely to contain the highest levels of contamination.

1.7 Project Schedule

1.7.1 Anticipated Date of Project Mobilization

The earliest date for which samples are planned to be collected is 8 June 1999.

1.7.2 Task Bar Chart and Associated Timeframes

The dates of projected milestones are indicated in the submitted Task Bar Chart.

Task	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sept-99
Research/Planning	19-	28							
Site Visit			16-17						
Document Prep.			22		28				
DQO				13					
QAPP					24				
SSHP					20				
FSP				21					
Field Investigation						10			
Data Validation							30		
SI Report Prep.								6	
Review SI Report								30	
Submit SI Report									29

SECTION 2

PROJECT ORGANIZATION AND RESPONSIBILITY

The U.S. Army Corps of Engineers has overall responsibility for all phases of the SI. The Louisville District Corps of Engineers will perform the field investigation and prepare the SI report. The various quality assurance and management responsibilities of key project personnel are defined below.

2.1 Project Organizational Chart

Shelton M. Poole, CHMM, RPIH — Health and Safety Manager (HSM)

Mr. Poole has the responsibility for ensuring that the provisions of the Site Specific Health and Safety Plan (SSHSP) are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning the adequacy of the protection programs. Mr. Poole is well experienced and meets the additional training requirements specified by OSHA in 29 CFR 1910.120. The HSM is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of the HASP.

Shirley Dunn — Health and Safety QC and Alternate

Ms. Dunn is also well experienced, and had the additional training requirements specified by OSHA in 29CFR1910.120. She will serve as the QC reviewer and alternative to Mr. Poole.

Samir A. Mansy, Ph.D. — Quality Assurance Manager

Dr. Mansy served as the Chief of the Quality Assurance Section at Great Lakes and Ohio River Division Laboratory, Cincinnati, Ohio. He is currently the Data Quality Assurance Manager in Louisville District, Environmental Engineering Branch. He is experienced in data review, validation, and trouble shooting. Dr. Mansy provides an independent review of the analytical data based on SW846 and National Functional Guidelines.

Albert J. Reyes, PE — Project Engineer and Team Leader

Mr. Reyes has served as a Project Engineer for Environmental Projects with the Louisville District since 1992. Mr. Reyes has extensive experience in all the aspects of contracting and execution of all types of Environmental Projects including preparation of Groundwater Treatment Plans, Testing and removal of Underground Storage Tanks, Preliminary Assessments, Site Investigations, Remedial Investigations and Feasibility Studies, and Remedial Design and Remedial Action. Mr. Reyes will serve as Project Engineer and Team Leader.

2.2 Management Responsibilities

Site Investigation Project Manager

The Project Manager, Rick Meadows, Huntington District, has the overall responsibility for all phases of the PBOW projects.

Site Manager

The Project Engineer serves as the Site Manager and is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The site manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The site manager will:

- Define project objectives and develop a detailed work plan schedule;
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;
- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints;
- Orient all field leaders and support staff concerning the project's special considerations;
- Monitor and direct the field leaders;
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task project;
- Review the work performed on each task to ensure its quality, responsiveness and timeliness;
- Approve all reports (deliverables) before their submission to Ohio EPA;
- Ultimately be responsible for the preparation and quality of interim and final reports.

2.3 Quality Assurance (QA) Responsibilities

Chemical QA Manager

The Chemical QA manager will remain independent of direct job involvement and day-to-day operations, and have direct access to corporate executive staff as necessary, to resolve any QA dispute. Dr. Mansy is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations, U.S. Army Corps of Engineers, and Ohio EPA requirements. Specific functions and duties include:

- Reviewing and approving of QA plans and procedures;
- Providing QA technical assistance to project staff;
- Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Engineer.
- Data validation including tentatively identified compounds;
- Review and approval of field, and laboratory procedure.
- Performance and system Audits of the Laboratory.

All samples will be analyzed by Quanterra Environmental Services, North Canton, Ohio, with the exception of Atterburg Limits and grain size analysis, which will be subcontracted to an approved laboratory. Data validation will be done by Roy F. Weston, Inc., Miamisburg, Ohio. Validation will be conducted randomly on 10% of the sample results.

2.4 Field Responsibilities

USACE Field Technical Staff

The technical staff (team members) for this project will be drawn from USACE pool of Louisville District, Environmental Engineering Branch resources. The technical team staff will be utilized to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

2.5 Laboratory Responsibilities

Quanterra Laboratory Project Manager

The Quanaterra project manager, Debora Hula, will report directly to the USACE Quality Assurance Manager, Dr. Samir Mansy, and will be responsible for the following:

- Ensuring all resources of the laboratory are available on an as-required basis;
- Over viewing of final analytical reports; and
- Approving final analytical reports prior to submission to Louisville District.

Quanterra Operations Manager

The Quanterra Operation Manager will report to the Quanterra Project Manager and will be responsible for:

- Coordinating laboratory analyses;
- Supervising in-house chain-of-custody;
- Scheduling sample analyses;
- Overseeing data review; and
- Overseeing preparation of analytical reports.

Quanterra Quality Assurance Officer

Ms. Opal Davis-Johnson is the Quanterra QA officer, and has the overall responsibility for data after it leaves the laboratory. The Quanterra QA officer will be independent of the laboratory but will communicate data issues through the Quanterra project manager. In addition, the Quanterra QA officer will:

- Overview laboratory quality assurance;
- Overview QA/QC documentation;
- Conduct random audits of detailed data;
- Determine whether to implement laboratory corrective actions, if required;
- Define appropriate laboratory QA procedures;
- Prepare laboratory Standard Operating Procedures; and
- Sign the title page of the QAPP.

Quanterra Sample Custodian

The Quanterra sample custodian, Lois Ezzo, will report to the Quanterra operations manager Ms. Debora Hula, and to the Laboratory Supervisor. Responsibilities of the sample custodian will include:

- Receiving and inspecting the incoming sample containers;
- Recording the condition of the incoming sample containers;

- Signing appropriate documents;
- Verifying chain-of-custody and its correctness;
- Notifying laboratory manager and laboratory supervisor of sample receipt and inspection;
- Assigning a unique identification number and customer number, and entering each into the sample receiving log;
- With the help of the laboratory manager, initiating transfer of the samples to appropriate lab sections; and
- Controlling and monitoring access/storage of samples and extracts.

Final responsibility for project quality rests with USACE Project Manager. Independent quality assurance will be provided by the Quanterra Project Manager and QA Office, prior to release of all data to the USACE Project Engineer.

Quanterra Technical Staff

The Quanterra technical staff will be responsible for sample analysis and identification of corrective actions. The staff will report directly to the Quanterra operations manager. The technical staff have signed Ethics Agreements that they abide by the high standards of integrity, they shall report actual data, and they will report to the officials of any accidental or intentional non-authentic data; copies of the agreements are provided in Appendix A.

SECTION 3

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results that are legally defensible in a court of law. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventative maintenance of field equipment, and corrective action are described in other sections of this QAPP.

3.1 Precision

3.1.1 Definition

Precision is a measure of the degree to which two or more measurements are in agreement.

3.1.2 Field Precision Objectives

Field precision is assessed through the collection and measurement of field duplicates at a rate of 1 duplicate per 10 analytical samples.

3.1.3 Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of relative percent difference (RPD) and relative standard deviations (RSD) for three or more samples. The equations to be used for precision in this project can be found in Section 12 of this QAPP. Precision control limits are included in the provided SOPs.

3.2 Accuracy

3.2.1 Definition

Accuracy is the degree of agreement between an observed value and an accepted reference value.

3.2.2 Field Accuracy Objectives

Accuracy in the field is assessed through the use of field and trip blanks and through the adherence to all sample handling, preservation and holding times.

3.2.3 Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) and the determination of percent recoveries. The equation to be

used for accuracy in this project can be found in Section 12 of this QAPP. Accuracy control limits are included in the provided SOPs.

3.3 Completeness

3.3.1 Definition

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

3.3.2 Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 12 of this QAPP. Laboratory completeness for this project will be greater than 95 percent.

3.4 Representativeness

3.4.1 Definition

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

3.4.2 Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan (FSP) is followed and that proper sampling techniques are used.

3.4.3 Measures to Ensure Representativeness of Laboratory Data

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample-holding times and analyzing and assessing field duplicated samples. The sampling network is designed to provide data representative of facility conditions. During development of this network, consideration is given to past waste disposal practices, existing analytical data, physical setting and processes, and constraints inherent to the FUDS program. The rationale of the sampling network is discussed in detail in the Field Sampling Plan (FSP).

3.5 Comparability

3.5.1 Definition

Comparability is an expression of the confidence with which one data set can be compared

with another. Comparability is also dependent on similar QA objectives.

3.5.2 Measures to Ensure Comparability of Field Data

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the FSP is followed and that proper sampling techniques are used.

3.5.3 Measures to Ensure Comparability of Laboratory Data

Planned analytical data will be comparable when similar sampling and analytical methods are used and documented in the QAPP. Comparability is also dependent on similar QA objectives.

3.6 Level of Quality Control Effort

Field blank, trip blank, method blank, duplicate, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the facility, which may cause samples contamination. Trip blanks are used to assess the potential for contamination of samples due to contamination migration during sample shipping and storage. Trip blanks generally pertain to volatile organic samples only. Trip blanks prepared prior to the sampling event in the actual sample containers and are kept with the investigative samples throughout the sampling event. They are then packaged for shipment with other samples and sent for analysis. There should be one trip blank included in each sample shipping container. At no time after their preparation are the sample containers opened before they reach the laboratory.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One matrix spike/matrix spike duplicate will be collected for every 20 or fewer investigative samples. MS/MSD samples are designated/ collected for organic analyses only.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for VOCs or extractable organics. However, aqueous MS/MSD samples must be collected at triple the volume for VOCs and double the volume for extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, soil).

The general level of the QC effort will be one field duplicate and one field blank for every 10 or fewer investigative samples. One volatile organic analysis (VOA) trip blank consisting of distilled deionized ultra pure water will be included along with each shipment of aqueous VOA samples.

The number of duplicate and field blank samples to be collected is listed in the Field Sampling Plan. Sampling procedures are also specified in the Field Sampling Plan.

SECTION 4

SAMPLING PROCEDURES

The sampling procedures to be used in this site investigation will be consistent for the purpose of this project. The attached FSP outlines all the sampling procedure information. Please refer to the following sections and subsections of the FSP for the following information:

3.0 SCOPE AND OBJECTIVES

4.0 SAMPLING DESIGN AND RATIONALE

5.0 FIELD ACTIVITIES AND SAMPLING PROCEDURES
5.1 Visual Inspections
5.2 Sample Documentation
5.3 Photographs
5.4 Surface Soil Sampling
5.5 Field Quality Control Sampling
5.6 Field Screening Test
5.7 Decontamination

6.0 FIELD SAMPLE IDENTIFICATION AND CUSTODY PROCEDURES
6.1 Sample Containers, Preservation and Holding Times
6.2 Sample Identification
6.3 Sample Packaging
6.4 Custody Transfer and Shipment Procedures

7.0 DISPOSITION OF FIELD INVESTIGATION DERIVED WASTE (IDW)

8.0 SCHEDULE
8.1 Start Date
8.2 Pre-mobilization
8.3 Mobilization
8.4 Demobilization

SECTION 5

CUSTODY PROCEDURES

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if:

* the item is in actual possession of a person; or
* the item is in the view of the person after being in actual possession of the person; or
* the item was in actual physical possession but is locked up to prevent tampering; or
* the item is in a designated and identified secure area.

5.1 Field Custody Procedures

All samples will be accompanied by a CoC form. When the possession of samples is transferred, the individual relinquishing the samples and the individual receiving the samples will sign, date, and note the time of transfer on the CoC document. This record will represent the official documentation for all transfers of sample custody until samples arrive at Quanterra Laboratories, North Canton, Ohio. Samples will be shipped via overnight service by the courier. This will allow for the least amount of time from sampling and analysis, and will ensure that all holding times are met. Notification of sample shipment to the laboratory will be performed by the Field team leader.

Quanterra Laboratory	Phone (330) 497-9396
4101 Shuffel Drive NW	Fax (330) 497-0772
North Canton, OH 44720	

5.2 Laboratory Custody Procedures

Laboratory custody procedures for sample receiving and log-in; sample storing and numbering; tracking during sample preparation and analysis; and storage of data are described in the Quanterra procedures in Appendix B.

The chain of custody procedures for samples shipped to the CRL are described in Quanterra Standard Operating Procedures (SOP).

5.3 Final Evidence Files

The final evidence file will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QAPP. The Project Engineer is the custodian of the evidence file and maintains the contents of evidence files for the site, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews in a secured, limited access area.

The final evidence file will include at a minimum:

- field logbooks
- field data and data deliverables
- drawings
- soil boring logs
- laboratory data deliverables
- data validation reports
- data assessment reports
- all custody documentation (tags, forms, Air bills).

SECTION 6

CALIBRATION PROCEDURES AND FREQUENCY

This section describes the calibration procedures and the frequency at which these procedures will be performed for both field and laboratory instruments.

6.1 Field Instrument Calibration

Field instruments include only the spectrophotometer for the EnSys Soil Test System. Please refer to the FSP paragraph 5.6 for details.

6.2 Laboratory Instrument Calibration

Calibration procedures for a scientific laboratory instrument will consist of an initial calibration (2, 3, 5, or 6 points, depending on the method), initial calibration verification and continuing calibration verification. For a description of the calibration procedures for a specific laboratory instrument, refer to the applicable SOPs in Appendix B of this QAPP. The SOP for each analysis performed in the laboratory describes the calibration procedures, their frequency, acceptance criteria and the conditions that will require recalibration. In all cases, the initial calibration will be verified using an independently prepared calibration verification solution (CRI-brand as second source).

The laboratory maintains a sample logbook for each instrument, which will contain the following information: instrument identification, date of calibration, analyst, calibration solutions run and the samples associated with these calibrations.

Organic Analyses

Prior to calibration, the instrument(s) used for Gas Chromatographic / Mass Spectrometer (GC / MS) analyses are tuned by analysis of p-bromofluorobenzene (BFB) for volatile analyses and decafluorotriphenyl phosphine (DFTPP) for semivolatile analyses. Once the tuning criteria for these reference compounds are met, the instrument should be initially calibrated by using a five-point calibration curve. The instrument tune will be verified each 12 hours of operation.

After the tuning criteria are met, the instrument is initially calibrated using a five-point calibration curve. Continuing calibration is verified as specified in the method, or at least each working day, using criteria specified by the method. The calibration standards will be USEPA- or NBS-traceable and are spiked with internal standards and surrogate compounds. Whereas, Calibration and continuing calibration verification at midpoint and at MRL (method Reporting Limit) levels will be performed at approved intervals as specified by the manufacturer or the analytical method (whichever is more frequent). Calibration standards used as reference standards will be traceable to the source.

