# GENERAL SAMPLING AND ANALYSIS PLAN
# TO SUPPORT
# HIGH SPEED TRAINSET FACILITY ACTIVITIES
# IN OPERABLE UNIT 4

Sunnyside Yard
Queens, New York

ROUX Associates, Inc.
ENVIRONMENTAL CONSULTING & MANAGEMENT

34

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**Sunnyside Yard**
**Queens, New York**

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## CONTENTS

## CONTENTS (Continued)

## TABLES



## APPENDICES

## 1.0 INTRODUCTION

The National Railroad Passenger Corporation (Amtrak) currently owns and operates a train makeup and maintenance facility known as Sunnyside Yard (Yard) located at 39-29 Honeywell Street in Queens County, a borough of New York City, New York. A portion of the Yard has been designated by Amtrak as the site for a proposed High Speed Trainset Facility (HSTF) Service and Inspection (S&I) Building. Additionally, modifications to other areas of the Yard are required to accommodate the HSTF program which includes, but is not limited to, installation of new tracks, relocation of existing tracks, installation of new catenary poles, and/or installation of new subsurface utilities.

The Yard is listed as a Class 2 site on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Disposal Sites. As a result of this listing, Amtrak, New Jersey Transit Corporation, and the NYSDEC entered into an Order on Consent, and Phase I, Phase II, and Phase II Addendum Remedial Investigations were performed by Roux Associates, Inc. (Roux Associates). As a result of these investigations, areas of the Yard were identified where levels of contamination require remedial efforts. With the NYSDEC concurrence, to accommodate the HSTF S&I Building construction schedule and still address remedial efforts sitewide in a timely and orderly manner, the Yard has been subdivided into six operable units (OUs). This Sampling and Analysis Plan (SAP) is designed to be used to support the general track maintenance program and the HSTF-related work performed in OU-4 only. OU-4 is designated as the soil above the water table in the remainder of the Yard (i.e., outside of HSTF-specific OU-1 and OU-2 and also OU-3, the former Area 1).

The general track maintenance program at the Yard includes the periodic replacement of rails, ties, and the ballast beneath the tracks. The ballast layer, which is comprised of 1-inch to 3-inch gravel or crushed stone, is generally about 1 foot in thickness and provides stability to the track bed and allows for adequate drainage. Over time, the ballast interstices become clogged with fine grained material, reducing drainage capabilities and, therefore, track stability which necessitates replacement.

In much the same context that the paved surface of a roadbed would not be considered when determining the soil quality beneath it, it is Amtrak's position that the ballast layer, due to its dynamic nature, should be considered in a special manner.

In that regard, we propose that all soil characterization samples will be collected beginning at the bottom of the ballast interval. All ballast to be removed during HSTF construction, track relocations, and maintenance activities will be sampled in-situ if time permits or stockpiled and sampled for the constituents of concern in order to determine reuse or disposal options. All ballast deemed not suitable for reuse at the Yard or not needed will be removed and disposed in accordance with all applicable local, state, and federal regulations. It should be noted that Amtrak will be addressing all ballast at the Yard as maintenance activities progress.

The primary function of this SAP is to provide guidelines and procedures for field and laboratory personnel to be followed during the characterization of soil for construction activities in OU-4, as well as the implementation of the remedial action, if required. It should be noted, however, that these sampling activities are to support construction and track maintenance activities. It is understood that NYSDEC may request additional sampling to support the OU-4 Remedial Investigation. Any additional sampling activities will be addressed in the OU-4 RI Work Plan. Furthermore, this SAP outlines the measures that will be taken to verify that data generated by field activities undertaken as part of this project are of quality sufficient to meet the data quality objectives. The SAP combines the elements of a field sampling plan (FSP) and a quality assurance project plan (QAPP) to streamline the project planning process. All field work will be performed in accordance with the previously prepared site-specific Health and Safety Plan (HASP).

## 2.0 PROJECT OBJECTIVES AND SCOPE

The objectives of this SAP are to characterize soil which will be encountered during the construction of the HSTF and track maintenance activities with respect to the site-specific cleanup levels for the constituents of concern at the Yard, and to define the methods used for implementation of the remedial action, if necessary. Specifically, the field activities will include the following:

- baseline soil sampling;
- post-excavation sampling (if necessary); and
- waste characterization (if necessary).

These results will be used to document the existence of constituents of concern, evaluate the concentrations detected (if present) with respect to the established site-specific cleanup levels for polychlorinated biphenyls (PCBs), carcinogenic polycyclic aromatic hydrocarbons (CPAHs) and lead provided by the NYSDEC in the February 25, 1997 correspondence, and, when present, delineate the boundaries of contamination above the site-specific cleanup levels. In addition, waste characterization may be used for offsite disposal options.

The scope of work to implement characterization, remediation and post-excavation activities will consist of the following tasks:

- Task I: Notification to NYSDEC;
- Task II: Soil Boring and Sampling;
- Task III: Soil Remediation (if necessary);
- Task IV: Post-Excavation Soil Sampling (if necessary);
- Task V: Waste Characterization Sampling (if necessary);
- Task VI: Reuse and/or Disposal Options; and
- Task VII: Report Preparation.

The above-listed tasks are discussed in detail in Section 11.0 of this SAP.

## Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements used to develop a scientific and resource effective sampling design. As stated in the Guidance for the Data Quality Objectives Process (EPA QA/G-4), DQOs are derived from the outputs of each step of the DQO process that:

- classify the study objective;
- define the most appropriate type of data to collect;
- determine the most appropriate conditions from which to collect the data; and
- specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision (USEPA, 1994).

The objective of the sampling at the Yard is to further assess soil quality conditions in areas to be impacted by construction activities to determine the nature, extent and gradients of the constituents of concern. A nonprobabilistic (judgmental) sampling approach will be used to select the specific sampling locations for these areas of concern. A judgmental sampling design consists of directed samples at specific sampling locations to confirm the existence of contamination at these chosen locations based on visual or historical information.

Total study error is the combination of sampling and measurement error. Total study error is directly related to decision error. These decision errors can be controlled through the use of hypothesis testing. For this sampling, the null hypothesis (baseline condition) is that the parameter of interest exceeds the site-specific cleanup level. This decision has the smallest degree of decision error. In addition, measurement error is reduced by analyzing individual samples using more precise laboratory methods. Analyses will be performed using NYSDEC Analytical Services Protocol (ASP) and the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) for the majority of parameters, and the Test Methods for the Evaluation of Solid Waste for parameters not analyzed under the ASP/CLP and when rapid turnaround time is required.

## 3.0 SAMPLE TYPES, LOCATION AND FREQUENCY

Sample locations for the soil borings will be determined based on the construction activity to be performed. Notification will be provided to the NYSDEC on the number and location of soil samples to be collected.

Soils samples collected during the course of this project will be analyzed in accordance with the specified ASP/CLP (or ASP/SW-846) procedures for organic and inorganic parameters which include CPAHs, PCBs, and lead. Specifics regarding the collection of samples at each location and for each task are provided in Section 6.0.

### Quality Control Checks

This section describes the Quality Control (QC) checks that will be used for this investigation. QC samples serve as checks on both the sampling and measurement systems and assist in determining the overall data quality with regard to representativeness, accuracy, and precision. The frequency and type of field QC samples to be submitted are summarized below.

Field duplicates and matrix spike samples are analyzed to assess the quality of the data resulting from the field sampling program. Field duplicate samples are individual portions of the same or essentially the same field sample. These samples can be used to estimate the overall precision of a data collection activity. Sampling error can be estimated by the comparison of duplicate sample results from the same sample. During characterization sampling, one field duplicate sample will be collected for each 20 grab samples collected. If fewer than 20 samples are collected, one duplicate sample will be analyzed.

Matrix spike/matrix spike duplicates (MS/MSDs) are used to evaluate analytical accuracy, and precision, respectively. MS/MSDs will be analyzed by the laboratory at a frequency of one per preparation batch.

## 4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The overall management structure for field activities and general discussions of the responsibilities of management and the field technical staff are provided below.

### Project Manager

The Project Manager bears the primary responsibility for the successful completion of the work assignment within the budget and schedule. Provides overall management for the execution of the investigation and directs the activities of the Site Manager and technical staff. Performs technical review of all field activities, data review and interpretation, and the preparation of all investigation reports. Works closely with the analytical laboratory, data validation contractors, drillers, and surveyors during the execution of the field program. Activities of the Project Manager are supported by senior management, the Project Quality Assurance Coordinator, and support staff.

### Site Manager

The Site Manager bears the primary responsibility for the successful execution of the field program. Directs the activities of technical staff in the field and assists in the interpretation of all physical and chemical data, and report preparation. Responsible for the management of technical staff including hydrogeologists and technicians, and subcontractors such as drillers and surveyors. In addition, works closely with the Site Health and Safety Officer to ensure compliance with the Health and Safety Plan (HASP).

### Field Technical Staff

Field technical staff consists of hydrogeologists and technicians who will perform activities such as soil sampling, and preparation of any field documentation which may be necessary.

### Laboratory Manager

The Laboratory Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analyses through oversight of the laboratory staff. The Laboratory Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Manager reports to the Project Manager.