Metals Analysis

The Atomic Absorption Spectrophotometer (AAS) and Inductively Coupled Plasma Emission Spectrophotometer (ICP) instruments are calibrated by use of a blank and a one-point standard prepared by dilution of certified stock solutions. An analysis blank is prepared with one calibration standard at the MRL for the metal. The other standards bracket the concentration range of the samples. Calibration standards will contain acids at the same concentration as the digestates.

A continuing calibration standard, prepared from a different stock solution than that used for preparation of the calibration standards, is prepared and analyzed after each ten samples or each two hours of continuous operation. The value of the continuing calibration standard concentration must agree with ± 10 percent of the initial value or the appropriate corrective action is taken which may include recalibrating the instrument and reanalyzing the previous ten samples.

For the ICP, linearity near the reporting limit will be verified with a standard prepared at a concentration at the reporting limit (MRL >3MDL). This standard must be run at the beginning and end of each sample analysis run or a minimum of twice per 8-hour period.

SECTION 7

ANALYTICAL PROCEDURES

Samples will be analyzed by Quanterra Incorporated, North Canton, Ohio.

7.1 Field Analytical Procedures

The field measurement procedures are described in the Field Sampling Plan. A copy of the FSP is attached to this QAPP.

7.2 Laboratory Analytical Procedures

The laboratory named above will implement the project required Standard Operating Procedures (SOPs). These laboratory SOPs for sample preparation, cleanup and analysis are based on SW-846 Revision (Latest Version). These SOPs provide sufficient details and are applicable to this investigation.

The site soil sample extracts requiring SVOC analysis shall be subject to gel permeation chromatography cleanup and/or other column chromatography cleanup as necessary.

The tables in Appendix E summarize the analyte groups of interest, appropriate laboratory SOP numbers and EPA reference method for the organic and inorganic analytes, respectively, to be evaluated in this investigation. The Quanterra SOPs to be used in this investigation are contained in Appendix B of this document.

7.2.1 List of Project Target Compounds and Laboratory Detection Limits

A complete listing of project target compounds, project quantitation limits, Method Reporting Limit (MRL), and current laboratory determined detection limits for each analyte group can be found in Appendix E of this QAPP. Method detection limits shown above have been experimentally determined using the procedure found in 40CFR, Part 136, Appendix B, or equivalent statistical approach. The latest MDLs at the time of sample analysis will be used.

SECTION 8

INTERNAL QUALITY CONTROL CHECKS

8.1 Field Quality Control Checks

Assessment of field sampling precision and bias will be made by collecting field duplicates and field blanks for laboratory analysis. Collection of the samples will be in accordance with the applicable procedures and at the frequency indicated in Section 5 of the attached FSP.

8.2 Laboratory Quality Control Checks

The laboratory identified in Section 7 of this QAPP has a QC program it uses to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section, which addresses the minimum QC requirements for the procedure. The internal quality control checks might differ slightly for each individual procedure but in general, the QC requirements include the following:

- Field /Trip blanks
- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis)
- Instrument blanks
- Matrix spikes/matrix spike duplicates
- Surrogate spikes
- Analytical spikes (Graphite furnace)
- Field duplicates
- Laboratory duplicates
- Laboratory control standards
- Internal standard areas for GC/MS analysis; control limits
- Mass tuning for GC/MS analysis
- Endrin/DDT degradation checks for GC/EC analysis
- Second dissimilar column confirmation for GC/EC analysis

For a description of the specific QC requirements of this site investigation and the frequency of audit, refer to the laboratory SOPs. The QC criteria are also included in the SOPs.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. Any samples analyzed in nonconformance with QC criteria will be re-analyzed by the laboratory, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

SECTION 9

DATA REDUCTION, VALIDATION, AND REPORTING

Data generated through field activities, or by the laboratory operation shall be reduced, and validated prior to reporting. Data shall not be disseminated by the laboratory until it has been subjected to these procedures which are summarized below.

9.1 Data Reduction

9.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Screening will include immunoassay detection of TNT . Such data will be written into field log books immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry.

9.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures will be followed according to the following protocol: All raw analytical data will be recorded in numerically identified laboratory notebooks (paper or electronic form). These notebooks will be issued only by the Laboratory QA manager. Data are recorded in this notebook along with other pertinent information, such as the sample identification number and the sample tag number. Other details will also be recorded in the lab notebook, such as the analytical method used (SOP#), name of analyst, the date of analysis, matrix sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook shall be signed and dated by the analyst. Copies of the strip chart printouts (such as gas chromatograms) will be maintained on file. Periodic review of these notebooks by the lab QA manager takes place at the opening and closing of laboratory logs, at a minimum. (Records of notebook entry inspections are maintained by the QA Manager.)

All calculations are checked by the Organic, and Inorganic including Metal Section Supervisor at the conclusion of each operating day. Errors are noted, corrections are made, but the original notations are crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis.

Quality control data (e.g. laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. In Level 1 review, the analyst reviews all of the data and QC. This is followed by Level 2 review, in which a senior analyst reviews 100% of QC and 10% of the raw data. Data considered to be acceptable will be entered into the laboratory computer system. The computer system compares QC data to internally generated limits (LCS< MS/MSD, and surrogate) and method criteria. The data are logged into the project database format. Unacceptable data shall be appropriately qualified in

the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits, and any other anomalous conditions encountered during sample analysis. After the Lab Project Manager approves these data, they are considered ready for third party data validation.

9.2 Data Validation

Data validation procedures shall be performed for both field and laboratory operations as described below:

9.2.1 Procedures Used to Evaluate Field Data

Procedures to evaluate field data for this project primarily include checking for transcription errors and review of field logbooks. This task will be the responsibility of the Field Manager.

9.2.2 Procedures Used to Validate Laboratory Data

USEPA Contract Laboratory Program National Functional Guidelines (NFG) for Organic and Inorganic Data Review, February 1994, procedures will be modified to include SW846 criteria summarized in Appendix C, Laboratory Analysis Criteria. The modified NFG will be followed to validate laboratory data in conjunction with the Data Validation Checklist found at Appendix D.

Roy F. Weston assessment will be accomplished by the joint efforts of the Data Reviewer and Project Manager. The data assessment by the Project Manager will be based on the criteria that the sample was properly collected and handled according to the Field Sampling Plan and Section 5 of this QAPP.

The Roy F. Weston Data Reviewer will conduct a systematic review of the data for compliance with the established QC criteria based on the spike, duplicate and blank results provided by the laboratory. All technical holding times shall be reviewed, the GC/MS instrument performance check sample results shall be evaluated, results of initial and continuing calibration will be reviewed and evaluated by trained reviewers independent of the laboratory. Also, results of all blanks, surrogate spikes, matrix spikes/matrix spike duplicates, laboratory control samples, internal standards, target compound identification and quanitation, tentatively identified compounds, system performance checks shall be performed for volatile organic compounds by the validator. Additionally, documents of method detection limits study will be provided to the validator. The results will also be validated. Ten percent (10%) of the data shall be validated.

The Data Review will identify any out-of-control data points and data omissions and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analysis may be made by the Project Engineer/Project Scientist based on the extent of the

deficiencies and their importance in the overall context of the project.

All data generated for the site will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include the data flags provided by Quanterra in accordance with the Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses (February 1994) and Inorganic Analyses (February 1994), as well as additional comments of the Data Reviewer. The laboratory-provided data flags will include such items as: 1) concentration below required detection limit, 2) estimated concentration due to poor spike recovery, and 3) concentration of chemical also found in laboratory blank. The Data Reviewer comments will indicate that the data are: 1) useable as a quantitative concentration, 2) useable with caution as an estimated concentration, or 3) unusable due to out-of-control QC results. All CLP forms summarizing this information will be checked as well. The overall completeness of the data package will also be evaluated by the Data Validator. Completeness checks will be administered on all data to determine whether deliverables specified in the SI Work plan and QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries, and supporting raw data from instrument printouts. The reviewer will determine whether all required items are present and request copies of missing deliverables.

9.3 Data Reporting

Data reporting procedures shall be carried out for field and laboratory operations as indicated below:

9.3.1 Field Data Reporting

Field data reporting shall be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field, and documentation of all field calibration checks.

9.3.2 Laboratory Data Reporting

The task of reporting laboratory data the U.S. Corps of Engineers begins after the validation activity has been concluded via the laboratory QA officer/manager. The Laboratory Project Manager must perform a final review of the report summaries and case narratives to determine whether the report meets project requirements. In addition to the record of chain-of-custody, the report format shall consist of the following:

1. Case Narrative:

   - Date of Issuance
   - Laboratory analysis performed

- Any deviations from intended analytical strategy
- Laboratory batch number
- Numbers of samples and respective matrices
- Quality control procedures utilized and also references to the acceptance criteria
- Laboratory report contents
- Project name and number
- Condition of samples 'as received'
- Discussion of whether or not sample holding times were met
- Discussion of technical problems or other observations which may have created analytical difficulties
- Discussion of any laboratory quality control checks which failed to meet project criteria
- Tables summarizing QC checks for MRLs (true values, found values, and % recoveries) in CLP form
- Signature of the laboratory QA Manager

2. Chemistry Data Package

- Case narrative for each package/analytical group
- Summary page indicating dates of analyses for samples and laboratory quality control checks
- Cross referencing of laboratory samples to project sample identification numbers
- Data qualifiers to be used should be adequately described
- Sample preparation and analyses for samples
- Sample results
- Raw data for sample results and laboratory quality control samples
- Results of (dated) initial and continuing calibration checks, and GC/MS tuning results
- Matrix spike and matrix spike duplicate recoveries, laboratory control samples, method blank results, calibration check compounds, and system performance check compound results
- Labeled (and dated) chromatograms/spectra of sample results and laboratory quality control checks
- Results of tentatively identified compounds

The Data package will be a "CLP-like" format consisting of all the information presented in a CLP data package.

SECTION 10

PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of laboratory activities will be conducted to verify that analyses are performed in accordance with the procedures established in the FSP and QAPP. The audits of laboratory activities include two independent parts: internal and external audits.

10.1 Laboratory Performance and Systems Audits

The Quanterra Analytical Services laboratories are audited on a regular basis by U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers Center of Expertise in Omaha, Nebraska conducts the system audits of the laboratories on an annual basis, and conducts performance audits.

The system audits, include examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain of custody procedure, sample preparation and analysis, instrument operating records, etc. The performance audits will consist of sending performance evaluation (PE) samples to laboratories for on-going assessment of laboratory precision and accuracy. The analytical results of the analysis of PE samples are evaluated by U.S. Army Corps of Engineers Center of Expertise to ensure the laboratories maintain good performances.

10.1.1 Internal Laboratory Audits

10.1.1.1 Internal Lab Audit Responsibilities

The internal laboratory audit will be conducted by the Quanterra QA Officer.

10.1.1.2 Internal Lab Audit Frequency

The internal lab system audits will be done on an annual basis while the internal lab performance audits will be conducted on a quarterly basis.

10.1.1.3 Internal Lab Audit Procedures

The internal lab system audits will include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc. The performance audits will involve preparing blind QC samples and submitting them along with project samples to the laboratory for analysis throughout the project. The Quanterra QA officer will evaluate the analytical results of these blind performance

samples to ensure the laboratory maintains acceptable QC performance. The laboratory audit checklist has been submitted.

10.1.2 External Laboratory Audits

10.1.2.1 External Lab Audit Responsibilities

An external audit may be conducted by the Corps of Engineers.

10.1.2.2 External Lab Audit Frequency

An external lab audit may be conducted prior to the initiation of the sampling and/or during analysis activities. These audits may or may not be announced and are at the discretion of the U.S. Army Corps of Engineers, Louisville District.

10.1.2.3 Overview of the External Lab Audit Process

External lab audits will include (but not be limited to) review of laboratory analytical procedures, laboratory on-site audits, and/or submission of performance evaluation samples to the laboratory for analysis.

SECTION 11

PREVENTATIVE MAINTENANCE

11.1 Field Instrument Preventative Maintenance

The field equipment for this project includes a TNT test kit. Specific preventative maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated daily for use. Backup instruments and equipment will be available on-site or within 1 day shipment to avoid delays in the field schedule.

11.2 Laboratory Instrument Preventative Maintenance

As part of their QA/QC Program, a preventative, routine maintenance program is conducted by a service contractor, on a limited basis, to minimize the occurrence of instrument failure and other system malfunctions. Quanterra Laboratories personnel perform routine scheduled maintenance, and repair or coordinate with the vendor for the repair of all instruments. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance is carried out on a regular, scheduled basis, and is documented in the laboratory instrument service logbook for each instrument. Emergency repair or scheduled manufacturer's maintenance is provided under a repair and maintenance contract with factory representatives.

SECTION 12

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

12.1 Accuracy Assessment

In order to assure the accuracy of the analytical procedures, an environmental sample will be randomly selected from each sample shipment received at the laboratory, and spiked with a known amount of the analyte or analytes to be evaluated. In general, a sample spike will be included in every set of 20 samples tested on each instrument. The spike sample will be then analyzed. The increase in concentration of the analyte observed in the spike sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. Control charts will be plotted periodically for each commonly analyzed compound and kept on method-specific, matrix-specific, and analyte-specific bases. The percent recovery for a spiked sample is calculated according to the following formula:

$$\%R = \frac{Amount\ in\ Spiked\ Sample - Amount\ in\ Sample}{Known\ Amount\ Sampled} \times 100$$

12.2 Precision Assessment

Spiked samples are prepared by choosing a sample at random from each sample shipment received at the laboratory, dividing the sample into equal aliquots, and then spiking each of the aliquots with a known amount of analyte. The duplicate samples will be then included in the analytical sample set. The splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate sample. The relative percent difference (RPD) between the spike and duplicate spike will be calculated and plotted. The RPD is calculated according to the following formula:

$$RPD = \frac{|Amount\ in\ Spike\ \#1 - Amount\ in\ Spike\ \#2|}{\frac{Amount\ in\ Spike\ \#1 + Amount\ in\ Spike\ \#2}{2}} \times 100$$

Control Charts for recoveries (%), and RPDs will be submitted with the data packages to the U.S. Army Corps of Engineers, Louisville District.

12.3 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ valid\ measurements)}{(number\ of\ measurements\ planned)} \times 100$$

SECTION 13

CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving and implementing measures to encounter unacceptable procedures or out of quality control performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. All corrective action proposed and implemented will be documented in the regular quality assurance reports to management. Corrective action should only be implemented after approval by the Project Engineer, or his designee, the field operations manager. If immediate corrective action is required, approvals secured by telephone from the Project Engineer should be documented in an additional memorandum.