**Project Quality Assurance Coordinator**

The Project Quality Assurance Coordinator (PQAC) is responsible for conducting reviews, inspections, and audits to assure that the data collection is conducted in accordance with the SAP. These responsibilities range from effective field equipment decontamination procedures, to proper sample collection, to review of all laboratory analytical data (including tentatively identified compounds, if analyzed) to ensure completeness and usefulness. The PQAC reports to the Project Manager.

## 5.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall Quality Assurance (QA) objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis, and reporting that will provide results which maximize the likelihood that the data are collected, analyzed and documented such that it is defensible. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, data reporting, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this SAP. The purpose of this section is to address the project-specific objectives for precision, accuracy, representativeness, completeness, and comparability, known as the "PARCC" parameters.

### 5.1 Accuracy, Precision, and Sensitivity of Analysis

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols.

Accuracy, precision and completeness requirements will be addressed for all the data generated. Accuracy, the ability to obtain a true value, is monitored through the use of field and method blanks, spikes, and standards, and compared to federal and state regulations and guidelines. This will reflect the impact of matrix interferences. Precision, the ability to replicate a value, is monitored through duplicate (replicate) samples. It is assessed for each matrix. Corrective actions and documentation for substandard recoveries, or substandard precision, must be performed by the laboratory. These parameters will be based on ASP/CLP criteria for ASP/CLP analyses, or modified criteria for non-ASP/CLP analyses.

Instrument sensitivity must be monitored to ensure the data quality through constant instrument performance. Method detection limits depend on instrument sensitivity and matrix effects. Monitoring of instrument sensitivity is performed through the analysis of reagent blanks, near detection limit standards and response factors.

Quality control criteria for laboratory and field analyses are provided in Table 1. Required field and laboratory QC samples and frequencies are summarized in Tables 2 and 3, respectively.

## 5.2 Completeness, Representativeness and Comparability

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. It is expected that the laboratory will provide data meeting QC acceptance criteria for 95 percent or more for all samples tested using the ASP/CLP Routine Analytical Services (RAS) methods and 90 percent for other methods. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness (percent)} = \frac{\text{(Valid Data Obtained)}}{\text{(Total Data Planned)}} \text{ X } 100$$

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. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. Representativeness will be satisfied by ensuring that the FSP is followed, proper sampling techniques are used, proper analytical procedures are followed and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed in part by the analysis of field duplicate samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are expected to provide comparable data. These new analytical data, however, may not be directly comparable to existing data because of difference in procedures and QA objectives.

## 6.0 SAMPLING AND SAMPLE CUSTODY PROCEDURES

The following sections describe the standard protocols to be used by Roux Associates' personnel during the course of sampling activities. The Roux Associates' Standard Operating Procedures (SOPs) included in Appendix A will be referenced where applicable.

### 6.1 Sample Designation

Sample bottles (preserved, if necessary), labels, shipping containers, trip blanks, and field blank water will be provided by the laboratory. During collection of soil samples, the sample containers will be labeled with a site identifier, Roux Associates' project number, a sample identification code, analysis identifier, date and time of collection, field handling information and type of preservative added (if applicable).

The sample identification code provided on each sample label will follow the sample number and coding system described below.

1. Sample location abbreviations will be as follows:

| | | |
|---|---|---|
| soil boring | = | SB |
| composite samples (post-excavation) | = | PE |
| stockpile | = | SP |

2. Analytical method designations will be as follows:

| | | |
|---|---|---|
| Polycyclic Aromatic Hydrocarbons | = | CPAH |
| Polychlorinated Biphenyls | = | PCB |
| Lead | = | Lead |
| Toxicity Characteristics | = | TC |

3. QC identifiers (if applicable) will be as follows:

| | | |
|---|---|---|
| Field duplicate | = | D |
| Matrix Spike | = | MS |
| Matrix Spike Duplicate | = | MSD |

## 6.2 Yard Control

Yard control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the site. In order to accomplish this objective, the following three considerations have been addressed:

- the establishment of discrete work zones in the investigative area;
- the decontamination of field equipment; and
- the security and access procedures for the site.

All personnel who come onto the site, including Yard employees, contractors, and observers, will be required to adhere strictly to the conditions imposed herein, and within the provision of the HASP.

### 6.2.1 Field Work Zones

Field work zones will be limited to areas where intrusive activities, including soil sampling and drilling, are conducted. Access will be limited in accordance with the HASP. Control of work zone access will be the responsibility of the Site Manager.

### 6.2.2 Decontamination

The location of the decontamination area will be determined prior to the start of operations. The decontamination area will be constructed to ensure that all wash water generated during decontamination will be collected and containerized for proper disposal.

### 6.2.3 Site Security and Access

The Yard is currently active. Site security and access control protocols used by the Yard will be followed during implementation of these investigations. At the completion of each working day, all loose equipment (e.g., sampling equipment, water-level measuring devices, coolers, etc.) will be secured. Heavy equipment, such as the drill rig, will remain onsite within the current work zone.

### 6.3 Field Equipment

All measurement systems utilized in the field will be operated in accordance with the manufacturer's instructions and the applicable SOPs in Appendix A. Methods of calibrating and maintaining the equipment are provided below.

#### 6.3.1 Equipment Calibration

All measurement equipment will be calibrated according to the manufacturer's recommendations, where applicable. Frequency of instrument calibration will be dictated by the type of measurement device. Table 4 lists the field measurement equipment to be used and the calibration frequency for the instrument. Records of all calibrations (both frequency and results) will be kept in the field or instrument logbook.

#### 6.3.2 Equipment Maintenance

All field equipment will be stored in a clean, controlled environment (as necessary) to prevent damage due to heat, cold, moisture, etc. prior to use. Reusable equipment will be decontaminated as soon as reasonably possible after use and stored as described above. Decontamination procedures are provided in Section 6.7 and in the SOPs (Appendix A). Maintenance for measurement and health and safety equipment will be in accordance with the schedule found in Table 4.

Equipment failing to meet manufacturer's minimum specifications will be removed from service immediately and kept out of service until the problem is identified and/or resolved. Records of all routine maintenance and repair will be kept in the instrument or field logbook.

### 6.4 Field Documentation

The following sections provide guidance to field personnel in the areas of documentation and record keeping. The goal of field documentation is to provide a clear and complete record which can be used for reference and information retrieval at a later date. All field documentation will be recorded in bound logbooks or pre-generated activity-specific forms using indelible (water proof) ink. Details of record keeping requirements are described in Appendix A. Samples of field forms are provided in Appendix B.

#### 6.4.1 Field Logbooks

Field logbooks will be used for all record keeping to provide a permanent, bound record of all field-related activities. Additional records may be kept on pre-generated forms for sample tracking and other purposes. The types of information and level of detail required for logbook recording are described in the Field Record Keeping and Quality Assurance/Quality Control SOP in Appendix A.

#### 6.4.2 Field Documentation for Drilling

Daily field activities will be summarized in a field notebook to ensure that an accurate record of all field investigation tasks are maintained. Geologic logs will be recorded in the field notebook during the drilling of soil borings. For each soil boring completed during these investigations, a geologic log will be prepared. Examples of geologic logs are provided in Appendix B.

#### 6.4.3 Sampling Documentation

A complete record of how each sample was selected, aliquotted, packaged, and preserved for analysis will be maintained in field logbooks. Specific procedures regarding the level and type of sampling documentation can be found in the activity-specific Roux Associates' SOP in Appendix A. Sample designation and labeling are discussed in Section 6.1. Questions regarding sampling methods and QA will be addressed by the Project Manager, or the Roux Associates' PQAC.

## 6.5 Field Custody Procedures and Documentation

The following sections describe the procedures necessary to document sample custody. The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable). Specific procedures regarding sample tracking from the field to the laboratory are described in (Appendix A). Examples of a chain of custody form and a custody seal can be found in Appendix B.

### 6.5.1 Field Custody

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Site Manager to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

Samples must be accompanied by a properly completed chain of custody form (Appendix B). The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

If split samples are requested, a separate chain of custody form is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency will request the representative's signature on the chain of custody form, acknowledging sample receipt. If the representative is unavailable or refuses, this will be noted in the "Received By" space.

If samples are to be collected and delivered directly to the Site Manager, the Site Manager will complete the chain of custody for laboratory shipment and have the field sampler sign in the "sampler" box. If samples are transferred from the field sampler to an intermediary person before being transferred to the Site Manager, a separate chain of custody form from that used to ship samples to the laboratory must be completed for the field transfers. Any questions regarding custody procedures or QA will be addressed by the Site Manager and/or the PQAC.

### 6.5.2 Laboratory Custody

The sample custodian at each laboratory will ensure that chain of custody records are completed upon receipt of the samples and will note questions or observations concerning sample integrity. The quality assurance officer will also ensure that sample tracking records are maintained. These records will follow each sample through all stages of laboratory processing. The sample tracking records must show the date of sample extraction or preparation and the date of instrument analysis. These records will be used, in part, to determine compliance with holding time requirements.

## 6.6 Sample Handling and Analysis

To assure quality data acquisition, and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples as well as sample packaging and shipping procedures.

### 6.6.1 Field Sample Handling and Shipment

All samples will be collected and handled according to the appropriate protocols for each matrix described in the SOPs (Appendix A). The types of containers, volumes needed and preservation techniques for the aforementioned testing parameters are presented in Table 5.