For noncompliance problems during laboratory analysis, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem will be responsible for notifying the project manager, who in turn will notify the U.S. Army Corps of Engineer Quality Assurance Manger. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or Field Sampling Plan will be identified and corrected in accordance with the QAPP. The USA Corps of Engineers Quality Assurance Manager, or his designee, will issue a nonconformance report for each nonconformance condition.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by stop-work order by the Quality Assurance manager or the SI Coordinator.

13.1 Field Corrective Action

Corrective action in the field can be needed when the sample network is changed (i.e. more/less samples, sampling locations other than those specified in the QAPP, etc.), sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. Technical staff and project personnel will be responsible for reporting all suspected technical or QA nonconformances or suspected deficiencies of any activity or issued document by reporting the situation to the SI Field Manager or designee. This manager will be responsible for assessing the suspected problems in consultation with the project QA manager on making a decision based on the potential for the situation to impact the quality of the data. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the manager.

The manager will be responsible for ensuring that corrective action for nonconformances are initiated by:

- evaluating all reported nonconformances;
- controlling additional work on nonconforming items;
- determining disposition or action to be taken;
- maintaining a log of nonconformances;
- reviewing nonconformance reports and corrective actions taken;
- ensuring nonconformance reports are included in the final site documentation in project files.

If appropriate, the SI Field Manager will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed. Corrective action for field measurements may include:

- Repeat the measurement to check the error;
- Check the batteries;
- Check the calibration;
- Replace the instrument or measurement devices;
- Stop work (if necessary).

The Field Team Leader or his designee is responsible for all site activities. In this role, the Field Team Leader at times is required to adjust the site programs to accommodate site specific needs. When it becomes necessary to modify a program, the responsible person notifies the Field Team Leader of the anticipated change and implements the necessary changes after obtaining the approval of the Field Team Leader. The Field Team Leader must approve the change in writing or verbally prior to field implementation, if feasible. If unacceptable, the action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The quality assurance officer will identify deficiencies and recommended corrective action to the project manager. Implementation of corrective actions will be performed by the field operations manager and field team. Corrective action will be documented in quality assurance reports to the entire project management.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by the U.S. Army Corps of Engineers QA

Manager.

13.2 Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with lab analysts and section leaders, it may be necessary for the laboratory Quality Control Coordinator to approve the implementation of corrective action. The submitted standard operating procedures (SOPs) specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, automatic re-injection/reanalysis when certain quality control criteria are not met, etc. A summary of method-specific corrective actions is found in this QAPP. Corrective action is implemented at several different levels. The laboratories are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification by the analyst about the errors and corrective procedures. The Corps of Engineers also may request corrective action for any contractual nonconformance identified by audits or data validation. The COE may request corrective action by the laboratories for any nonconformances identified in the data validation process or, for minor problems, the lab may be contacted directly. Corrective actions may include:

- Re-analyzing the samples, if holding time criteria permits;
- Resampling and analyzing, and/or;
- Evaluation and amending sampling procedures and/or
- Evaluation and amending analytical procedures; and/or
- Accepting data and acknowledging the level of uncertainty.

If re-sampling is deemed necessary due to laboratory problems, PM must identify the necessary approach for the additional sampling effort.

Corrective actions are required whenever an out-of-control event or potential is noted. The investigative action taken is somewhat dependent on the analysis and the event.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy;
- Blanks contain target analytes above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;

- There are unusual changes in detection limits;
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA department.

These corrective actions are performed prior to release of the data from the laboratory. The corrective actions will be documented in both the laboratory's corrective action log (signed by analyst, section leader and quality control coordinator), and the narrative data report sent from the laboratory to the data validator. If corrective action does not rectify the situation, the laboratory will contact the Corps of Engineers QA Manager.

13.3 Corrective Action During Data Validation and Data Assessment

The U.S. Army Corps of Engineers may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include resampling by the field team or re-injection/reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g. the holding time for samples is not exceeded, etc.) When the U.S. Army Corps of Engineers data assessor identifies a corrective action situation, the project manager will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. All corrective actions of this type will be documented by the QA manager.

SECTION 14

QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Project Manager will be responsible for deliverables associated with the tasks identified in this QAPP. The Quality Assurance Officer reports on the accuracy, precision, and completeness of the data as well as the results of the performance and system audits, and any corrective action needed or taken during the project.

14.1 Contents of Project QA Reports

The QA report will contain all results of field and laboratory audits, all information generated reflecting on the achievement of specific data quality objectives, and a summary of corrective action that was implemented, and its immediate results on the project. The status of the project with respect to the Project Schedule included in the QAPP will be determined. Whenever necessary, updates on training provided, changes in key personnel, anticipated problems in the field or lab for the upcoming month that could bear on data quality along with proposed solutions, will be reported. Detailed references to QAPP modifications will also be highlighted. All QA reports will be prepared in written, final format by the project manager or his designee. In the event of an emergency, or in case it is essential to implement corrective action immediately, QA reports can be made by telephone to the appropriate individuals, as identified in the Project Organization or Corrective Action sections of this QAPP. However, these events, and their resolution will be addressed thoroughly in the final QA report.

14.2 Frequency of QA Reports

Based on the short duration of this project, only one QA Report is planned and will be prepared at the end of the project. The frequency of any emergency reports that must be delivered verbally cannot be estimated at the present time.

14.3 Individuals Receiving/Reviewing QA Reports

All individuals identified in the Project Organization chart will receive copies of all QA report.

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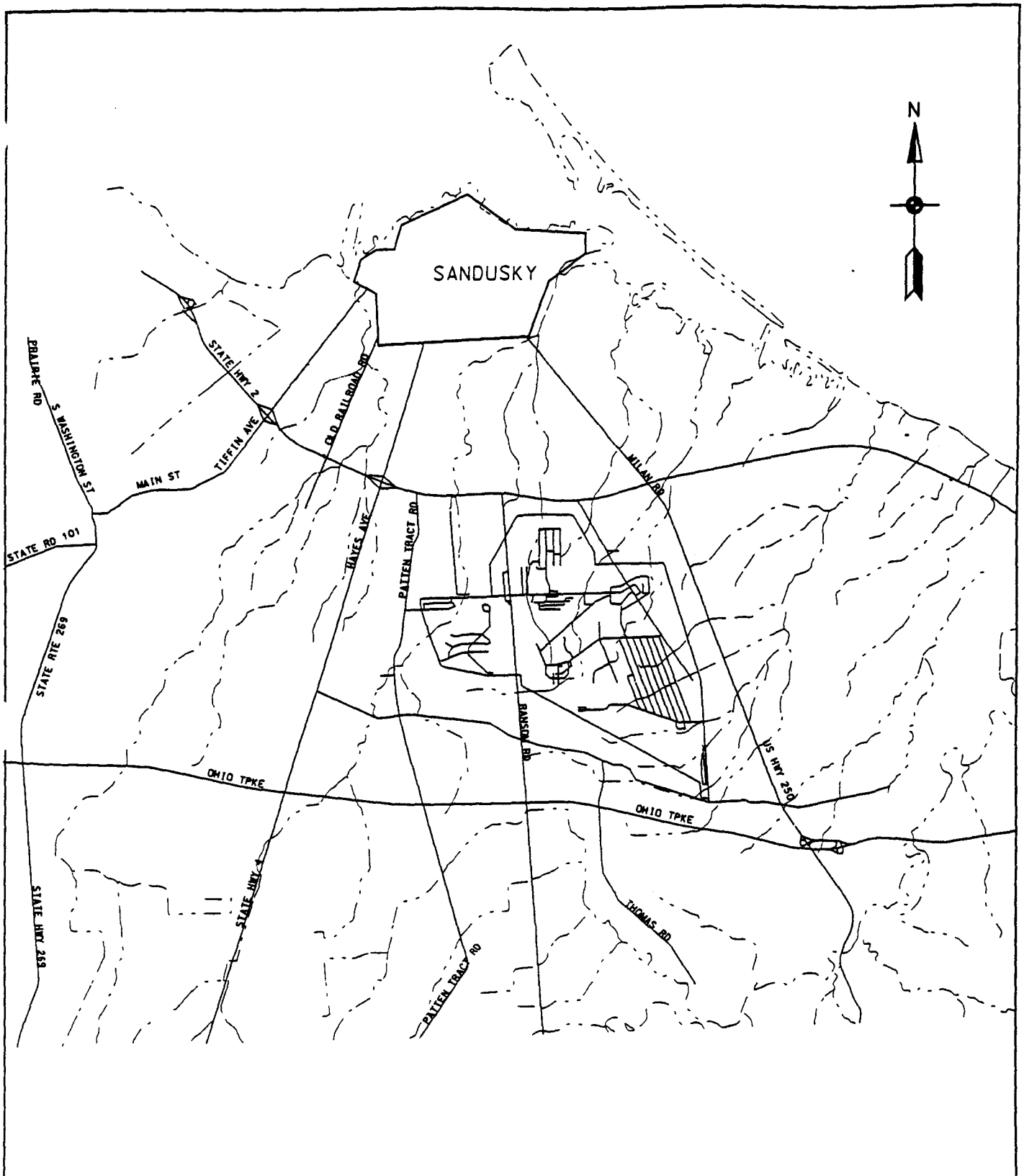
Figures

Figure 1: Location of Plum Brook Station

Figure 2: Location of Rail Car Loading Area

Figure 3: Sample Location Plan



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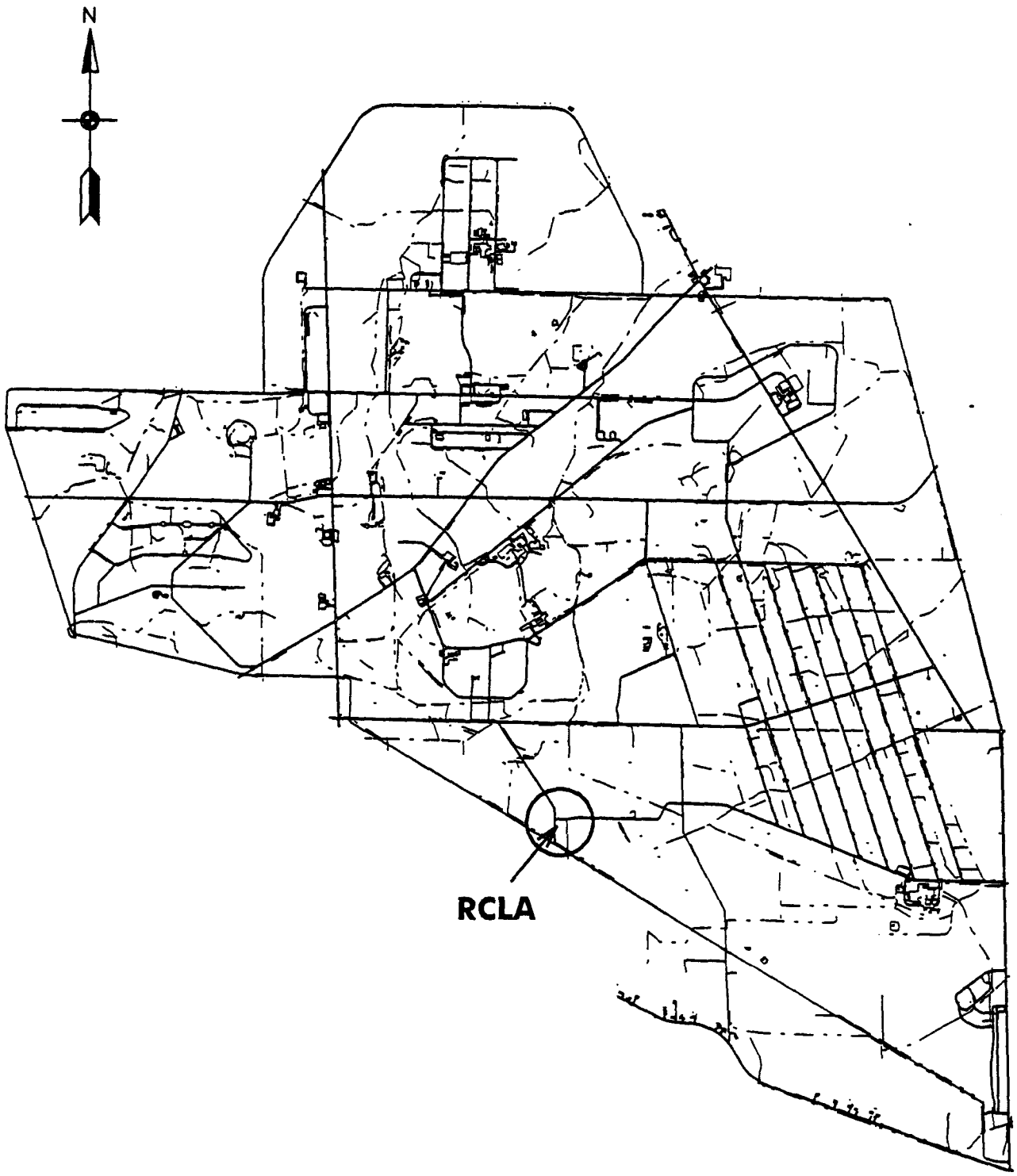