Sample packaging and shipping procedures are based upon USEPA specifications, as well as U.S. Department of Transportation (DOT) regulations. The procedures vary according to potential sample analytes, concentration, and matrix, and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general

outline described below. Additional information regarding sample handling is provided in the SOPs (Appendix A).

All samples will be shipped within 48 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below.

1. Prepare cooler(s) for shipment.
    - Tape drain(s) of cooler shut;
    - Affix "This Side Up" arrow labels and "Fragile" labels on each cooler; and
    - Place mailing label with laboratory address on top of cooler(s).
2. Arrange sample containers in groups by sample number.
3. Ensure that all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
4. Arrange containers in front of assigned coolers.
5. Seal sample containers within plastic zip-lock bags to prevent leakage.
6. Place approximately 2 inches of vermiculite or other packaging material at the bottom of the cooler to act as a cushion for the sample containers.
7. Arrange containers in the cooler so that they are not in contact with the cooler or other samples.
8. Fill remaining spaces with vermiculite or other packaging material.
9. Ensure all containers are firmly packed in vermiculite or other packaging material.
10. If ice is required to preserve the samples, ice cubes should be repackaged in double zip-lock bags, and placed on top of the vermiculite or other packaging material.
11. Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express or other carrier, as appropriate.
12. Separate copies of chain of custody forms. Seal proper copies within a large zip-lock bag and tape to cooler. Retain copies of all forms.
13. Close lid and latch.
14. Secure each cooler using custody seals.

15. Tape cooler shut on both ends.

16. Relinquish to Federal Express or other courier service as appropriate. Retain airbill receipt for project records. (Note: All samples will be shipped for "NEXT DAY" delivery.

17. Telephone laboratory contact and provide him/her with the following shipment information:

    - Sampler's name;
    - project name;
    - number of samples sent according to matrix and concentration; and
    - airbill number.

### 6.6.2 Laboratory Analysis

Analytical methods for the chemical analysis of constituents of concern have been chosen to provide the highest level of data quality for purposes of the evaluation of remedial alternatives. Laboratory analyses will be conducted using standard methodologies as summarized in Table 1. Applicable QA/QC is described in Table 2 and Table 3 for field QC and laboratory QC, respectively.

## 6.7 Decontamination Procedures

The procedures for the decontamination of field equipment, personnel and sampling equipment are outlined in the following sections. Detailed procedures for the decontamination of field and sampling equipment are included in the SOPs provided in Appendix A.

In an attempt to avoid the spread of contamination, all equipment (i.e., drilling tools, sampling equipment, etc.) must be decontaminated at a reasonable frequency in the decontamination area. The location of the decontamination area will be determined prior to the start of operations. All wash water generated during cleaning will be collected and removed for proper disposal.

### 6.7.1 Drilling Equipment

The rig and all associated equipment will be cleaned by the contractor before arriving at and exiting the site. The augers, drilling casings, rods, samplers, tools, and any piece of equipment that may come in contact (directly or indirectly) with the soil, will be steam cleaned prior to set up for drilling to ensure proper decontamination. The same steam cleaning procedures will be followed for augers and sampling tools used for each borehole.

All steam cleaning (decontamination) activities will be monitored and documented by Roux Associates. Specific procedures for decontaminating drilling equipment are provided in the Roux Associates' SOP in Appendix A.

### 6.7.2 Personnel Protection

The field work will be performed in level D protection with continuous air monitoring provided to demonstrate the adequacy of this protection. Any decontamination of personnel required will be performed at a designated area of the site and appropriate decontamination materials (e.g., eye wash) will be maintained for use in this area. The required photoionization detector (PID) readings for changing protection levels and other specifics regarding personnel protection and decontamination are discussed in the HASP.

### 6.7.3 Sampling Equipment

All soil sampling equipment will be decontaminated prior to sampling and between sampling locations according to the procedures outlined in the SOPs included in Appendix A. Soil sampling equipment will be decontaminated using steam cleaning equipment, non-phosphate, laboratory-grade detergent solution, and distilled or potable water in a clean bucket. Water sampling equipment will be decontaminated prior to sampling in a similar manner.

### 6.8 Waste Handling and Disposal

Wastes generated during performance of field tasks (e.g., drill cuttings) will be containerized in labeled 55-gallon drums and stored within a designated area of the site. Each drum will be labeled with the site name, drum number, date, and nature of contents. Drill cuttings and disposable personnel protective equipment will be stored separately.

The handling of all wastes will conform to all health and safety requirements of the HASP. Composite samples will be collected to characterize the wastes prior to transport and disposal. Sample types, analytical parameters, and number of samples analyzed will be dependent upon state and federal transportation, landfill and/or site disposal requirements, and the requirements of the contracted waste hauler and waste-processing facility for wastes determined to be hazardous.

## 7.0 CALIBRATION PROCEDURES AND PREVENTIVE MAINTENANCE

This section describes procedures for maintaining the accuracy of all measurements and measuring equipment which are used for conducting field tests and laboratory analyses. All equipment must be calibrated prior to each use and on a periodic basis.

### 7.1 Field Instruments/Equipment

Field instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used during field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to ensure that all maintenance requirements are being observed. Backup instrumentation will be sent into the field where possible. Preventive maintenance will be conducted for equipment and instruments to ensure the accuracy of measurement systems, and to verify the availability of spare parts and backup systems.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and such procedures take precedence over the following general discussion.

Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate. Field instrumentation may include an Organic Vapor Meter (OVM) or photoionization detector (PID). In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be removed from service until the problem is resolved.

### 7.2 Laboratory Instruments

The ASP/CLP and ASP/SW-846 calibration procedures and frequencies are specified in the ASP procedures and CLP Statements of Work (SOWs). In all cases where analyses are conducted according to the ASP/CLP protocols, the calibration procedures and frequencies specified in the applicable ASP/CLP RAS SOW will be followed.

Calibration of laboratory equipment for non-ASP/CLP analyses will be based on approved written procedures. Records of calibration, repairs, or replacement will be filed and maintained by the designated laboratory personnel performing QC activities. These records will be filed at the location where the work is performed and will be subject to QA audits. For all instruments, the laboratory will retain a factory-trained repair staff with in-house spare parts or will maintain service contracts with vendors.

The records of laboratory calibration will be kept as follows:

- if possible, each instrument will have a record of calibration permanently affixed with an assigned record number;
- a label will be affixed to each instrument showing description, manufacturer, model numbers, date of last calibration, by whom calibrated (signature), and due date of next calibration. Reports and compensation or correction figures will be maintained with the instrument;
- a written stepwise calibration procedure will be available for each piece of test and measurement equipment; and
- any instrument that is not calibrated with the manufacturer's original specification will display a warning tag to alert the analyst that the device carries only a "Limited Calibration."

More detailed information on the calibration of laboratory equipment is presented in the laboratory QA plan.

### 7.3 Standards/Calibration Solutions Preparation

The standards/calibration solutions preparation will be performed in accordance with the ASP/CLP SOWs, if applicable, and using good laboratory practice (GLP) in all cases.

## 8.0 DATA REDUCTION, VALIDATION AND REPORTING

Applicable methods/procedures will be required for the reduction, validation and reporting of data generated during all phases of this project. Please note that unless requested by the NYSDEC, an independent validation will not be performed. Both the field and laboratory data will be subjected to a level of data validation commensurate with the required data quality level. If required, all data will be validated using either the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (February, 1994), USEPA Region II CLP Organics Data Review and Preliminary Review (SOP No. HW-6, Revision 8), USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February, 1994) and/or the Evaluation of Metals Data for the Contract Laboratory Program (SOP No. HW-2, Revision #11) or the same guidelines modified for non-ASP/CLP analyses. The level of complete transcription checks (raw data to reporting for calculation checks) shall nominally be 10 percent, but this percentage may be increased or decreased depending on the nature and significance of the individual results.

### 8.1 Data Reduction

Data reduction involves the generation, interpretation and calculation of results from the field and laboratory analyses performed as part of the data gathering effort. In order to make the appropriate decisions, it is necessary to verify that the reported values are correct, both in the way they have been generated (instrument calibration, etc.) and the way they are calculated and reported. Due to the different quantities of documentation and the different quality levels of data generated in the field and the laboratory, somewhat different levels of effort are required for reduction verification for these different data sources.

#### 8.1.1 Field Data Reduction

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbook. If the data are to be used in the project reports, they will be documented in the report. All measurement data recorded in field logbooks or field forms will be reviewed by the Project Manager for completeness and clarity. Any discrepancies noted will be resolved by the Project Manager. All calculation equations shall also be verified by the Project Manager and individual calculations will be verified at a minimum frequency of 30 percent by the PQAC. Any

field information entered into data systems will be subject to the Roux Associates' QA/QC procedures (Appendix A).

### 8.1.2 Laboratory Data Reduction

The off-site laboratory will perform in-house analytical data reduction and validation under the direction of the Laboratory QA Officer. The Laboratory QA Officer is responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other notations which would caution the data user of possible unreliability. Data reduction, validation, and reporting by the laboratory will be conducted as follows:

- raw data produced by the analyst is turned over to the respective area supervisor;
- the area supervisor reviews the data for attainment of QC criteria as outlined in CLP protocols and/or established USEPA methods and for overall reasonableness;
- upon acceptance of the raw data by the area supervisor, a computerized report is generated and sent to the Laboratory QA Officer;
- the Laboratory QA Officer will complete a thorough audit of reports at a frequency of one in ten, and an audit of every report for consistency;
- the Laboratory QA Officer and area supervisors will decide whether any sample re-analysis is required; and
- upon acceptance of the preliminary reports by the Laboratory QA Officer, final reports will be generated and signed by the Laboratory Project Manager. The laboratory package shall be presented in the same order in which the samples were analyzed.