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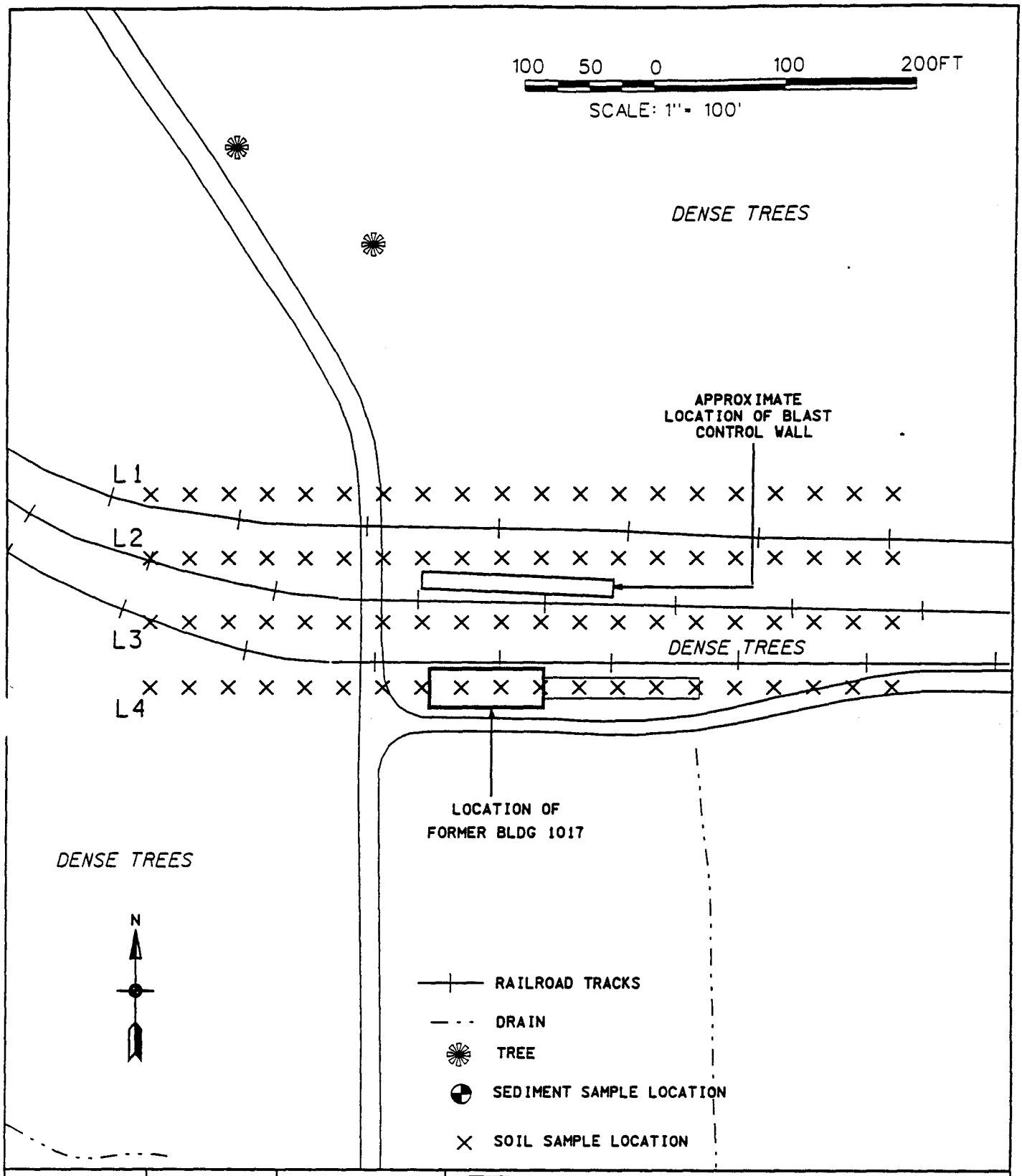

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This section not reproduced in this TNT Rail Car Loading Area submission. This section was provided in the submission of the Former Plum Brook Ordnance Works, Pentolite Area.

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Comment Responses

Document: Quality Assurance Project Plan (QAPP),
Limited Site Inspection for the TNT Rail Car Loading Area.
Name: Ronald E. Nabors, Ohio EPA

1. General Comment: The Ohio EPA, DERR, would prefer to receive the Quality Assurance Project Plan under separate cover and have it referenced in all site investigation Work Plan submittals.

Response: We apologize for not obtaining an OEPA, DERR preferred format to develop the Quality Assurance Project Plan (QAPP). We have prepared QAPP documents for projects in Illinois, Michigan and Ohio. The QAPP and associated FSP and DQO attachments were assembled for the Former Plum Brook Ordnance Works using the EPA Region 5 model QAPP, the format we typically use. We apologize for this inconvenience. If our office executes future phases of work for this Formerly Used Defense Site, we will incorporate the OEPA, DERR preferred format in preparing documents.

2. General Comment: The flow of the document is very good. It provides a brief history of the former Plum Brook Ordnance Works (PBOW) and then focuses the remainder of the document on the TNT Rail Car Loading Area.

Response: Thank You.

3. Section 1.6.1, Sample Network by Task and Matrix, page 3: Please identify which sections of the Field Sampling Plan will address this section.

Response: Sections 3 and 4 of the Field Sampling plan will be referenced in the text as suggested.

4. Field Sampling Plan, Section 1.1 Introduction, page 1: The second sentence of the first paragraph should read "...has been ... or is being..." not is been."

Response: The text will be edited accordingly

5. Field Sampling Plan, Attachment 1: Are there any historical aerial photographs available for this area?

Response: Historical aerial photographs are available and presented in Appendix E of the Draft Final Report.

U.S. ARMY CORPS
OF ENGINEERS
LOUISVILLE DISTRICT

Field Sampling Plan

Limited Site Investigation of the former

Plum Brook Ordnance Works

TNT Rail Car Loading Area

Sandusky, Ohio

DERP-FUDS HTRW Project No. G05OH001816

July 2000

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1.0 PROJECT DESCRIPTION

1.1 Introduction

Located near Sandusky Ohio, the former Plum Brook Ordnance Works (PBOW) was operated from 1941 to 1945 by the Army as a manufacturing plant for trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Contamination detected at the site by previous studies has been related to those activities and is being addressed by the Department on Defense (DOD) under the framework of the Defense Environmental Restoration Program (DERP), Formerly Used Defense Sites (FUDS).

A limited Site Investigation (SI) of one of the PBOW sites, the TNT Rail Car Loading Areas, will be conducted under this project. The purpose of the SI is to evaluate the potential for contamination of the sites that may be traced to Army activities.

This project is one of several limited SI projects simultaneously undertaken by the U.S. Army Corps of Engineers to be executed by the Louisville District (CELRL) under the direction of the Huntington District (CELRH).

1.2 History and Usage

1.2.1 Installation

Based on the Archives Search Report (USACE, 1993), the facility was established in 1941 and referred to as Plum Brook Ordnance Works (PBOW). The installation was established for the purpose of manufacturing trinitrotoluene (TNT), dinitrotoluene (DNT), pentolite, and nitric and sulfuric acids. Built by E.B. Badger and Sons Company, the facility was operated under contract by the Trojan Powder Company. Production of explosives ceased two weeks after V-J Day, having manufactured in excess of one billion pounds of explosives during the four-year operating period.

Decontamination of TNT, acid, pentolite and DNT manufacturing lines was completed during the last quarter of 1945. On 17 December 1945, the physical custody of the plant was transferred from Trojan to the Ordnance Department. The U.S. Army Corps of Engineers assumed responsibility for maintenance and custodial duties until September 1946 when the property was transferred to the War Assets Administration (predecessor to the Government Services Administration), after it was certified by the U.S. Army to be decontaminated. NASA acquired the PBOW in 1963 and is presently using the site, now referred to as Plum Brook Station (PBS).

The PBS site currently lies in an area that is primarily rural and agricultural with a low population density. The NASA Glenn Research Center occupies a majority

of the former ordnance works. The Department of the Army maintains a reserve center on the westernmost portion of the facility. The remainder of the former installation is in private ownership with the vast majority being cultivated. A tract on the northern boundary is owned by the Perkins Board of Education and is utilized as a bus maintenance facility.

1.2.2 Site Specific

Several miles of railroad tracks crossed the PBOW. Along those lines docks were established for loading and unloading finished and intermediate products. Loading docks are areas of concern because product could have been spilled during the loading/unloading operations. One of the loading docks is being investigated under this project: Rail Car Loading Area 1017 (RCLA1017), adjacent to dunnage storage building 1017. That RCLA1017 was a major car loading area is suggested by its situation relative to the TNT Area B and the Magazine Area, the presence nearby of the dunnage storage building, and the layout of roads and tracks around. The railroad tracks split at the place in three branches and an explosion containment wall is located between two of them. The three branches run parallel for some 1500 feet before uniting again in a single line. RCLA1017 is situated southeast of the TNT Area B and west of the Magazine Area. The sampling area is defined as a 500 feet long band (see figures 4.0), centered on the containment wall, that covers the space between the tracks and 20 feet beyond on both sides, see Figure 4.1, Attachment 1. Historic photographs of the site do not show much variation over the years, except that a growing vegetation has been invading the zone. This fact was verified in a recent site visit. In fact, the vegetation is so dense today, that a clean up would be necessary in order to access the area for sampling. Currently, NASA allows local law enforcement agencies to use the site as an outdoor range training area for small caliber weapons.

1.3 Location

RCLA1017 is situated southeast of the TNT Area B and west of the Magazine Area. The split section of the tracks, where the sampling will take place, runs for some 1500 feet, with the containment wall situated midway in the zone (Figures 1.1 and 1.2 in Attachment 1).

1.4 Climate

The climate for Erie County is continental with cold and cloudy winters and warm, humid summers. The county's first freezing temperature is typically in October, and its last freezing temperature is typically in April. Average annual precipitation for Sandusky from 1961 to 1990 was 34.05 inches. Within that time period February had the lowest mean monthly rainfall average with 1.65 inches, whereas July had a high of 3.70 inches.

The weather changes every few days as cold fronts move through the region. Wind is from the southwest 55 percent of the time (Morrison Knudsen,1994).

1.5 Topography

The subject rail line area is flat and wet. Dense vegetation covers the area.

1.6 Geology

Based on the Site Wide Ground Study (IT Corporation, 1997-1998), three formations, all of the Devonian Age, underlie the PBOW site. The Delaware Limestone is the lowermost formation. It is characterized as a hard, dense, finely crystalline limestone and dolomite. Dissolution of this unit has been described which has produced solution channels along bedding planes and joints, and even producing caverns in some areas. The unit is typically buff colored and usually described as fossiliferous. In the vicinity of PBOW, benzene, toluene, ethyl benzene, and xylene (BTEX) and hydrogen sulfide are common in area quarries. Overlying the Delaware Limestone is the Olentangy Formation. Two members of the Olentangy Formation have been characterized at the PBOW site, the Plumbrook Shale and the overlying Prout Limestone. The Plum Brook Shale is interpreted to consist of approximately 35 feet of bluish-gray, soft, fossiliferous shale containing thin layers of dark, hard, fossiliferous limestone. The Prout Limestone has been interpreted to be a unit approximately 15 feet thick which outcrops occasionally in a 1,000 to 2,000 foot-wide, northeast striking band across the middle portion of the PBOW. It has been described as a dark-gray to blue, very hard, silicious, fossiliferous limestone or dolomitic mudstone. The uppermost formation at the PBOW site is the Ohio Shale. Only one member of the Ohio Shale is present in the PBOW area- the Huron Shale. This unit has been described as black, thinly bedded, with pyrite and abundant carbonaceous matter with some large pyrite/carbonate concretions up to 6 feet in diameter.

The bedrock overburden in Erie County is predominantly glacial till, glacial outwash or glacial lacustrine (lake) deposits. In the vicinity of PBOW, the soil has been interpreted to be lacustrine. In many areas, the overburden also consists of highly weathered bedrock. The thickness of the overburden ranges from approximately 5 feet or less for most of PBOW to greater than 25 feet. The overburden is thickest on the northern portion of the site.

1.7 Hydrogeology

Based on the Site Wide Groundwater Study (IT Corporation, 1997), potable groundwater is encountered in the bedrock units underlying the PBOW site. Generally this groundwater flows northward toward Lake Erie. Based on the hydrogeologic information

given in the Groundwater Resources of Erie County, 1986, the PBOW site includes 3 distinct hydrogeologic regimes. Groundwater yields from these regimes range from limited, to the northeast and south, to more than 500 gallons per minute (gpm), to the northwest.

The rail car loading area is located in an area designated as having water yields that seldom exceed three gallons per minute. This area is characterized by w1ater found in thin, discontinuous sand and gravel deposits interbedded in fine, sandy clay. Water may also originate from the underlying shale. The shale in the area is described as impervious. (ODNR, 1986)

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 General

This work is being pursued by the United States Army Corps of Engineers (USACE) in the frame of the Defense Environmental Restoration Program (DERP)/ Formally Used Defense Sites (FUDS). The primary responsibility for the project lies with the Huntington District (CELRH) that acts as the administrator of the funds and performs the overall management functions. CELRH has contracted the Louisville District (CELRL) to execute the design and fieldwork for the project. Several individuals will coordinate efforts to carry on the project. Their names and functions are listed below.

2.2 Team Members

Project Manager:	Rick Meadows, CELRH-DL-M
Team Leader & Site Manager:	Albert J. Reyes, CELRL-ED-EE
Project Engineer:	Albert J. Reyes, CELRL-ED-EE
Health & Safety Manager:	Shelton Poole, CELRL-ED-EB
Health & Safety Manager Alternate:	David Brancato, CELRL-ED-EE
Quality Assurance Chemist:	Samir Mansy, CELRL-ED-EB
Independent Technical Review:	Douglas Meadors, CELRL-ED-EE

3.0 SCOPE AND OBJECTIVES

The purpose of this limited SI is to evaluate the potential for contamination of the site due to past Army activities. Historical information was utilized to identify environmental media and locations most likely to be affected. Field sampling and chemical laboratory analysis will be performed to evaluate the suspect media. Results of the laboratory analysis will be compared to risk based, media specific screening criteria. USEPA Region 9 Preliminary Remediation Goals will be used for the screening criteria.

Comparison to background values, if warranted by the analytical results, is out of the scope of this project and will be performed in subsequent phases.

The Field investigation for this limited SI will include:

- A visual survey to assess and document site conditions
- Immunoassay kit field screening
- Surface soil sampling

Target parameters include nitroaromatics, semivolatiles, and TAL metals. These parameters will be identified based on analytical results using USEPA SW-846 methodology. This data will be used to evaluate the potential for contamination at the site by comparing results to the aforementioned screening criteria (Region 9 PRGs).

Additional data will be gathered to help assess the physical characteristics of the site and potential migration characteristics of COC. This includes pH, total organic carbon (TOC) and soil grain size distribution and soil plasticity.

4.0 SAMPLING DESIGN AND RATIONALE

Formal Data Quality Objectives (DQOs) for this SI were evaluated and documented in an associated document dated May 1999. Contaminants of concern associated with finished and intermediate products of a TNT manufacturing plant are nitroaromatics. In addition, SVOCs and heavy metals must also be considered to complete the evaluation of the site. Surface soil sampling will be performed to detect the presence of these COCs at the site. A length of 500 feet of railroad tracks, centered on the containment wall, will be covered. Because the exact location of the loading docks is unknown, samples will be taken in four 500 feet long lines, the first lying beyond the first track, the second between the first and second track, the next between the second and third track, and the last beyond the fourth track (see Figure 4.1, Attachment 1). Samples will be collected at 25-foot intervals over those lines. Four discreet samples will be composited at 100-foot intervals. The composited samples obtained in this way (twenty samples, five over each line) will then be field screening by immunoassay. Six samples will have confirmatory samples taken and submitted for laboratory analysis. The confirmatory samples submitted to the laboratory will be those with the highest response to the immunoassay screening. If less than six samples give a positive response to the immunoassay, the remaining samples to be submitted for laboratory confirmation will be selected randomly.

5.0 FIELD ACTIVITIES AND SAMPLING PROCEDURES

5.1 Visual Inspections

A visual inspection of the site will be performed before actual sampling takes place. The inspection will consist of a thorough walkover of the site to familiarize the working team with the site and to locate visual signs of contamination and potential migration pathways. Modifications to the sampling design may result from this action.

5.2 Sample Documentation

Logbooks with sequentially numbered pages will be kept at the site during all field activities and will be assigned to each sample team. These logs will be updated continuously and will constitute master field investigation documents. Information to be recorded in the logs includes, but is not limited to the following:

- Project Identification.
- General work activity, work dates, and general time of occurrence.
- Unusual events.
- Communication with the project manager and facility representative.
- Visitors on site.
- Sample number and time of day for each sample collected for analysis.
- Record of telephone calls to laboratory informing it of sample shipment.
- Accomplishment of decontamination of sampling equipment.
- Disposition of decontamination fluids, and soil cuttings.
- Variances from project plans and procedures.
- Accomplishment of tailgate safety meetings.
- Photographs taken and identification numbers (including location, spatial orientation, and a brief description of the photograph subject).

5.3 Photographs

Color photographs will be taken of sampling areas to record significant field observations or to record site conditions in the case of visual inspections. Prints will be identified with

the project number, date and time taken, and a brief description of the subject, location, and orientation of the photograph.

5.4 Surface Soil Sampling

Field screening samples will be collected with a stainless steel scoop at 0.5-foot depths at the location described in Section 4. Samples will be placed in a stainless steel bowl and will be thoroughly mixed and homogenized before proceeding to the field-screening test.

Confirmatory surface soil sampling will be performed using a stainless steel hand auger. The area around the boring location will be cleared of any debris (twigs, rocks, liter). A piece of plastic sheeting will be placed on the ground around the sample boring location to prevent cross contamination. Samples will not come into direct contact of this plastic sheeting. Hand augers will be decontaminated prior to each individual sampling episode. The boring will be advanced by turning the hand auger's crossbar at the same time the operator presses the auger into the ground. Sampling will be continuous throughout the boring. Samples will be collected at 0.5 foot. Any variances in sampling due to field conditions or findings will be properly documented. All borings will be documented in the field logbook. Once the proper depth is obtained the auger is removed from the borehole and the sample is taken from the sampling section (void) of the auger. Samples will be placed in a stainless steel bowl and will be thoroughly mixed and homogenized before placing samples in the appropriate container. All soil sample containers will be clearly identified on the labels and put on ice for preservation. The proper volume of samples will be taken to insure that all internal laboratory quality control samples (i.e., Matrix Spike/Matrix Spike Duplicates (MS/MSDs), spikes, and laboratory duplicates) can be performed by the laboratory. Sample collection information will be recorded in a field logbook. All sampling equipment will be appropriately decontaminated prior to each individual sampling episode to prevent down-hole and cross-hole contamination and prior to leaving the investigative area.

5.5 Field Quality Control Sampling

The following field quality control samples will be collected to monitor sampling precision, cross contamination, and decontamination procedures:

- Duplicates - Duplicate samples will be collected at the same time as the original sample and in the same analytical sequence. One field duplicate will be collected for every 10 investigative samples. Duplicate samples will be used to monitor sampling precision in the field. Duplicate analysis will be performed for metals , and TOC analyses.

- Rinsate - Rinsate samples will be collected by rinsing sampling equipment (i.e., hand augers, stainless steel scoops) with deionized water after decontamination has been performed. The water being used to rinse the equipment will be collected in the appropriate sample container. One rinsate will be collected for every 20 investigative samples. These samples will monitor field-sampling procedures for decontamination completeness. Metals and TOC analyses will be performed on rinsates.

- Field Blanks - Field blanks will be collected from the deionized water used in the field for sampling procedures. One field blank will be collected for every 20 investigative samples. These samples will monitor field-sampling procedures for the introduction of contamination. Field blanks will be analyzed for metals.

- Temperature Blanks – The laboratory of record will provide prefilled sample bottles. This sample will be clearly identified as a temperature blank. This sample will be added in every cooler prepared for shipment to the analytical laboratory to monitor temperature of the samples while in transit from the field to the laboratory.

5.6 Field Screening Test

Field screening tests will be performed using the Strategic Diagnostics Inc. (SDI) TNT EnSys® Soil Test System with spectrophotometer DR/2010. Procedures will follow the manufacturer instructions included in Attachment 2 to this FSP. One control QA/QC check per day will be performed according to manufacturer recommendations.

5.7 Decontamination

Decontamination procedures are implemented to prevent cross contamination, to control potential migration of chemical constituents, and to prevent worker exposure to chemicals or pathogens that may contaminate clothing or protective gear. A decontamination system will be established to wash and rinse all personal protective equipment and sampling equipment. Several gallons of clean, distilled water will be maintained on site along with plastic buckets, brushes, soap, etc., to decontaminate during the sample collection process.

Personnel entering exclusion zones during field activities must decontaminate upon exiting the area. Personal safety and health considerations are presented in the Site-specific Health and Safety plan. In addition, all hand tools and equipment will require decontamination prior to removal from the work area. Any materials generated during the site investigation activities (i.e. investigative derived wastes) generated as a result of decontamination procedures will be labeled and stored until final disposal arrangements, consistent with applicable environmental requirements, are made (see Section 7.0 IDW).

Only minor decontamination of site personnel is recommended, incorporating gross decontamination of the soles of work boots and any personal protective equipment used while on site. All discarded materials shall be handled in such a manner as to preclude spreading of contamination, creating a sanitary hazard, or littering the site. In addition, site workers must wash their hands (and face optional, if exposure warrants) with soap and water before eating, drinking, and before leaving the investigative area.

Decontamination procedures involved in this site investigation will generally involve the subsequent cleaning of any sampling equipment associated with soil, sediment and water collection. Generally accepted measures for ensured data quality and reliability will be employed, specifically involving rinsing of sampling tools and equipment with distilled water and soap (Alconox or other non-phosphate detergent), with a final rinse of deionized water.

This will be accomplished by moving the equipment to a "contained area" and washing down all suspect contaminated equipment with brush scrubbing and the soap solution. Hand tools, trowels, scoops, bowls, bailers, etc. used for sample collection of soils and surface waters shall similarly be decontaminated between samples and before leaving the site for the day.

Rinsates and decontamination fluids will require containerization in containers approved for liquids, labeled and properly stored, while awaiting approval for disposal. Based on the anticipated levels of contamination on most sites, it is believed that disposal approvals will permit disposal of decontamination fluids through the local sanitary sewer.

Materials used for decontamination will be compatible and safe for the purpose intended and for site workers. Consistent with the Hazardous Communication Standard, 29 CFR 1910.1200, any chemical materials brought on site will be accompanied by a Materials Safety Data Sheet (MSDS) and kept with the field team.

6.0 FIELD SAMPLE IDENTIFICATION AND CUSTODY PROCEDURES

Proper sample collection and analysis requires the maintenance of a chain-of-custody (CoC) procedure. CoC procedures include tracking and documentation during sample collection, shipment, and laboratory processing. A sample is considered to be in an individual 's custody if it is:

- In the physical possession or view of the individual party.
- Secured to prevent tampering.
- Placed in a restricted area by the responsible party.

The sampling team leader is responsible for the custody of the collected samples in the field until they are properly packaged, documented, and released to the courier for shipment to the laboratory. The laboratory is responsible for sample custody thereafter. Custody will be documented by using the CoC record initiated for each day that samples are collected. This record will accompany the samples from the site to the laboratory and will be returned to key project personnel with the final analytical report. All personnel with sample custody responsibilities are required to sign, date, and note the time on the CoC record when relinquishing and receiving samples from their immediate custody. Any discrepancies will be noted at this time. All samples will be shipped via overnight courier to the analytical laboratory. Bills of lading will be used as custody documentation during this time and will be retained as part of the permanent sample custody documentation. Sample documentation and custody for field and laboratory activities are detailed in the following sections.

6.1 Sample Containers, Preservation and Holding Times

The laboratory will supply sample containers. Containers will be selected to ensure compatibility with the sample matrix, COC to be analyzed, and to minimize breakage during transportation. Sample bottle size required, preservatives, and holding times are listed in the following. Blank labels, preservatives, and packing materials will also be supplied by the laboratory. Sample labels will be attached to containers and filled out at the time of sampling. The following information will be recorded on each label:

- sample identification number
- project number
- collectors initials
- date and time of collection
- preservatives added (if applicable)
- sample type
- depth

Summary of Sample Containers, Preservation Methods, and Holding Times for Soils Samples

Parameter	Analytical Method	Quantity	Type	Preservation Methods	Holding Times
Nitroaromatics	EPA 8330	10-20	4-oz wide mouth	Cool 4°C	Extract:14 days Analyze: 28 days
Metals (TAL)	Trace ICP 6010	10-20	2 oz wide mouth	Cool 4°C	6 months Mercury – 28 days
SVOCs	EPA 8270C	10-20	4 oz wide mouth	Cool 4°C	Extract:14 days Analyze:

					28 days
TOCs	EPA 9060	10-20	4 oz wide mouth	Cool 4°C	Extract:14 days Analyze: 28 days
pH		10-20	2 oz wide mouth	Cool 4°C	Immediately

Summary of Sample Containers, Preservation Methods, and Holding Times for Water Samples

Parameter	Analytical Method	Quantity	Type	Preservation Methods	Holding Times
Nitroaromatics	EPA 8330	2	1 liter Amber glass	Cool 4°C	7 days to extract
Metals	Trace ICP 6010	1	1 liter poly	Cool 4°C	6 MO's Hg 28 days
SVOCs	EPA 8270C	2	1 liter amber glass	Cool 4°C	7 days to extract

6.2 Sample Identification

Each sample will be assigned a unique identification number that uniquely identify each sample for analysis.

6.3 Sample Packaging

The following procedures will be performed during sample packaging:

- Number of samples will be verified with field logbook documentation.
- Sample labels will be checked for accuracy and legibility.
- All samples will be wrapped in bubble pack, and placed in a sealed zip-locked bag.
- All coolers will have a temp blank so that the temperature can be monitored.
- Samples will be packaged in a thermally insulated, rigid cooler.
- Packing material will be placed in the coolers to prevent breakage.

- Ice will be placed in the cooler for samples requiring 4°C ± 2° preservation.

- Each cooler will have its own Chain of Custody (CoC) form reflecting the samples inside.

- The CoC form will be placed in a sealed zip-lock bag, and taped to the inside lid of the cooler.

- The cooler will be closed and sealed with duct tape around both ends, and around the lid.

- Custody seals will be placed in two separate locations on the cooler across the lid and main body of the cooler and signed by the field team leader.

- An addressed courier bill will be placed on the cooler so that shipment of the cooler can take place.

6.4 Custody Transfer and Shipment Procedures

All samples will be accompanied by a CoC form. When the possession of samples is transferred, the individual relinquishing the samples and the individual receiving the samples will sign, date, and note the time of transfer on the CoC document. This record will represent the official documentation for all transfers of sample custody until samples arrive at Quanterra Laboratories, North Canton, Ohio. Samples will be shipped for overnight service by the courier. This will allow for the least amount of time from sampling and analysis, and will ensure that all holding times are met. Notification of sample shipment to the laboratory will be performed by the Field team leader.

Quanterra Laboratory	Phone (330) 497-9396
4101 Shuffel Drive NW	Fax (330) 497-0772
North Canton, OH 44720	

7.0 DISPOSITION OF FIELD INVESTIGATION DERIVED WASTE (IDW)

Investigation derived waste will be minimal for this field activity. Soil cuttings from all hand-augured borings will be replaced. All personal protective equipment (PPE) (e.g., Tyvek®, nitrile or latex gloves) will be placed in a plastic garbage bag and taken to a PBS dumpster for disposal. All decontamination water will be collected and stored in an appropriate storage container pending analytical results. Should results obtained show insignificant contamination, the water will be placed in a sanitary sewer system at Plum Brook Station. Should significant contamination be revealed, the decontamination water

will be disposed of at a licensed treatment storage and disposal (TSD) facility. IDW will be identified and properly handled while it is being accumulated or stored on site.

IDW shall be contained and handled in compliance with the following requirements:

- IDW shall be stored at the site of generation or consolidated at a central storage location supplied by NASA-PBS, pending analytical results.
- Waste generation will be minimized whenever possible and feasible.
- Storage, label and equipment needs shall be identified in a timely manner for NASA -PBS personnel.
- All IDW, pending analytical results, will be characterized for appropriate disposal at a licensed disposal facility within 45 days of initiating field activities.

8.0 SCHEDULE

8.1 Start Date

The earliest date for which field activities will begin is 7 June 1999.

8.2 Pre-mobilization

The following activities will be completed before field activities begin:

- Site Access - Access has been obtained from NASA by the U.S Army Corps of Engineers to enter Plum Brook Station.
- Security - Access to Plum Brook Station is controlled by the main gate and security office located on Taylor Road. The security procedures for gaining access are vehicle and personnel registration. The Security office will issue vehicle and personnel badges. Only U.S. citizens with picture I.D. can obtain access to the station. All personnel allowed access to Plum Brook Station are required to view a short 10-minute safety and informational video. The security office will also dispense hand radios to all personnel performing fieldwork for safety as well as security reasons.
- Staging and Support Area - NASA has provided the USACE with a staging area within NASA's shipping and receiving building #9209 located south

of Maintenance Road in the garage /maintenance area. This area will be used as a staging area for small sampling supplies and sample shipment.

- Site Visit - A site visit will take place prior to any sampling event. This site visit will allow USACE personnel to visually assess sites, and will facilitate optimization of the sampling design and rationale.

8.3 Mobilization

Mobilization includes efforts required by USACE personnel to prepare for the sampling portion of the site investigation. All sampling team members will review the FSP and QAPP prepared for the site investigation. All sampling equipment and materials will be inspected for proper decontamination and good working condition. All provisions will be made by USACE to ensure that field supplies are available and appropriate for sampling team members. These supplies include logbooks, sample containers, labels, chain of custody forms, shipping supplies, coolers, and packing materials.

8.4 Demobilization

At the completion of sampling activities USACE personnel will demobilize. Arrangements have been made for the disposal of investigation-derived waste (IDW). Preparation of waste manifests, if necessary, will be prepared by USACE personnel for signature by PBS personnel. All sampling equipment and materials will be removed by USACE personnel from the site as well as the staging area provided by NASA. USACE personnel will maintain a clean and safe work environment at the investigative site as well as the staging areas provided by NASA. All efforts will be made to leave investigative areas in the same condition as they were found.