Data reduction reporting procedures will be those specified in the ASP/CLP SOW for inorganic and organic analyses.

Laboratories will prepare and retain full analytical and QC documentation the same as (ASP/CLP analyses) or similar to that (non-ASP/CLP analyses) required by the Contact Laboratory Program.

The laboratory will report the data in chronological order along with all pertinent QC data. Laboratories will provide the following information to the prime contractor in each analytical data package submitted.

1. Cover sheets listing the samples included in the report and narrative comments describing problems encountered in analysis.

2. Tabulated results of inorganic and organic compounds identified and quantified.

3. Analytical results for QC samples, spikes, sample duplicates, initial and continuing calibration verification standards and blanks, standard procedural (method) blanks, laboratory control samples, and Inductively Coupled Plasma (ICP) interference check samples.

4. Tabulation of instrument detection limits determined in pure water.

5. Raw data system printouts (or legible photocopies) identifying: date of analyses, analyst, parameter(s) determined, calibration curve, calibration verifications, method blanks, sample and any dilutions, sample duplicates, spikes and control samples.

6. Sample preparation/extraction/analysis logs including weights, volumes and dilutions.

### 8.2 Field Data Validation

Field data assessment will be accomplished by the efforts of the PQAC and/or Project Manager. The data assessment by the Project Manager or his/her designee will be based on the criteria that the sample was properly collected and handled according to Section 6.0.

### 8.3 Laboratory Data Validation

Validation of laboratory-generated data will be performed by Roux Associates or a Roux Associates' subcontractor, if necessary. The contractor 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. An evaluation of data accuracy, precision, representativeness and completeness, based on criteria in Section 5.0, will be performed and presented in the summary report.

The data reviewer 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 analyses may be made by the Project Manager based on the extent of the deficiencies and their importance in the overall context of the project.

Data validation for laboratory data will be performed in accordance with the above-mentioned documents for evaluating organic analyses and inorganic analyses for all samples analyzed using ASP/CLP methodology. Non-ASP/CLP analysis data will also be validated using the functional guidelines, but use of the guidelines will be modified according to the applicable method and required QA/QC. It is anticipated that all laboratory data will be validated (i.e., complete transcription checks, calculation checks, etc.) by the laboratory.

### 8.4 Data Reporting

All data generated for the site will be computerized in a database format organized to facilitate data review and evaluation. The computerized data set will include the data flags provided in accordance with the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses and Inorganic Analyses, as well as additional comments of the data reviewer for ASP/CLP analyses. For non-ASP/CLP analysis, the data will include appropriate flags based on the data validation functional guidelines. The data flags will include such items as: 1) concentration below required detection limit, 2) estimated concentration due to poor recovery below required detection limit, 3) estimated concentration due to poor spike recovery, and 4) concentration of chemical also found in laboratory blank. Selected data reviewer comments will also become part of the database in order to indicate whether the data are usable as a quantitative concentration, usable with caution as an estimated concentration, or unusable due to out-of-control QC results.

The site data set(s) will be available for controlled access by the Project Manager, and authorized personnel. The complete data set(s) will be incorporated into the report.

## 9.0 PERFORMANCE AND SYSTEM AUDITS

This section provides the types, frequencies and content of the various audits and audit functions to be applied to this project. Audits for the work generally consist of four types: management audits, data quality audits, technical systems audits and performance audits. These audits may be internal (performed by the same agency/organization generating the information) or external (performed by an outside agency/organization). The purpose of these audits is to establish and verify that the sampling and analysis activities are performed in accordance with the SAP.

Project audits are intended to provide information regarding:

- on-going assessment of the data quality;
- identification of areas with a need for improvement;
- verification of QA program implementation;
- assessment of applied resources to complete the assigned tasks; and
- address changes and/or variances to procedures necessitated by the actual field or laboratory conditions.

Roux Associates is dedicated to confirmation of the specific and overall QA/QC objectives for this project through the use of management, performance and systems audits. The specific content and frequency of audits anticipated for this project are delineated below.

### 9.1 Management Audits

Management audits will be performed by Roux Associates' personnel to determine whether the management functions and responsibilities related to environmental measurements are performed in accordance with Roux Associates' QA procedures. Management audits will include a review of the SAP implementation for this project in order to evaluate:

- the level of management support;
- the field and analytical tracking systems;
- the procedures for developing the project DQOs;
- the procedures for developing, approving and reviewing the SAP;

- the procedures for developing and approving SOPs; and
- the procedures and schedules for conducting audits.

Management audits are an on-going function of the Roux Associates' QA/QC procedures. Project-specific management audits for this project are the responsibility of the Project Manager and will be implemented as required for each management function. The Project Manager will review the management program and the other audit functions on a routine basis.

### 9.2 Data Quality Audits

Data quality audits will be performed by Roux Associates or Roux Associates' contractor personnel to determine whether data derived as part of the work are of known quality. Data quality audits may be supported by the data validation effort to determine whether or not sufficient information exists with the data set to support an assessment of data quality. Through the use of data validation and authentication (if applicable), information provided by Roux Associates and its contractors will be used to audit and evaluate:

- if a data set, or all the data sets of a particular project, met the DQOs;
- if the contractor collecting or reducing the data performed their own data quality assessment; and
- if the contractor identified deficiencies (if they existed) and corrected the cause(s), both technical and managerial.

For data generated by laboratories and contractors other than Roux Associates, all data will be verified through the data validation and authentication (if applicable) programs as described in Section 8.0. Hardcopy data from the laboratories and/or contractors will be checked for completeness and accuracy of data reduction at the level and frequency specified in this section. For data validation performed by Roux Associates' subcontractors, key data may be subject to additional Roux Associates validation based on its importance in decision making for the project.

All data quality functions will be subject to Roux Associates oversight to verify the accuracy and completeness of the data reduction and validation efforts. Data quality is the responsibility of the PQAC and will be implemented as required for each type of data generating activity. At a minimum, the PQAC will review the data validation effort, perform spot checks on the quality of the data validation effort, and document his/her findings.

### 9.3 Technical Systems Audits

Technical systems audits will be performed to determine if the field and laboratory sampling and analytical systems specified in the SAP are sufficient to generate data which will meet the stated DQOs. These audits will include the on-site examination of field and laboratory activities for quality and conformance to the SAP. Both internal (performed by the same agency/organization generating the information) or external (performed by an outside agency/organization) audits will be performed for both the field and laboratory systems.

#### 9.3.1 Field Audits - Internal

The internal field audits will include examination and review of field sampling records, field instrument operating records, sample collection, handling, packaging and shipping procedures, maintenance of QA procedures, chain of custody, etc. to determine conformity to the SAP. Internal audits of field activities (sampling and measurements) will be conducted by the Roux Associates PQAC and/or Project Manager. Should any deficiencies be discovered during the course of the audit, the PQAC will have the authority to take any necessary action, including implementing a "stop work" order, to correct the deficiency.

These internal field audits will occur at the onset of the project to verify that all established procedures are followed. Follow-up audits to correct deficiencies, and to verify that QA procedures are maintained throughout the investigation, will be conducted on a routine basis. The specific contents of these audits will be based on Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) guidelines.

#### 9.3.2 Field Audits - External

At this time it is not anticipated that external audits of the field activities will be necessary. However, if the internal audits determine that deficiencies exist which require an outside organization or agent to resolve the problem(s), Roux Associates will employ the services of an outside subcontractor to audit the field activities and make/suggest corrections to the problem.

### 9.3.3 Laboratory Audits - Internal

The internal laboratory system audits will be performed by the Laboratory QA Officer on at least an annual basis (at a minimum) and will 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. as described in the laboratory QA plan (if applicable) or according to the guidelines set forth in the CLP Bid Package documentation regarding laboratory QA requirements.

### 9.3.4 Laboratory Audits - External

For this project it is anticipated that only laboratories currently meeting the criteria set forth for the ASP/CLP will be used for off-site sample analyses. These laboratories will have already been subject to a laboratory audit by NYSDEC/USEPA personnel and it is not anticipated that an additional audit by Roux Associates or Roux Associates' subcontractor personnel will be required. However, should any laboratory be selected which has not been audited by the ASP/CLP, or an equivalent audit (state or other federal agency) in the last 12 months, Roux Associates or its contractor personnel will perform a laboratory audit using the guidelines set forth in the ASP/CLP Bid Package documentation prior to that laboratory performing any field sample analyses.

## 9.4 Performance Evaluation Audits

The internal performance audits of the laboratory(ies) will be conducted by the Laboratory QA Officer. The performance audits will be conducted on at least a quarterly basis. Blind QC samples will be prepared and submitted along with project samples to the laboratory for analysis throughout the project. The Laboratory QA Officer will evaluate the analytical results of these blind performance samples to ensure the laboratories maintain a good performance.

External performance audits of the laboratories selected for the project will have already been performed by the NYSDEC/CLP for some or all of the analytes being tested. These performance evaluation audits may be supplemented by the use of field-generated blind QC samples (replicates) submitted by Roux Associates.