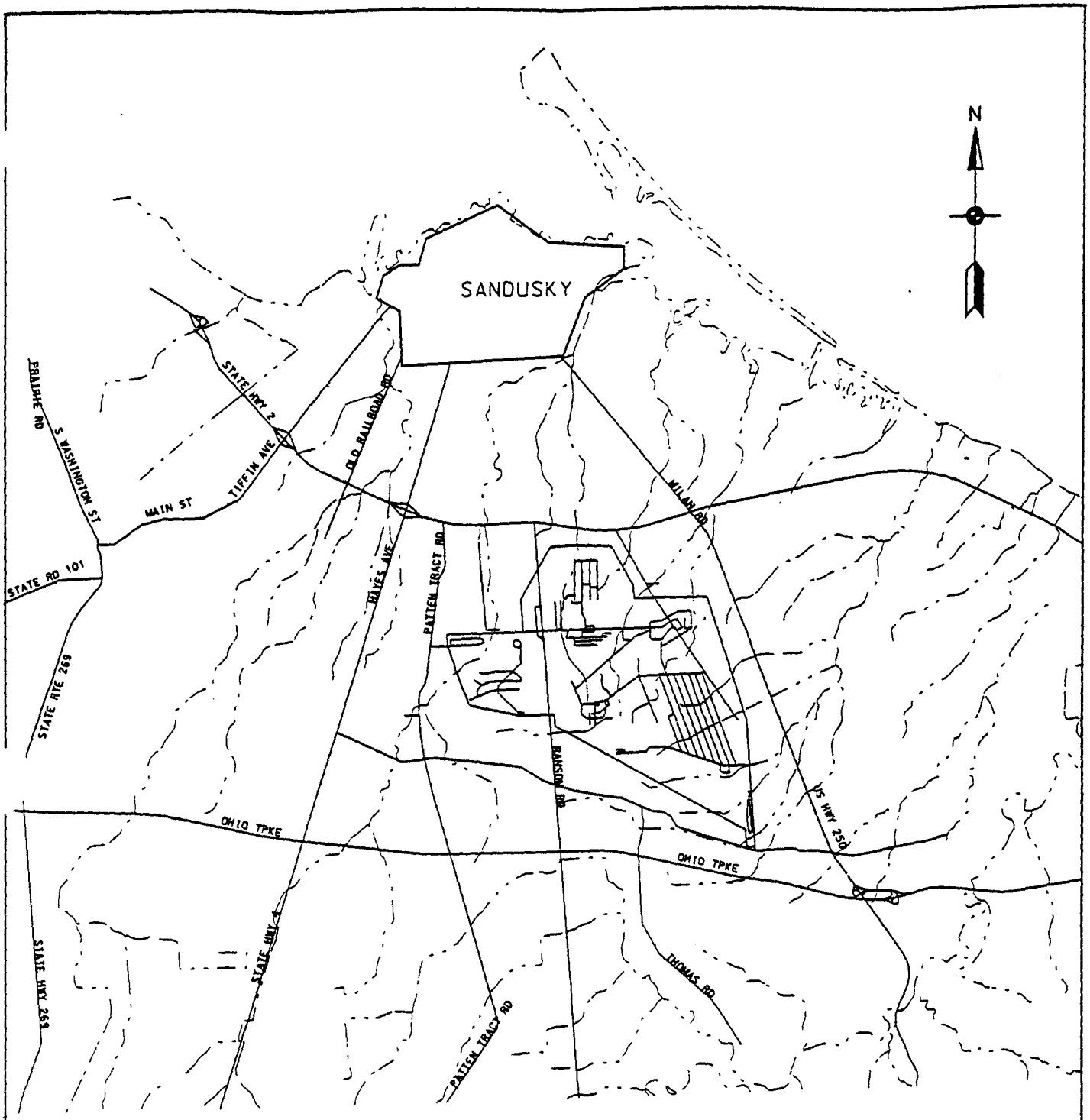
Attachment 1:

Figures

Figure 1: Location of Plum Brook Station

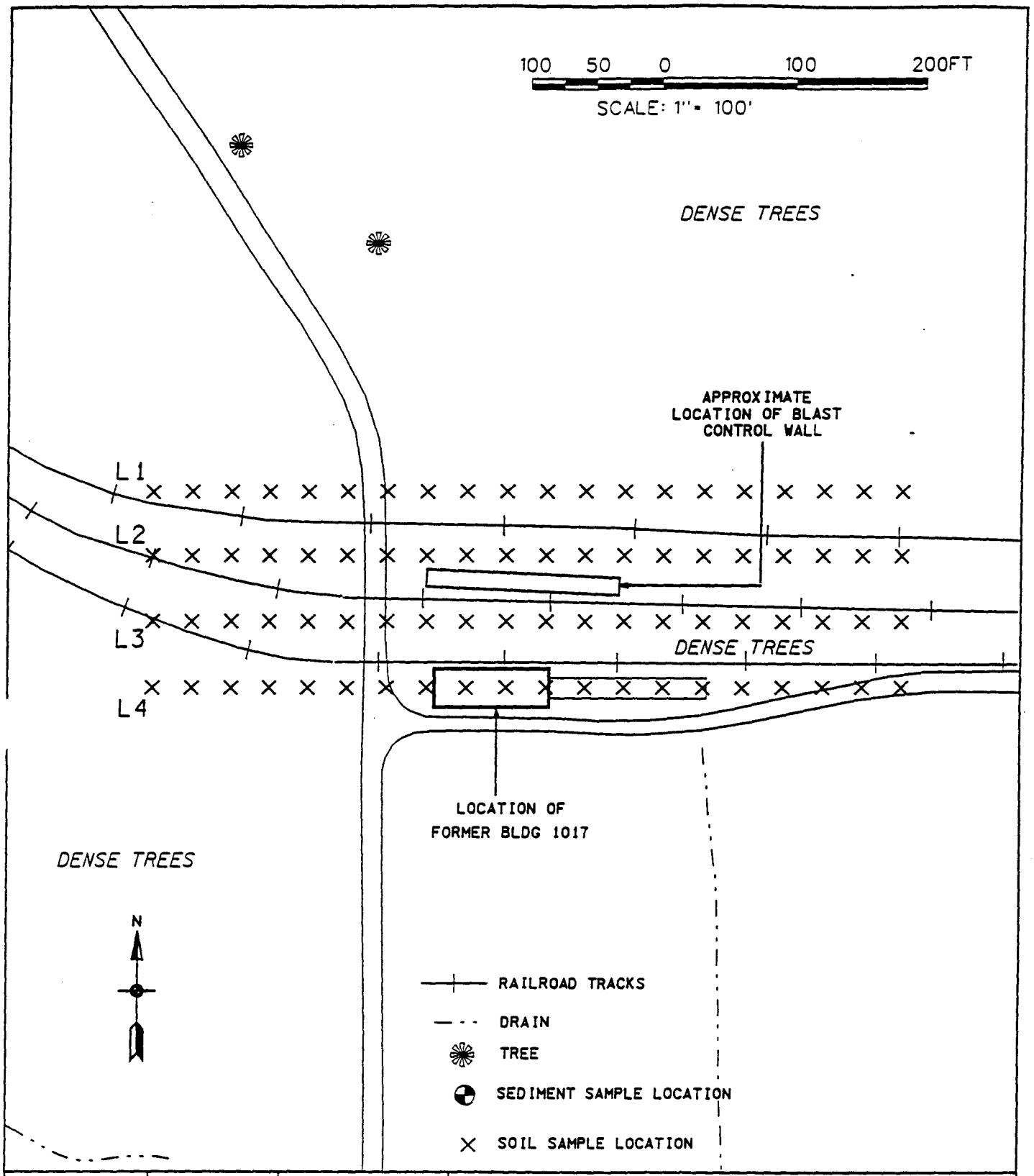
Figure 2: Location of Rail Car Loading Area

Figure 3: Sample Location Plan



Design By:	Drawn By:	Checked By:	US Army Corps of Engineers	TNT RAILCAR LOADING AREAS REGIONAL MAP FORMER PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO LIMITED SITE INVESTIGATION, 1999	
Reviewed By:	Approved By:				
e:	Scale:		Drawing Code:	Sheet Ref. No.	FIG 1.1

File Name:
Plot Date:



Design By:	Drawn By:	Checked By:	US Army Corps of Engineers	TNT RAILCAR LOADING AREAS SAMPLING MAP FORMER PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO LIMITED SITE INVESTIGATION, 1999	
Reviewed By:	Approved By:				
Date: 10 MAY 99	Scale: 1" = 100'		Drawing Code:	Sheet Ref. No.	FIG 4.1

File Name:
Plot Date:

Attachment 2:

TNT FIELD SCREENING PROCEDURES

Field TNT Screening

Field TNT screening will be performed using an EnSys Test Kit in accordance with the procedures outlined in the following users manual. Field screening for TNT is necessary to insure that a soil with significant explosive contamination is not sent to the laboratory without notice of the significant potential for explosive contamination. Moreover field screening is necessary for the personnel safety of the investigators. TNT is capable of detonating from pressure. The edges of a drill rig or a direct push probe can exert high pressures as the tool is advanced through the soil such that detonation is a possibility. The field screening procedure is also addressed the Site Specific Health and Safety Plan (SSHSP) for this project. The field screening uses an immunoassay procedure. The protocol for the procedure suggests that approximately 25 minutes is necessary to perform the test.

STRATEGIC DIAGNOSTICS INC.

TNT EnSys® SOIL TEST SYSTEM

RAPID FIELD SCREEN

User's Guide

IMPORTANT NOTICE

The range of this test is between 1 and 30 ppm TNT/TNB/DNT. The relative standard deviation is 8%. The least detectable concentration is 0.7 ppm (TNT).

This test system should be used only under the supervision of a technically qualified individual who is capable of understanding any potential health and environmental risks of this product as identified in the product literature. The components must only be used for the analysis of soil samples for the presence of TNT. After use, the kits must be disposed of in accordance with applicable federal and local regulations.

PHASE 1 TEST PREPARATION

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

ITEMS INCLUDED IN TEST KIT

- ❑ 2 [illegible]
- ❑ 1 [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ 1 [illegible]
- ❑ 1 [illegible]
- ❑ 1 [illegible]
- ❑ 1 [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]

ITEMS NOT INCLUDED IN TEST KIT

- ❑ 2 [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ [illegible]

READ BEFORE PROCEEDING

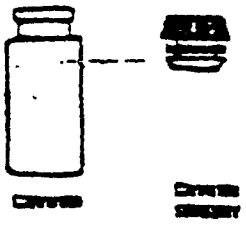
- For some matrices, air drying the soil samples may result in better TNT recovery or more reproducible data.
- A slightly modified protocol should be used if the primary analyte of concern is DNT. Please refer to the modification outlined on page 6.
- It is recommended that a control be run each day. See page 8 for instructions.
- SDI's EnSys® TNT Soil Test System is designed for use with either of Hach models DR/2000 or the newer DR/2010 spectrophotometers. Protocols for use of both instruments are provided in this User's Guide. Ensure the instrument protocol followed is appropriate for the instrument being used.
- The Hach DR/2000 is designed to turn off after a few minutes of inactivity. Press the "READ/ENTER" key every few minutes to prevent DR/2000 from turning off. If DR/2000 turns off, use Reference cuvette to rezero. Newer DR/2000 models and the DR/2010 have an overide "constant on" feature that allows the machine to run indefinitely. Refer to the Instrument Operation: Spectrophotometer Setup section of the HACH DR/2000 or DR/2010 User's manuals.

If you are using the TNT test in conjunction with the RDX test it is important to save your sample extracts. They will be used in the RDX test. Remember to cap the extracts tightly after use. An RDX kit without extraction set-ups can be purchased specifically for this purpose.

PHASE 1 TEST PREPARATION

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

CLEAN CUVETTES



1a Fill 2 Hach matched cuvettes with approximately 5 mL water.

1b Cap each with cuvette stopper plug and, holding plug in place, shake vigorously for 3 seconds.

1c Empty into waste container.

1d Fill cuvettes with approximately 5 mL acetone.

1e Cap each with cuvette stopper plug and, holding plug in place, shake vigorously for 3 seconds.

1f Empty into waste container.

1g Repeat acetone wash (steps 1d - 1f).

1h Wipe outside of cuvette with paper towels. Take care to especially clean the side labeled "25 mL" and the side opposite.

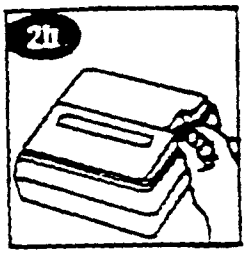
PHASE 1 TEST PREPARATION

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

READ BEFORE PROCEEDING

- Designate a "Reference" and "Sample" cuvette.

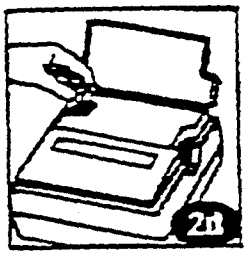
SPECTROPHOTOMETER PREPARATION



2a1 Turn on Hach DR/2000. The instrument will read "SELF-TEST" followed by "Method?". Select Method "0" and press the "READ/ENTER" key.

or

2a2 Turn on the Hach DR/2010. The instrument will read "Self-Test V.xx", then "Enter Program #". Press the [Shift] key (do not hold) and then the [ABS/S] key. Note: Select Program # "0" may also be used to select absorbance mode on the DR/2010.



2b Rotate the wavelength dial until the small display shows: 540 nm.

2c Fill both cuvettes with acetone to the 25 mL line.

2d Insert "Reference" cuvette into cell holder on Hach DR/2000 or DR/2010 with side marked "25 mL" on the right.

2e1 Close light shield of the DR/2000 and press "CLEAR/ZERO" key to establish the reference. The display will read "WAIT" and then "0.000 Abs.".

or

2e2 Close the light shield of the DR/2010 and press the [ZERO] key. The display will read "Zeroing..." then "0.000 Abs.".

2f Remove the "Reference" cuvette and place the "Sample" cuvette in the cell holder.

2g1 On the DR/2000, press the "READ/ENTER" key and record the absorbance on the worksheet as "$Abs_{background}$".

or

2g2 On the DR/2010, press the [READ] key and record the absorbance on the worksheet as "$Abs_{background}$".

2h If reading is greater than 0.002 in magnitude (+ or -), clean cuvettes and redo steps 2a - 2g.

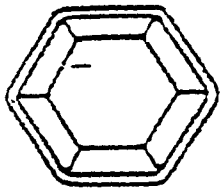
2i Empty acetone from "Sample" cuvette into waste container.

PHASE 2 SAMPLE EXTRACTION & PREPARATION

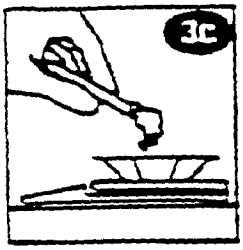
READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

READ BEFORE PROCEEDING

- Sample should be mixed to ensure a homogeneous sample.



WEIGH SAMPLE

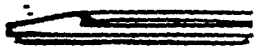


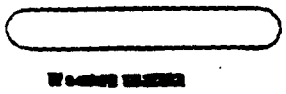
3a Place an unused weigh boat on pan balance.

3b Press ON/MEMORY button on pan balance. Balance will beep and display 0.0.

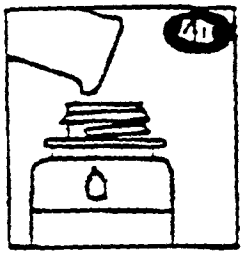
3c Weigh out 10+/-0.1 grams of soil.

3d If balance turns off prior to completing weighing, use empty weigh boat to retare, then continue.





EXTRACT TNT



4a Measure 50 mL acetone in the 50mL graduated conical tube.

4b Pour acetone into an extraction jar.

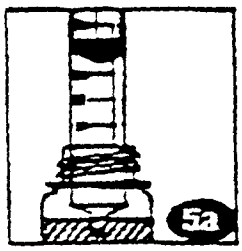
4c Using wooden spatula, transfer 10 grams of soil from weigh boat into extraction jar.

4d Recap extraction jar tightly and shake vigorously for three minutes.

4e Allow to settle for five minutes.

Repeat steps 3a - 4e for each sample to be tested.

FILTER SAMPLE



5a Place tip of 30 cc syringe into liquid above the sediment layer in the extraction jar and draw up 25 mL of the sample.

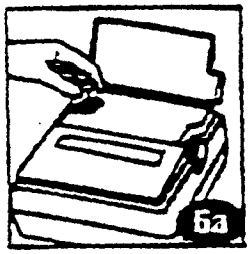
5b Screw the syringe filter onto the end of the syringe.

5c Press the plunger firmly and dispense the sample into the "Sample" cuvette.

PHASE 3 SAMPLE ANALYSIS

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

READ SAMPLE



6a Place the "Sample" cuvette in the cell holder.

6b Press the "READ/ENTER" key and record the absorbance on the worksheet as "$Abs_{initial}$".

6c Remove the "Sample" cuvette from the cell holder.

6d Add 1 drop of Developer Solution.

6e Cap the "Sample" cuvette and shake vigorously for 3 seconds.

DNT Analysis Note:

For analysis of samples containing DNT, and/or where DNT concentration is of concern, samples must be allowed to develop for 10 minutes before reading sample absorbance. This will not effect color development for other nitroaromatics.

6f Remove the cuvette stopper and place the "Sample" cuvette in the cell holder.

6g Press the "READ/ENTER" key and record the absorbance on the worksheet as "Abs_{sample}".

6h Clean cuvette between samples using procedure in steps 1a - 1h.

PHASE 4 INTERPRETATION

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

INTERPRETATION OF RESULTS

7a Multiply the "$Abs_{initial}$" value for each sample by 4. Enter these values on the worksheet.

7b Subtract this value from the "Abs_{sample}" values for each sample and record on the worksheet.

7c Divide the adjusted sample value by 0.0323 and record on the worksheet. This value is the TNT concentration of the sample in parts per million.

$$TNT_{(ppm)} = \frac{Abs_{sample} - (Abs_{initial} \times 4)}{0.0323}$$

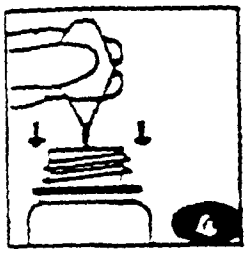
Note: For sample concentrations greater than 30ppm the sample extract should be diluted with acetone and reanalyzed. Remember to multiply the result by the dilution factor in order to determine the correct concentration.

CONTROL (QA/QC) CHECK

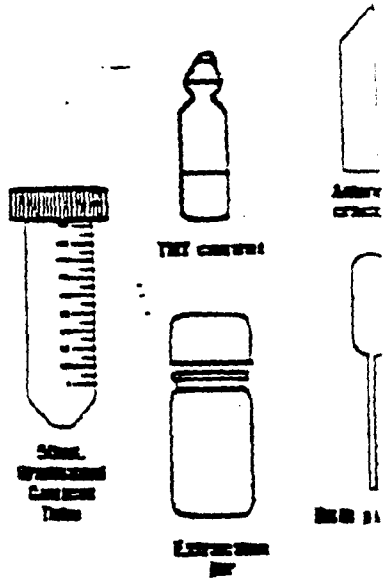
READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

- The TNT control is optional, but it is recommended that it be run daily.

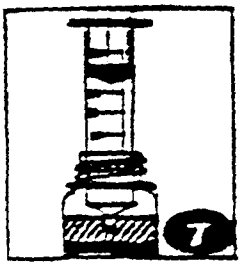
PREPARE CONTROL



1. Measure 50 mL acetone in the 50mL graduated conical tube.
2. Pour into extraction jar.
3. Open TNT control ampule by slipping ampule cracker over top, and then breaking tip at scored neck.
4. Transfer entire contents of TNT control ampule into extraction jar using bulb pipette.
5. Cap extraction jar and shake vigorously for 3 seconds.



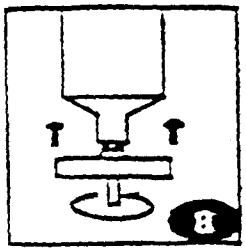
ANALYZE THE CONTROL



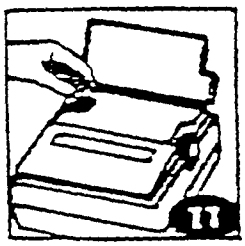
7. Place tip of 30 cc syringe in extraction jar and draw up 25 mL.
8. Attach syringe filter and disperse into "Sample" cuvette.
9. Add 1 drop of developer solution.
10. Cap the cuvette and shake vigorously for 3 seconds.
11. Remove the cuvette stopper and place in the cell holder.
12. Press "READ/ENTER" key and record the absorbance on the worksheet as "$Abs_{control}$".

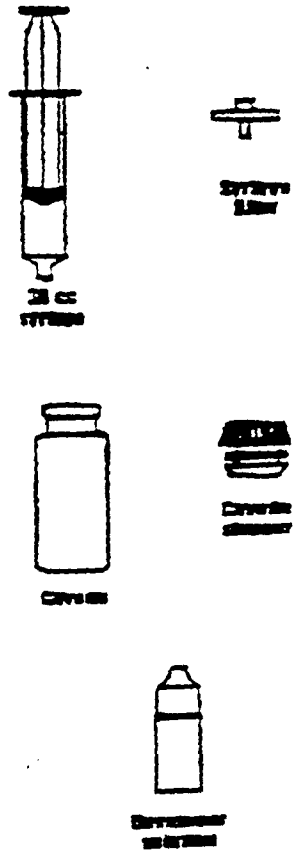
    Absorbance must be between 0.307 - 0.373 for the test to be in control.

    If test is not in control, clean "Sample" cuvette, and then redo steps 7-12 using the remaining liquid from the extraction jar.



13. If test is in control clean "Sample" cuvette before proceeding with samples.





QUALITY CONTROL

READ ALL INSTRUCTIONS BEFORE PROCEEDING WITH THE TEST

System Description

Each SDI EnSys® TNT Soil Test System contains enough material to perform twenty complete tests.

The TNT Soil Test is divided into four phases. The instructions and notes should be reviewed before proceeding with the test.

Hotline Assistance

If you need assistance or are missing necessary Test System materials, call toll free: 1-800-544-8881.

Validation Information

Product claims are based on validation studies carried out under controlled conditions. Data has been collected in accordance with valid statistical methods and the product has undergone quality control tests of each manufactured lot.

Strategic Diagnostics Inc. does not guarantee that the results with the TNT Soil Test System will always agree with instrument-based analytical laboratory methods. All analytical methods, both field and laboratory, need to be subject to the appropriate quality control procedures.

How It Works

Controls, Samples, and color-change reagents are added to cuvettes. The concentration of TNT in an unknown Sample is determined by evaluating how much color is developed.

Quality Control

Standard precautions for maintaining quality control:

- Do not use reagents or components from one Test System with reagents or components from another Test System.
- Do not use the Test System after its expiration date.
- The sample must be analyzed immediately after adding the Developer Solution.
- Results may not be valid if DR/2000 reading for Control is outside of the range of 0.307 - 0.373.

Storage and Handling Precautions

- Wear protective gloves and eye wear.
- Store kit at room temperature and out of direct sunlight (less than 80°F).
- If acetone comes into contact with eyes, wash thoroughly with cold water and seek immediate medical attention.
- Operate test at temperatures greater than 4° C/40° F and less than 39° C/100° F.
- After use, dispose of kit components in accordance with applicable federal and local regulations.

ON-SITE QUALITY CONTROL/QUALITY ASSURANCE RECOMMENDATIONS
SDI EnSys© TEST SYSTEM

Please read the following before proceeding with field testing.

SAMPLING

The result of your screening test is only as valid as the sample that was analyzed. Samples should be homogenized thoroughly to ensure that the 10 grams you remove for field testing is representative of the sample as a whole. All other applicable sample handling procedures should be followed as well.

PRIOR TO TESTING SAMPLES

Carefully follow the instructions in the User's Guide included with every test kit. This is the key element in obtaining accurate results. In addition, store your unused test kits at room temperature and do not use them past their expiration date (see label on each test kit).

INTERNAL TEST QC

One control is provided with each Kit to provide internal test system quality control. Test runs resulting in a number that falls outside of the specified range should be repeated to ensure valid conclusions.

QA/QC

The validity of field test results can be substantially enhanced by employing a modest, but effective QA/QC plan. SDI recommends that you structure your QA/QC plan with the elements detailed below. These have been developed based on the data quality principles established by the U.S. Environmental Protection Agency.

A. **Sample Documentation**
   1. Location, depth
   2. Time and date of collection and field analysis

B. **Field analysis documentation** - provide raw data, calibration, any calculations, and final results of field analysis for all samples screened (including QC samples)

C. **Method calibration** - this is an integral part of SDI tests: a TNT control analysis should be performed daily (see the instructions in the User's Guide)

D. **Method blank** - field analyze fresh acetone

E. **Site-specific matrix background field analysis** - collect and field analyze uncontaminated sample from site matrix to document matrix effect

F. **Duplicate sample field analysis** - field analyze duplicate sample to document method repeatability; at least one of every 20 samples should be analyzed in duplicate

G. **Confirmation of field analysis** - provide confirmation of the quantitation of the analyte via an EPA-approved method different from the field method on at least 10% of the samples; provide chain of custody and documentation such as gas chromatograms, mass spectra, etc.

H. **Performance evaluation sample field analysis (optional, but strongly recommended)** - field analyze performance evaluation sample daily to document method/operator performance

I. **Matrix spike field analysis (optional)** - field analyze matrix spike to document matrix effect on analyte measurement

FURTHER QUESTIONS?

SDI's Technical Support personnel are always prepared to discuss your quality needs to help you meet your data quality objectives. Call 1-(800) 544-8881.

TNT SOIL TEST - ABBREVIATED PROCEDURE

1	• Clean cuvettes • Zero the spectrophotometer at 540 nm
2	• Add 10 g soil and 50 ml acetone to extraction jar • Shake 3 minutes, let settle • Draw up 25 mL extract, filter into cuvette
3	• Read $Abs_{initial}$, record • Add 1 drop developer solution, shake • Read Abs_{sample}, record TNT TNB DNB 1 to 30 ppm
4	• Multiply $Abs_{initial}$ by 4 • Subtract from Abs_{sample} • Divide by 0.0323 • $TNT_{(ppm)} = \frac{Abs_{sample} - (Abs_{initial} \times 4)}{0.0323}$

TNT likely COC
no need to quantify, don't need tech
determine % pres/abs. of TNT

1800
544
8981
ext.
138

TNT SOIL TEST KIT WORKSHEET

$Abs_{background}$ _____ $Abs_{control}$ _____

1	2	3	4	5	6
SAMPLE #	$Abs_{initial}$	Abs_{sample}	$Abs_{initial}$ x4	Abs_{final} (Column 3 - Column 4)	TNT CONC ppm (Column 5/0.0323)

U.S. ARMY CORPS
OF ENGINEERS
LOUISVILLE DISTRICT

Data Quality Objectives

Limited Site Investigation of the former

Plum Brook Ordnance Works

TNT Rail Car Loading Area

Sandusky, Ohio

DERP-FUDS HTRW Project No. G05OH001816

July 2000

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1.0 DATA QUALITY OBJECTIVE PROCESS

The purpose of this section is to provide and document the rationale for developing Data Quality Objectives (DQOs) for the Site Investigation (SI) of the TNT Loading Area, located at the former Plum Brook Ordnance Works (PBOW), Ohio FUDS Site.

The former PBOW was operated from 1941 to 1945 by the Trojan Powder Company under contract to the Army Ordnance Department. The facility manufactured trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Along several miles of railroad track docks were established for loading and unloading intermediate products. This area is known as the Rail Car Loading Area, the subject of this SI. Investigation of the PBOW is being addressed by the DOD under the Defense Environmental Restoration Program (DERP), Formerly Used Defense Sites (FUDS) program. This project is being undertaken by the U.S. Army Corps of Engineers Louisville District (CELRL) under direction of the U.S. Army Corps of Engineers Huntington District (CELRH).

The DQO process is a strategic planning approach based on the Scientific Method that is used to prepare for a data collection activity. It provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect.

The DQO process consists of the following seven distinct steps with the following brief descriptions (USEPA 1994):

- **Step 1**: State the Problem – Concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.

- **Step 2:** Identify the Decision – Identify what questions the study will attempt to resolve, and what actions may result.

- **Step 3**: Identify the Inputs to the Decision – Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.

- **Step 4:** Define the Study Boundaries – Specify the time periods and spatial area to which decisions will apply. Determine when and where the data should be collected.

- **Step 5:** Develop a Decision Rule – Define the statistical parameters of interest, specify the action level, and integrate the previous DQO outputs into a singe statement that describes the logical basis for choosing among alternative actions.

- **Step 6:** Specify Tolerable Limits on Decision Errors – Define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision.

- **Step 7:** Optimize the Design – Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

The DQO process is iterative by design; the outputs of one step may influence any steps in the process and improve the investigation as knowledge of the site increases.

2.0 Background

2.1 Installation and Site History

Based on the Archives Search Report (USACE, 1993), the original PBS site was established in 1941 and referred to as Plum Brook Ordnance Works (PBOW). The installation was established for the purpose of manufacturing trinitrotoluene (TNT), dinitrotoluene (DNT), pentolite, and nitric and sulfuric acids. Built by E.B. Badger and Sons Company, the facility was operated under contract by the Trojan Powder Company. Production of explosives ceased two weeks after V-J Day, having manufactured in excess of one billion pounds of explosives during the four-year operating period.