Internal performance evaluation audits of the field measurements performed by Roux Associates' personnel may be utilized if suitable reference solutions are available for the specific project activities. These types of checks could include analysis of "blind" calibration span gases for PID measurements.

For laboratory checks, tolerance limits for the performance evaluation samples will be based on the accepted values supplied with the check sample/standard. For the field checks, the tolerance limits will also be based on the accepted values supplied with the check sample/standard, but may be modified as necessary to take into account the less quantitative (screening) nature of the field analytical measurements.

## 10.0 CORRECTIVE ACTIONS

Corrective action generally addresses the need to bring data generating systems back into conformance after some trigger or other criteria have shown the system to be out of conformance. The following paragraphs describe the mechanics of how corrective action will be managed and implemented during the course of this project.

Corrective actions may be required for two classes of problems: analytical and equipment functional problems, and noncompliance problems. Analytical and equipment functional problems may occur during sampling and sample handling, sample preparation, laboratory instrumental analysis, and data review. The need for laboratory analysis corrective actions is based on predetermined limits for acceptability (Section 5.0). By conducting system and performance audits, the Laboratory QA Officer will determine if the overall data generating systems are acceptable.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the PQAC and/or Project Manager. If the problem is analytical in nature, information on these problems will be promptly communicated to the Laboratory QA Officer and method specific corrective actions will be implemented.

### 10.1 Field Corrective Action

Corrective actions will be implemented by field personnel and documented in the field record book. No staff member will initiate corrective action without notification through the proper channels. If corrective actions are insufficient, a stop-work order may be issued by the Project Manager.

Technical staff and project personnel will be responsible for reporting all suspected technical or QA nonconformance, or suspected deficiencies of any activity (or issued document) by reporting the situation to the Project Manager or his/her designee. The Project Manager will be responsible for assessing the suspected problems in consultation with the PQAC, and for making decisions 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 and/or requires corrective action, then a nonconformance report will be initiated by the field personnel and submitted to the Project Manager for review.

The Project 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; and
- ensuring nonconformance reports are included in the site documentation project files.

If appropriate, the Project Manager will ensure that no additional work which is dependent on the nonconforming activity be performed until the corrective actions are completed.

Corrective action for field measurements may include the following:

- repeat the measurement to check the error;
- check for all proper adjustments for ambient conditions such as temperature;
- check the batteries;
- recalibration;
- check the calibration;
- replace the instrument or measurement devices; and
- stop work (if necessary).

The Project Manager or his/her designee is ultimately responsible for all site activities. In this role, the Project Manager at times is required to adjust the site programs to accommodate the site program specific needs. The change in the program will be documented on the Field Change Request form (Appendix B) that will be signed by the initiators and the Project Manager or his/her designee. The Field Change Request shall be attached to the file copy of the affected document. The Project Manager and the PQAC must approve the change in writing or verbally prior to the 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 appropriate action will be taken by the Project Manager to document the significance of the problem.

The Project Manager is responsible for the controlling, tracking, and implementation of the identified changes. Reports on all changes will be distributed to all affected parties.

### 10.2 Laboratory Corrective Action

Corrective action is required whenever an out-of-control event or potential out-of-control event is noted. The corrective action taken will be somewhat dependent on the analysis and the event. These actions are to be implemented in accordance with the laboratory QA plan and the ASP/CLP SOWs, as appropriate and applicable.

## 11.0 FIELD INVESTIGATION PROCEDURES

This section describes the methods to be utilized during implementation of each field task described in Section 2.0. These tasks include the following:

- Task I: Notification to the NYSDEC;
- Task II: Soil Boring and Sampling;
- Task III: Soil Remediation
- Task IV: Post-Excavation Soil Sampling;
- Task V: Waste Characterization Sampling;
- Task VI: Reuse and/or Disposal Options; and
- Task VII: Report Preparation.

The balance of this section is organized by task and provides descriptions of the methods to be utilized in the performance of each task.

### 11.1 Task I: Notification to the NYSDEC

The NYSDEC Region 2 will be notified prior to commencing soil sampling activities. Written notification will be provided which will include a schedule, the number of proposed samples, and the proposed locations of the samples presented on a map.

### 11.2 Task II: Soil Boring and Sampling

As stated above, proposed soil boring locations will be provided to the NYSDEC prior to sampling; however actual sampling locations will be dependent on field conditions. Soil boring, drilling, and sampling procedures to be used are provided in Appendix A. A general discussion concerning the collection of soil borings at the Yard is provided below.

Because this SAP is designed to support construction and track maintenance activities and is not part of a remedial investigation, baseline sampling will be conducted only in the zone of construction and track maintenance (i.e., no sampling down to the water table on a routine basis). Amtrak and New Jersey Transit are aware that future remedial investigation/feasibility study activities at OU-4 may necessitate additional sampling and analysis.

Safety concerns related to the abundance of unmarked and unmapped underground utility lines and cables warrant that the interval 0 to 3 feet for all soil borings be advanced by hand. Soil samples in the affected intervals will be collected by placing the excavated soil on plastic sheeting, homogenizing it, and collecting a representative sample from the interval. The sampling will be performed as follows.

- At all boring locations, soil characterization samples will be collected from consecutive 1-foot intervals below ballast and each successive sample will be analyzed until the concentrations of the constituent(s) of concern are detected at less than the site-specific cleanup levels (i.e., if 0 to 1 foot below ballast is clean, the 1 to 2 foot sample will not be analyzed).

- Soil borings will be completed at 200-foot intervals along the tracks, trenches, etc.

- The soil samples will be visually inspected and a log describing the geologic conditions will be developed. The soil samples will be screened in the field for any evidence of contamination (i.e., staining, presence of petroleum or odors), and also will be screened for volatile organic compounds by using a portable PID.

- Any non-representative material (i.e., cinders, pieces of railroad ties, asphalt), when observed, will not be placed in the sample container.

- Any soil samples selected for laboratory analyses will be placed on ice and protected from light immediately after collection and until delivery to the laboratory.

When augering with a drill rig, soil samples will be collected from depths greater than three feet below land surface (bls) using a split spoon sampler.

All laboratory analyses will be performed by I.E.A., Inc. of Monroe, Connecticut following the NYSDEC Analytical Services Protocols (ASP). Data validation of the analytical results may be performed. A general discussion describing the collection of soil borings under the proposed activities is provided below.

Soil samples will be collected from three 1-foot depth intervals beginning at the bottom of the ballast. As stated above, if the concentrations of the constituents of concern (i.e., CPAHs, PCBs, lead) in the shallowest sample are below the site-specific cleanup levels, no further analysis will be performed. If the concentration of any of the constituents of concern exceeds the site-specific cleanup levels in the shallowest sample, then additional analysis from the next 1-foot interval will be performed, only for the constituent(s) which exceeded the cleanup levels in the shallower interval, to define the vertical extent of contamination. This sampling and analysis will continue (through the water table if necessary) until the soil sample results indicate that the concentrations of the constituents of concern detected in the shallower intervals are below the respective cleanup levels.

To determine the horizontal and vertical extent of contamination within the track bed, soil samples will be collected on either side (i.e., tracks, trenches, etc. are linear) of the contaminated sample at a minimum of ten-foot intervals, or as Site conditions warrant. The same sampling program (i.e., one-foot depth intervals beginning at the bottom of ballast) listed above will be performed at these locations until the constituents of concern are below the respective cleanup levels.

### 11.3 Task III: Soil Remediation

If the site-specific cleanup levels are exceeded, excavation of the contaminated soil will be performed until the site-specific cleanup levels are met. The procedures for excavation activities for soil are discussed below.

Where practical, the contaminated soil will be excavated to the depths and horizontal extent based on the location where the analytical results indicated that site-specific cleanup levels are met. Based on space and schedule constraints it may be necessary to excavate the soil before delineation occurs; therefore, excavation activities may proceed to an area which appears clean based on professional judgment, or to the next sample location meeting the site-specific cleanup level. Post-excavation samples will be collected as necessary using the procedures described in Section 11.4.

When contaminated soil above the site-specific cleanup level is continuous from the bottom of ballast to below the water table, the remediation will be addressed on a case-by-case basis, and a separate remediation plan, including post-excavation verification, will be submitted to the NYSDEC.

### 11.4 Task IV: Post-Excavation Soil Samples

Post-excavation samples will be collected, as necessary, to confirm that soil remaining after excavation from above the water table excavations meet the site-specific cleanup levels. The procedures for post-excavation sampling based on both additional delineation and professional judgment scenarios are presented below.

#### 11.4.1 Post Excavation Sampling Following Remediation Based on Delineation

Because the floor and two sides of the excavation (i.e., short sides) are to be completed to locations where the site-specific cleanup levels are met, no post-excavation soil samples will be required from these locations. Post-excavation sidewall samples will be collected and analyzed from the long sides to determine if contamination above the cleanup levels extends laterally beyond the confines of the excavation.

Post-excavation sidewall samples will be collected at a frequency of one composite sample per 100 linear feet. Four grab samples will be collected from 0 to six inches below the exposed surface and combined to form one composite sample for that 100-foot section (i.e., approximately

one every 25 feet) of sidewall. This procedure will be performed on each long sidewall. These samples will be analyzed only for the constituent(s) previously determined to exceed the site-specific cleanup levels.