Decontamination of TNT, acid, pentolite and DNT manufacturing lines was completed during the last quarter of 1945. On 17 December 1945, the physical custody of the plant was transferred from Trojan to the Ordnance Department. The U.S. Army Corps of Engineers assumed responsibility for maintenance and custodial duties until September 1946 when the property was transferred to the War Assets Administration (predecessor to the Government Services Administration), after it was certified by the U.S. Army to be decontaminated.

NASA acquired the PBOW in 1963 and is presently using the site, now referred to as PBS.

The PBS site currently lies in an area that is primarily rural and agricultural with a low population density. The NASA Glenn Research Center occupies a majority of the former ordnance works. The Department of the Army maintains a reserve center on the westernmost portion of the facility. The remainder of the former installation is in private ownership with the vast majority being cultivated. A tract on the northern boundary is owned by the Perkins Board of Education and is utilized as a bus maintenance facility.

Several miles of railroad tracks crossed the PBOW. Along those lines docks were established for loading and unloading finished and intermediate products. Loading docks are areas of concern because product could have been spilled during the loading/unloading operations. One of the loading docks is being investigated under this project: Rail Car Loading Area 1017 (RCLA1017), adjacent to dunnage storage building 1017. That RCLA1017 was a major car loading area is suggested by its situation relative to the TNT area B and the Magazine Area, the

presence nearby of the dunnage storage building, and the layout of roads and tracks around. The railroad tracks split at the place in three branches and an explosion containment wall is located between two of them. The three branches run parallel for some 1500 feet before uniting again in a single line. RCLA1017 is situated southeast of the TNT Area B and west of the Magazine Area. The sampling area is defined as a 500 ft. long band, centered on the containment wall, that covers the space between the tracks and 20 feet beyond on both sides as shown in the Field Sampling Plan (FSP). Historic photographs of the site do not show much variation over the years, except that a growing vegetation has been invading the zone. This fact was verified in a recent site visit. In fact, the vegetation is so dense today, that a clean up would be necessary in order to access the area for sampling. Currently, NASA allows local law enforcement agencies to use the site as an outdoor range training area for small caliber weapons.

2.2 Topography

In general, the ground surface along the subject rail lines is relatively flat.

2.3 Geology

Based on the Site Wide Ground Study (IT Corporation, 1997-1998), three formations, all of the Devonian Age, underlie the PBOW site. The Delaware Limestone is the lowermost formation. It is characterized as a hard, dense, finely crystalline limestone and dolomite. Dissolution of this unit has been described which has produced solution channels along bedding planes and joints, and even producing caverns in some areas. The unit is typically buff colored and usually described as fossiliferous. In the vicinity of PBOW, benzene, toluene, ethyl benzene, and xylene (BTEX) and hydrogen sulfide are common in area quarries. Overlying the Delaware Limestone is the Olentangy Formation. Two members of the Olentangy Formation have been characterized at the PBOW site, the Plumbrook Shale and the overlying Prout Limestone. The Plum Brook Shale is interpreted to consist of approximately 35 feet of bluish-gray, soft, fossiliferous shale containing thin layers of dark, hard, fossiliferous limestone. The Prout Limestone has been interpreted to be a unit approximately 15 feet thick which outcrops occasionally in a 1,000 to 2,000 foot-wide, northeast striking band across the middle portion of the PBOW. It has been described as a dark-gray to blue, very hard, silicious, fossiliferous limestone or dolomitic mudstone. The uppermost formation at the PBOW site is the Ohio Shale. Only one member of the Ohio Shale is present in the PBOW area- the Huron Shale. This unit has been described as black, thinly bedded, with pyrite and abundant carbonaceous matter with some large pyrite/carbonate concretions up to 6 feet in diameter.

The bedrock overburden in Erie County is predominantly glacial till, glacial outwash or glacial lacustrine (lake) deposits. In the vicinity of PBOW, the soil has been interpreted to be lacustrine. In many areas, the overburden also consists of highly weathered bedrock. The thickness of the overburden ranges from approximately 5 feet or less for most of PBOW to greater than 25 feet. The overburden is thickest on the northern portion of the site.

2.4 Hydrogeology

Based on the Site Wide Groundwater Study (IT Corporation 1997-1998), potable groundwater is encountered in the bedrock units underlying the PBOW site. Generally this groundwater flows northward toward Lake Erie. Based on the hydrogeologic information given in the Groundwater Resources of Erie County, 1986, the PBOW site includes 3 distinct hydrogeologic regimes. Groundwater yields from these regimes range from limited, to the northeast and south, to more than 500 gallons per minute (gpm), to the northwest.

3.0 Data Quality Objectives Process

3.1 Step 1: State the Problem:

The purpose of this step is to define the problem so that the focus of the study will be unambiguous. Concisely describe the problem to be studied and review prior studies and existing information to gain a sufficient understanding to define the problem.

3.1.1 *Identification of Planning Team Members*

Project Manager:	Rick Meadows, CELRH-DL-M
Team Leader & Site Manager:	Doug Meadors, CELRL-ED-EE
Project Engineer:	Albert J. Reyes, CELRL-ED-EE
Health & Safety Manager:	Shelton Poole, CELRL-ED-EB
Health & Safety Manager Alternate:	David Brancato, CELRL-ED-EE
Quality Assurance Manager:	Samir Mansy, CELRL-ED-EB

3.1.2 *Description of Problem:*

Potential contamination at the TNT Rail Car Loading Areas was identified in a project summary sheet, as an exhibit to an Inventory Project Report (INPR) prepared by Huntington District, which requested a Limited Site Investigation. The purpose of the Limited SI was to identify any contamination related to the previous Army activities. Soil samples have not been collected in this area.

3.1.3 Potential Transport Mechanisms:

Potential transport mechanisms in the Rail Car Loading Area include:

- Surface water runoff.
- Leaching through the soil column to the subsurface soil and groundwater.

3.1.4 Resources and Relevant Deadlines for the Site Investigation:

The funding resources for Site Investigations are provided under the DERP-FUDS DOD program. This limited SI must be completed by the end of FY 99 in order to closeout the records for this project in the financial system. The Louisville District Environmental Engineering Branch is slated to provide the necessary labor to complete the investigation. This is slated to be a limited SI since it is the initial investigative work for the Rail Car Loading Area.

3.2 Step 2: Identify the Decision

The purpose of this step is to define the decision statement that the study will attempt to resolve.

3.2.1 Principal Study Question

Do constituents of concern exist in the environmental media at the TNT Rail Car Loading Areas at levels that would exceed those found in USEPA Region IX PRGs?

3.2.2 Alternative Actions that could result from Resolution of the Principle Study Question:

- SI report recommendation: Coordinate with federal and state regulatory authorities to proceed toward a no further action (NFA) decision document.
- SI report recommendation: Additional site investigation or interim measures.

3.2.3 Decision Statement

The primary decision for the site investigation is to determine whether the COCs present at the Rail Car Loading Area are at levels that exceed media specific screening criteria (Region IX PRGs) and thus would require further action.

3.3 Step 3: Identify Inputs to the Decision

The purpose of this step is to identify the informational inputs that will be required to resolve the decision statement and determine which inputs require environmental measurements.

3.3.1 Information Required to Resolve Decision Statement:

- Historical records, interviews, aerial photographs, visual inspections, previous environmental investigations, site topography, geology, site hydrology and hydrogeology will be utilized to make an informed decision about the expected type

of COCs. This information will also help position the most likely location of samples within the TNT Rail Car Loading Area where contaminated media will be discovered.

- Transport mechanisms and chemical properties of COCs to evaluate migration pathways.
- Analytical samples and results from the corresponding environmental media within the TNT Rail Car Loading Area to compare to PRGs.

3.3.2 Sources for Information

DERP-FUDS and EPA guidance are the principle tools leading this investigation. CELRH has an extensive administrative record (AR) for the former PBOW. A review of excepts from this AR and other sources including historic aerial photographs, historical topographic quadrangles, published geologic information, and data base searches revealed useful information about the site. Information regarding the chemical properties and characteristics of COCs can be obtained from the NIOSH *Chemical Guide (NIOSH 1998).* The "References" section of the Quality Assurance Project Plan (QAPP) dated June 1999 for this project contains a complete listing of the reviewed information.

3.3.3 Information Needed to Establish the Action Level and Confirm that Appropriate Measurement Methods Exist to Provide the Necessary Data

The action levels for the contaminants of concern (COCs) will be the USEPA Region IX screening criteria for the protection of human health. USEPA SW-846 analytical methods were selected for sample analysis to provide Method Detection Limits that are sufficiently low enough to allow comparison with applicable screening criteria. The performance-based methods have inherited quantitative and qualitative QA objectives, internal method requirements, and specific QC limits. These methods along with strict USEPA QA/QC guidance and protocols will provide data that will meet data quality objectives.

3.4 Step 4 – Define Site Investigation Boundaries

This step describes the spatial and temporal boundaries of the site investigation to which decisions will apply. Characteristics of the population to be sampled are defined, and practical considerations for the site investigation are evaluated in this section. Based on the initial results of the site investigation, additional data may be required to further define the investigation boundaries.

3.4.1 Characteristics that Define the Population of Interest

The COC associated with the rail car loading area, that may have been released into the environment include explosives, Target Analyte List (TAL) metals, and Semi-Volatile Organic Compounds (SVOCs). Samples should be collected from the surface soil to characterize the population of COC that may have been spilled during loading and unloading operations

3.4.2 Spatial Boundary of the Decision Statement

The site investigation will focus around the emplacement of the suspected location of the car loading area. This includes 3000 feet of railroad that will be investigated at either side of this point. The vertical extent of the site investigation is 2 feet down through the soil column.

3.4.3 Temporal Boundary of Decision Statement

The analytical data obtained from this site investigation will be used as valid indicators of COCs throughout an exposure time frame of 50 years. The sampling for this investigation should take place in the time frame of early spring through summer. If performed in this time frame, optimum weather conditions for fieldwork should occur.

3.4.4 Scale of Decision Making

The scale of decision making will be based on the concentrations of the possible contaminants identified in the surface water, surface soil, and subsurface soil samples compared to the values for the Region IX PRGs.

3.4.5 Practical Constraints on Data Collection

Practical constraints on data collection for this site investigation could be scheduling problems, access problems, personal injury during fieldwork, illness, dangerous weather, and/or budget constraints.

3.5 Step 5: Develop a Decision Rule

Define the statistical parameters of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.

3.5.1 Specify the Parameter that Characterizes the Population of Interest

The concentration levels of the COCs found will be compared to the levels of the specific screening criteria. Any findings surpassing the criteria levels will become the area of focus for further investigation.

3.5.2 Specify the Action Level for the Site Investigation

The analytical sample results will be compared to the proper screening standard set forth by Region IV PRGs. The levels of screening are conservative so that the proper protection is met for both human health and the environment.

3.5.3 Decision Rule

If concentration levels of the COCs are higher than that of the criteria levels, then a recommendation for further investigation and/or remediation will be implemented. If the concentration levels are below the criteria, then an approach for a No Further Action (NOFA) will be developed. During the review process data gaps may be uncovered. Such data gaps may require additional media sampling and analytical chemistry effort to proceed to NOFA.

3.6 Step 6: Specify Tolerable Limits on Decision Error

Define the decision maker's tolerable decision error rates based on a consideration of the consequence of making an incorrect decision.

3.5.4 Determine the Possible Range of the Parameter of Interest

Previous samples have not been taken at the former Rail Car Loading Area site. Therefore, the minimum value used for the parameter of interest is the concentration at the detection limit for each COC. The maximum values are those that exceed the appropriate screening criteria.

3.5.5 Identify the Decision Errors and Choose the Null Hypothesis

A non-statistical sampling plan will be used to position the location of each sample along with the number of samples. This process is being implemented because this is a limited SI. The sampling will be both purposeful and biased to locations that are most likely contaminated. Four steps are used to define where each decision error occurs relative to an action level and establish the decision errors associated with the sampling design.

Definition of Decision Error – As in any statistical test, there are two kinds of error that can occur in implementing the decision rule: the null hypothesis may be rejected when true (Type I error, with probability α), or the fail to reject decision may be made when false (Type II error, with probability β). The number of samples needed to make the decision is driven by the error rate that can be tolerated, as well as by other considerations such as spatial variability of COCs distributions. Because this is a limited SI, probability errors will not be considered herein.

The Null Hypothesis (baseline condition) and the Alternative Hypothesis– The baseline conditions or null hypothesis for the TNT Rail Car Loading Area is "COCs detected in the soil or surface water are at concentrations that warrant additional investigation activities". The alternate hypothesis is "COCs detected in the soil or groundwater are at concentrations that do not demand additional investigation activities". In terms of this investigation, the default assumption (null hypothesis) is that the concentrations of COCs at the site are significant enough to require further investigation.

Potential Consequence of Each Decision Error – In the event that the COCs expected do not exceed the criteria levels when actually they do (Type I error), then possible endangerment of human health and the environment could occur. If this takes place, then the Army Corps of Engineers and its sister agencies responsible for protection of human health and the environment would not be meeting their stated mission. If the COCs are detected at a concentration level that exceeds the criteria levels when actually they do not, then the Army will have unnecessary expenses associated with additional investigation activities.

Which Decision Error Has More Severe Consequences Near the Action Level – For the purpose of protecting human health and the environment, the Type I error has more severe consequences in terms of the stated null hypothesis. The Type I decision error has a more severe consequence near the action level since the risk of jeopardizing human health is likely to outweigh the consequences associated with additional investigation expenditures and schedule delays. In using the data collected, careful review will be made to insure that the Type I error is not likely to occur. If the review warrants, additional investigation will be recommended.

3.7 Step 7: Optimization of the Sampling Design

The purpose of this step is to identify a resource-effective data collection design for generating data that are expected to satisfy DQOs. This SI will be based on surface and subsurface soil samples collected within and below the potential source area (that is, the former lagoons, themselves). As more information is obtained, the sampling design may be optimized to accomplish the goals of this investigation.

No existing chemical data is available for the Rail Car Loading Area. Therefore, the sampling design is based on hypothetical expectations of what may be detected at the site. Alternative sampling plans could require additional samples and funds; however, the scope of this SI is limited in nature.

Field screening and confirmatory surface soil samples will be taken along the rail lines of the suspected TNT Loading Area. Because the exact emplacement of the loading area is unknown, sampling will be done in the vicinity of the loading operations most likely occurred in the area of the containment wall and building 1017. Detailed sampling strategy is in the FSP. Specific sampling locations are on the sampling map of the FSP. Each section will be sampled at 25 feet intervals. Every four samples, or every 100-ft., will be composite and field screened for TNT. 10% of the composite samples, those that produced the highest reading, will then have confirmatory samples taken and submitted for laboratory analysis.