**11.4.2 Post-Excavation Sampling Following Remediation Based on Professional Judgment**

Depending on the situation, remediation may have been based on partial or no additional delineation. Sections of the excavation that were remediated based on additional delineation will not require post-excavation sampling; however, the remainder of the excavation will. Excavations based entirely on professional judgment will require sidewall (all four sides) and bottom post-excavation sampling.

Post-excavation sidewall samples on the long walls will be collected and analyzed as discussed in Section 11.4.1. One sidewall grab sample only (i.e., no composites) will be collected from each short wall and analyzed for only the constituent(s) of concern previously determined to be above the site-specific cleanup level.

Post-excavation floor samples will be collected at the frequency of one composite sample per 3,000 square feet of excavation. Four grab samples will be collected from 0 to 6 inches below the exposed surface and combined to form each composite sample to be analyzed for only the constituent(s) of concern previously determined to be above the site-specific cleanup level.

If analytical results indicate that contamination still exists above the water table, additional excavation and post-excavation sampling will be performed until the site-specific constituents of concern cleanup levels are met or it is impractical or unsafe to continue the excavation. The NYSDEC will be notified of any situation where contamination was left in place.

If analytical results indicate that contamination exists laterally into adjacent track areas, the NYSDEC will be notified and remedial efforts will be initiated at a time when track maintenance or modifications permit it to occur.

### 11.5 Waste Characterization Sampling

Waste characterization samples may be collected if previous analytical results, or generator's knowledge, are not adequate to determine disposal options. The parameters for which sampling may be required will be determined based on the potential disposal options for soil which exceed the site-specific cleanup levels.

In accordance with the toxicity characteristic (TC) rule, composite soil samples will be extracted using USEPA Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP]). The extract will be analyzed using the following SW-846 methods:

- Semivolatile Organic Compounds - USEPA Method 8270;
- Pesticides - USEPA Method 8081/8150; and
- Resource Conservation and Recovery Act (RCRA) metals - USEPA Methods 6010/7471.

For disposal characterization, waste will be sampled for ignitability, and reactivity. Toxicity characteristics will only be analyzed using TCLP when total analyses are not available, or where the total analyses calculations exceed the regulatory levels.

#### Sampling Procedures

Sampling will be performed in accordance with the appropriate federal, state, and New York City regulations and guidance, as well as Roux Associates' SOPs presented in Appendix A. These procedures are summarized below.

#### Stockpiled Soil

Representative samples will be collected and analyzed from each stockpile created. The number and type of soil samples to be taken and analyzed for each excavated soil stockpile will be determined based on the volume of the stockpile and in accordance with the "Recommended Number of Soil Pile Samples" table in the NYSDEC Spill Technology and Remediation Series (STARS Memo #1) Petroleum Contaminated Soil Guidance Policy. Based on this guidance and additional guidance documents, one composite sample will be collected and analyzed for each 300 cubic yards of soil in the stockpile. Once the volume of each stockpile is determined, a sample

grid will be developed that divides the stockpile into blocks with equal surface area. The maximum number of grid blocks will equal the required number of composite samples for analysis. Each composite sample will consist of five distinct sample locations. Depth of the grab samples will vary to ensure that soil from the top, middle, and bottom of the stockpile will be collected and analyzed.

Soil from individual sample points comprising each composite will be mixed together in the field using large plastic or stainless steel mixing bowls. Large soil aggregates will be manually broken up using hand pressure, plastic trowels or stainless steel trowels. Soil aggregates which cannot be reduced to less than one centimeter in diameter using these methods will be excluded from the composite. Once the soil aggregates have been reduced in size, the soil will be co-mingled for approximately five minutes, or for a sufficient time to make the composite mixture as homogeneous as feasible. Samples for analysis will then be collected from the composite for packaging and shipment to the off-site laboratory. Samples shall be labeled using the SP identifier associated with the grid point used to establish the location for the individual sampling points comprising the composite.

### 11.6 Task VI: Reuse and/or Disposal Options

Waste generated during excavation and sampling tasks will be stored within a designated area of the Yard. Disposal and reuse options will be developed based on the waste classifications, site space limitations, and the construction schedule. The handling of all waste will conform to the health and safety requirements specified in the HASP.

#### 11.6.1 Disposal Options

Disposal options include off-site disposal of stockpiled soil to either a permitted construction and demolition (C&D) landfill, a permitted municipal landfill or a permitted hazardous waste treatment, storage and disposal facility (TSDF).

**Construction and Demolition Debris**

If the waste is uncontaminated (status due to its known origin and composition) it qualifies as C&D debris and may be disposed in a C&D landfill. More detail on the definition of C&D debris is provided in the NYSDEC Division of Solid Waste Technical and Administrative Guidance Memorandum (TAGM): Construction and Demolition Debris.

**Land Disposal Restrictions**

Land Disposal Restrictions (LDRs) apply only to RCRA waste (i.e., characteristic or listed waste). Waste that is not RCRA hazardous is not subject to LDR requirements. If the waste is RCRA hazardous, the steps below will be followed:

- determine the hazardous waste codes that apply;
- determine the LDR treatment standards for the applicable waste codes; and
- determine if the waste meets the treatment standards (if met, waste may be land disposed without treatment; if not met, waste must be treated).

LDRs impose restrictions on activities that involve placing untreated wastes in or on land when treatment or immobilization alternatives exist.

Until alternative treatment standards for hazardous soil are promulgated as part of the Hazardous Waste Identification Rule (57FR 21450 - 21522), contaminated soil will generally qualify for a treatability variance if it cannot be treated to the LDR treatment standards.

If RCRA waste is present, and treatment or disposal are required, the waste will be transported offsite to a permitted TSDF.

The TSDF contracted to accept hazardous materials must possess an EPA identification number, have a Part 373 permit issued pursuant to 6 NYCRR Part 373, a RCRA Part B Permit, or operate under an interim status permit. The TSDF must also possess the following information:

- a copy of the preparedness and prevention program and a contingency plan;
- a personnel training program;

- an approved closure and post-closure plan;
- adequate financial insurance and liability insurance mechanisms for the cost of closure, post-closure care (where applicable), and for third-party compensation in case of accidents and incidents; and
- information addressing any pending criminal actions.

### 11.6.2 Reuse Options

Reuse options for soil removed as part of construction and track maintenance activities, not during remediation, will be determined based on the analytical data, site space requirements, and the construction schedule.

Excavated soil with soil concentrations below site-specific cleanup levels may be reused as backfill for the same excavation, or excavations containing similar contaminants at the site provided that the waste are nonhazardous. To verify that the soil to be used is nonhazardous, five percent of the samples collected, where total analysis of lead exceeds 100 mg/kg, will be analyzed using TCLP (for lead only).

Based on space requirements, off-site disposal of excavated soil may be required. The NYSDEC should be contacted to receive approval to provide the nonhazardous soil to a landfill for use as daily cover.

**Segregation of Recyclable Materials**

Where possible, materials which can be recycled (e.g., metal, plastic, glass, etc.) should be separated from C&D debris prior to shipping offsite. These recyclables may be stored onsite for up to 60 days.

## 11.7. Task VII: Report Preparation

Upon completion of the field investigation and remedial activities, Roux Associates will submit a report which presents the characterization and post-excavation sampling results.

# TABLES

**Table 1. Project Quality Control Summary**

| Parameter | Media | Quantitation Limit[a] | Estimated Accuracy | Estimated Precision[b] | Completeness | Analysis Method |
|---|---|---|---|---|---|---|
| Polycyclic Aromatic Hydrocarbons | Soil | 330 to 1,600 µg/kg | 20 - 150% | 50 RPD | 95% | ASP 95-2[c] |
| Polychlorinated Biphenyls | Soil | 8.0 to 160 µg/kg | 20 to 150% | 50 RPD | 95% | ASP-95-3[c] |
| Lead | Soil | 0.2 to 1,000 mg/kg | 75 - 125% | 35 RPD | 95% | ILM04.0[d] |
| Toxicity Characteristics | | | | | | |
| – Pesticides | Soil | 1.1 to 5.7 µg/kg | 86-111% | 35 RPD | 90% | 1311/8081/8150 |
| – Semivolatile Organic Compounds | Soil | 330 µg/kg | 20-150% | 50 RPD | 90% | 1311/8270[e] |
| – RCRA metals | Soil | 0.1 - 1,000 mg/kg | 75-125% | 35 RPD | 90% | 1311/6010/7471[e] |
| Ignitability | Soil | NA | NA | NA | 90% | 1010/1011[e] |
| Reactivity | Soil | NA | NA | NA | 90% | 9010/9030[e] |

µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram

RPD - relative percent difference
NA - Not applicable

a. Quantitation limits are based on Contract Laboratory Program (CLP) Statement of Work requirements (where applicable), or on method references. Limits for soil are based on nominal wet weight of the sample. Dry weight limits will be higher.
b. Actual limits for matrix spikes, system monitoring compounds, and laboratory control samples are provided in the CLP Statement of Work or cited method.
c. Analytical Services Protocols
d. CLP Statement of Work
e. Test Methods for the Evaluation of Solid Wastes

| Table 2. Field Quality Control Sample Frequency | | | |
|---|---|---|---|
| **Parameters** | **Media** | **Field Duplicates[a]** | **MS/MSD/MSB[b]** |
| Polycyclic Aromatic Hydrocarbons | Soil | 1/20 | 1/20 |
| Polychlorinated Biphenyls | Soil | 1/20 | 1/20 |
| Lead | Soil | 1/20 | 1/20 |
| Toxicity Characteristics | | | |
| – Semivolatile Organic Compounds | Soil | NA | NA |
| – Pesticides | Soil | NA | NA |
| – RCRA Metals | Soil | NA | NA |
| Ignitability | Soil | 1/20 | NA |
| Reactivity | Soil | 1/20 | NA |

NA - Not applicable
MS/MSD/MSB - Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank

a. Where applicable, one per twenty of fewer field samples, or one per day, whichever is most frequent.
b. Where applicable, one per twenty or fewer field samples.

**Table 3. Laboratory Quality Control Sample Frequency**

| Parameter | Media | Method Blank[a] | MS/MSD[a] | Laboratory Replicate[a] | Analysis Method |
|---|---|---|---|---|---|
| Polycyclic Aromatic Hydrocarbons | Soil | 1/20 | 1/20 | NA | ASP 95-2[b] |
| Polychlorinated Biphenyls | Soil | 1/20 | 1/20 | NA | ASP 95-3[b] |
| Lead | Soil | 1/20 | 1/20 | 1/20 | ILM04.0[c] |
| Toxicity Characteristics | | | | | |
| – Semivolatile Organic Compounds | Soil | 1/20 | 1/20 | NA | 1311/8270[d] |
| – Pesticides | Soil | 1/20 | 1/20 | NA | 1311/8081/8150[d] |
| – RCRA metals | Soil | 1/20 | 1/20 | 1/20 | 1311/6010/7471[d] |
| Ignitability | Soil | NA | NA | 1/20 | 1010/1011[d] |
| Reactivity | Soil | NA | NA | 1/20 | 9010/9030[d] |

NA - Not applicable

a. Matrix Spike/Matric Spike Duplicate/Matrix Spike Blank - where applicable, one per twenty or fewer field samples, or one per analytical batch, whichever is more frequent
b. Analytical Services Protocol
c. Contract Laboratory Program Statement of Work
d. Test Methods for the Evaluation of Solid Wastes

| Table 4. Field Equipment Calibration Requirements and Maintenance Schedule | | |
|---|---|---|
| **Equipment Type** | **Calibration Requirements** | **Maintenance Schedule** |
| PID | Manufacturer's Directions | Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories. |
| Personal Protective Equipment | Not Applicable | Integrity/function test prior to donning equipment. Visual inspection for defects/leakage for all reusable gear. |
| Magnetometer | Manufacturer's Directions | Replace batteries as necessary. |
| Surveying Instruments | Attachment A-1 | Regularly clean instrument lenses. |

| Table 5. Preservation, Holding Times and Sample Containers | | | |
|---|---|---|---|
| **Parameter** | **Preservation** | **Holding Time[a]** | **Containers** |
| Soil SVOCs (PAHs) | 4°C until extraction and analysis | 14 days until extraction<br>40 days until analysis | 4 oz jar w/teflon lined lid |
| Soil Metals (Lead) | 4°C until analysis | 180 days | 8 oz jar w/teflon lined lid (included above) |
| Soil PCBs/Pest | 4°C until extraction and analysis | 10days until extraction[b]<br>40 days until analysis | 100 grams jar w/teflon lined lid |

a. From collection until analysis unless otherwise specified.
b. 14 days from field to TCLP extraction/7 days from TCLP extraction to preparative extraction/40 days to analysis
c. 180 days from field to TCLP extraction/180 days from extraction to analysis

NA - Not applicable
SVOCs - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls

# APPENDICES

# APPENDIX A

# APPENDIX A

Roux Associates'
Standard Operating Procedures

Date: May 15, 1990

Revision Number: 0

Corporate QA/QC Manager: Michael A. DeCillis

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## 1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for surveying distances and elevations. This SOP applies to the following automatic level instruments: Wild-Heerbrugg models NA-1, NA-20, NA-24, and NA-28; and Lietz model C40.

## 2.0 CONSIDERATIONS

### 2.1 Personnel

Two people are required to conduct land surveying activities. The instrument person is responsible for collecting measurements with the automatic level. The leveling staff person is responsible for holding the leveling staff at given locations.

### 2.2 Equipment

The basic equipment required for surveying includes a tripod, an automatic level and a leveling staff (or rod). The leveling staffs and the tripods may vary slightly from office to office, but no discussion is warranted. The automatic levels are all quite similar in construction and operation. The primary differences are in the telescope, compensator setting, and leveling accuracy which are described in the technical data sections of the respective operator's manuals. Certain features such as the optical sight, pentaprism for viewing the circular bubble, and coarse/fine focusing vary between models, and in some cases these features are absent.

A composite description of automatic level features is provided in Exhibit A. The individual features are identified and briefly described. Those who are unfamiliar with the automatic level must seek instruction and practice with the instrument and the operator's manual prior to entering the field.

### 2.3 Equipment Assembly and Set Up

Tripod

The tripod is set up by fully extending each leg and locking the legs in place with the clamp screws. The legs are spread out until the tripod head is roughly at chin level and the leg tips form an equilateral triangle. While confirming that the tripod head is approximately level, push the legs into the ground by stepping on

the tripod points. If the tripod is to be set up on smooth surfaces, then care must be taken to make sure the legs do not shift at all during measurements. In paved areas, putting the tripod points in cracks, grooves, or small holes helps to secure the legs. If the instrument is set up on asphalt in hot weather, then blocks or "shoes" must be placed under the tripod points to prevent it from sinking into the soft surface.

Automatic Level

Place the automatic level on the tripod head and anchor it using the centering screw. The base of the automatic level should be approximately centered within the tripod head. The instrument is leveled by adjustment of the three footscrews located between the instrument and the base plate. The adjustment is continued until the circular bubble is centered. Rotate the instrument 90° without disturbing the tripod, and ensure that the circular bubble is still centered. At this point, the instrument is set up to collect measurements.

Leveling Staff

The leveling staff is usually in three sections, each four or five feet in length. The leveling staff is extended to the desired length and carefully secured to prevent slipping of the sections. The leveling staffs which Roux Associates, Inc. (Roux Associates) uses are engineer's scale and graduated in 0.01 foot increments. The leveling staff is held at the desired location and a staff level (bubble) is used to confirm that the leveling staff is perfectly vertical. A turning plate should be used at turning point locations in grass, soft dirt, or bumpy areas. When on smooth hard surfaces, it is sometimes more suitable to use an "X" marked with chalk or crayon on a suitable location.

## 2.4 Elevations

When surveying to collect elevation data, a benchmark is required. The benchmark may be a known elevation (e.g., United States Geological Survey [USGS]) or an arbitrary elevation (e.g., assign 100.000 at a permanent location). Once the benchmark elevation has been established, the height of the properly leveled instrument is determined from a backsight. A backsight is taken from the instrument to the leveling staff at a point of known elevation (e.g., benchmark). The backsight reading added to the known elevation of the benchmark is the height of the instrument. When collecting elevation data, the leveling staff reading is always at the intersection of the vertical cross hair and the middle horizontal cross hair. The upper and lower horizontal cross hairs are for distance determination. Once the instrument height has been established, the leveling staff is moved to a location where the actual elevation will be determined. The

automatic level is aligned with the new location, but is never releveled between a backsight and a foresight. A foresight is taken from the instrument to the leveling staff at a point where the elevation is to be determined (e.g., a monitoring well). The elevation of the new location (e.g., a monitoring well, turning point, etc.) is determined by subtracting the foresight reading from the height of the instrument. After collecting a foresight reading, the instrument person moves to a new location, levels the instrument, and collects a backsight reading. The leveling staff person remains at the location of known elevation. When the new backsight reading is collected, the height of the instrument is established and the leveling staff person moves to a new location. By repeating this procedure in a "leap-frog" manner, a "loop" is completed through all locations where elevations are desired and terminated with a foresight to the original benchmark for closure.

In order to determine the closure accuracy, the sum of all the backsights is subtracted from the sum of all the foresights. If the absolute difference is less than 0.02 foot, then the survey loop is considered accurate for determining the measuring points for monitoring wells. If the difference is greater than 0.10 foot and the calculations are correct, the survey loop must be repeated. If the difference is between 0.02 and 0.10 foot, then the project manager must determine if the accuracy is sufficient based on factors such as data needs, hydraulic gradient, topography, etc.

Items which can help ensure closure accuracy are discussed below. The length of any foresight or backsight must not exceed 100 feet. The length of the backsight and foresight for a given pair of readings must be approximately equal. By doing this, any minor internal adjustment problems are naturally eliminated. The instrument and the leveling staff must be carefully leveled and any instrument movement eliminated. If the leveling staff is not perfectly vertical, then a larger reading will result. On windy days, it is advisable to only extend the leveling staff as necessary. Both the instrument person and the leveling staff person must pay due attention to soft ground, grass, etc. and utilize "shoes" or turning plates where appropriate. Care must be taken during each reading to ensure that the middle horizontal cross hair is used. Errors from misreading the cross hairs are often made when the instrument is set too high or too low for the instrument person's natural line of sight. To eliminate reading errors, it is suggested that the reading be taken, written in the field notebook, and then confirmed with a second reading.

## 2.5 Distances

Horizontal distances can be easily measured with an automatic level. It is especially useful for measurements across busy roads, rivers, wetlands, hilly terrain, etc. However, if the distances are short and unobstructed it is often easier to use a 100-foot cloth tape measure.

The instrument person sets up and levels the instrument at point A. The leveling staff person places the leveling staff at point B. The top cross hair reading is subtracted from the bottom cross hair reading. The difference multiplied by 100 is the horizontal distance from point A to point B.

## 3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines surveying requirements.

b. Field notebook, field surveying forms, maps, benchmark information.

c. Automatic level in carrying case.

d. Leveling staff.

e. Staff level (bubble).

f. Tripod.

g. Turning plate.

h. Lumber crayon or chalk.

i. Feet (or small pieces of wood to be placed beneath tripod legs when set up on asphalt in hot weather, etc.).

j. Flogging tape and spray paint.

k. Machete.

l. Pocket transit.

## 4.0 CALIBRATION

The automatic levels which Roux Associates owns are high quality instruments which hold their adjustment extremely well. Calibration, therefore, is not necessary for field personnel. It is advisable, however, to check the circular bubble and horizontal line-of-sight occasionally (i.e., quarterly). The procedures are easy and can be found in the operator's manual.

## 5.0 PROCEDURES

5.1 The instrument person sets up the tripod at the first station (ST-1). DO NOT set up the stations any further than 100 feet from the benchmark or turning points because, to do otherwise, would compromise the accuracy of the measurements. The instrument is now ready to be leveled.

5.2 The instrument is leveled by adjustment of the three footscrews between the instrument and the instrument base plate. The adjustment is continued until the level bubble is centered. Once this has been done, the instrument is not releveled until it is set up at a new station. An exception to this is if the tripod is moved (kicked, etc.) or for some other reason the instrument is no longer level (i.e., tripod legs sink in asphalt), in which case the instrument must be releveled. DO NOT relevel the instrument between backsights and foresights.

5.3 The instrument, once leveled, is turned by use of the horizontal drive screw to come into line to sight the leveling staff at the benchmark. The instrument is adjusted until the leveling staff numbering and points are in sharp focus. The cross hairs of the instrument are focused by use of the knob on the eyepiece (if present).

5.4 The button below the eyepiece (if present) is pushed as a final check to ensure that the automatic internal compensator has brought the line of sight to horizontal. Now record the number that is read at the intersection of the vertical and middle horizontal cross hairs that extend across the entire field of view. This number is recorded in the field notebook to the nearest 0.001 foot. This establishes the height of the instrument.

5.5 The leveling staff person picks up their equipment and moves past the instrument station to the next turning point. A turning plate should be used to turn in grass or dirt areas. When on pavement, it is sometimes more suitable to use an X marked on a suitable area of the pavement. The intersection of the two lines is used as the point and the lines are used to line up the staff or rod, placing the line in the middle of each face or edge of the rods.

5.6 The instrument is not moved other than to rotate the instrument by use of the horizontal drive screw to sight the new location of the leveling staff and focusing of the instrument. The instrument is NOT releveled by use of the foot screws between backsights and foresights. Once the instrument has been focused on the staff at the new location, the compensator button is pushed (if present) and the leveling staff reading is recorded. This reading is a foresight that establishes the elevation at the turning point and is recorded in the foresight column.

5.7 The instrument is moved past the turning point and the procedures are repeated until the final destination is reached.

5.8 After the final destination has been reached and the foresight establishing its elevation has been recorded, a loop should be closed to the original benchmark to confirm that no errors were made (Exhibit B). This can be done by going back through the same stations and turning points or returning by a separate route. If the same stations and turning points are used, then the leveling staff person should stay on the final destination. The instrument stays at the same general location but is moved enough to require releveling (i.e., move the legs outward or inward several inches). The instrument is then releveled. This will make another turning point in the loop and will ensure that if an error was made in the final foresight reading, the loop to the original benchmark will not close. After the instrument has been releveled, a backsight is recorded and procedures 5.1 to 5.6 are repeated until the leveling staff person reaches the original benchmark and the instrument person performs a foresight to the staff at this location.

5.9 The field notebook should have the same number of backsights and foresights if the leveling was conducted as described above and no side shots were made. (A side shot is a case where two or more foresights are made from the same station and same instrument height. However, because the side shots are not an integral part of the loop as are turning points, an error in the staff reading will not be caught, yet, the loop will still close.) It is therefore recommended that each elevation to be established be treated as a turning point and that side shots not be utilized.

5.10 To check the loop for closure, sum the column of foresights, then sum all the backsights. The difference between these two totals is the closure error. If the closure error is within the tolerance limits set by the project manager, then the leveling is completed and the equipment should be packed up and returned to the office. If the closure error exceeds the tolerance limits set by the project manager, then the loop needs to be redone.

# STANDARD OPERATING PROCEDURE FOR DECONTAMINATION OF FIELD EQUIPMENT

Date: December 21, 1989 Revision Number: 0

Corporate QA/QC Manager: Michael R. DeCillis

## 1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

## 2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinsate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

## 3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

## 4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner, and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

# STANDARD OPERATING PROCEDURE FOR COLLECTION OF SOIL SAMPLES FOR LABORATORY ANALYSIS

Date: May 15, 1990

Revision Number: 0

Corporate QA/QC Manager: Michael R. DeCelis

## 1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

## 2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. Another clean bucket auger should then be used to collect the sample. To collect samples at depths of greater than approximately six feet the use of a drill rig and split spoon samples will usually be necessary. In some situations, sample locations are accessed with the use of a backhoe.

## 3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines soil sampling requirements.

b. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

c. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, plastic sheeting, etc.).

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable sampling gloves.

g. Laboratory-supplied sample containers with labels.

h. Cooler with blue or wet ice.

i. Plastic sheeting.

j. Black pen and indelible marker.

k. Zip-lock bags and packing material.

l. Tape measure.

m. Paper towels or clean rags.

n. Masking and packing tape.

o. Overnight (express) mail forms.

## 4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner.

## 5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the decontamination SOP. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.).

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet and homogenized. Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler at 4°C.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a zip-lock bag to the laboratory. A custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to the following: client name, site location, sample location, sample depth, sample identification, date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the decontamination SOP. Following the final decontamination (after all samples are collected) the sampling equipment is wrapped in aluminum foil. Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

Date: May 15, 1990

Revision Number: 0

Corporate QA/QC Manager: Michael A. de Alles

## 1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

## 2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

### 2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., Teflon™) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE

(e.g., Teflon™). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record

Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an indivudual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

## 3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap", and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.
e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

## 4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

# STANDARD OPERATING PROCEDURE FOR FIELD RECORD KEEPING AND QUALITY ASSURANCE/QUALITY CONTROL

Date: May 15, 1990 Revision Number: 0

Corporate QA/QC Manager: Michael A. DeAlto

## 1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and standards for record keeping and maintenance, for all field activities conducted by Roux Associates, Inc. (Roux Associates).

Strict quality assurance/quality control (QA/QC) is necessary to properly and accurately document and preserve all project-related information. Quality assurance is implemented to corroborate that quality control procedures are followed. Quality control provides a means to monitor investigation activities (e.g., sampling and laboratory performance) as a check on the quality of the data.

Valid data and information are integral to all aspects of Roux Associates' field activities. These aspects include, but are not necessarily limited to, activities that involve: drilling; sediment, sludge, and soil sampling (lithologic, and soil-quality and analysis); well construction and development; aquifer testing and analysis; water-quality sampling and analysis (surface water and ground water); free-product sampling and analysis; air-quality sampling and analysis; geophysical testing; demolition activities; waste removal operations; engineering installations; etc. The data will be confirmed by QA/QC methods established and set forth in the work plan/scope of work. Without checks on the field and analytical procedures, the potential exists for contradictory results, and associated incomplete or incorrect results from the interpretation of potentially questionable data.

Documentation will be entered in the field notebook and must be transcribed with extreme care, in a clear and concise manner, as the information recorded will become part of the permanent legal record. Because field notes are the legal record of site activities, they must be taken in a standard and consistent manner. If abbreviations are used, then they must first be spelled out for clarity (i.e., to avoid ambiguity and misunderstanding). All entries must be dated and initialed, and the time (military time) of the entry included. Field notebooks and forms must be assigned to an individual project and properly identified (i.e., client name, project number, location and name of site, individual recording information, dates, times, etc.). Change of possession of field notebooks or forms must be documented with the date and time, and initialed by both individuals. Following each day's entries, the field notebook or form must be photocopied in the event that the original documentation is lost or stolen. All field notebooks must have the company name and address legibly printed in indelible ink

along with the message "If found, then please forward to Roux Associates, Inc. at the above address - REWARD OFFERED."

Information must be recorded while onsite because it may be difficult to recall details at a later date. Furthermore, information must be documented immediately as it provides unbiased information which will be used for writing the report when the field activities are completed. Project-related documentation is an irreplaceable, important record for other individuals who may become involved in the project, and provides the project manager with a complete history of project-related activities. Written information must be accompanied by maps, sketches, and photographs where appropriate, especially if these supplemental sources of information assist in the documentation process. A new page must be used in the field notebook for each new day's entries (i.e., unused portions of a previous page must have an "X" placed through it). The end of the day's records must be initialed and dated.

As part of record keeping and QA/QC activities, state and federal regulatory agencies should be contacted to check if special or different protocols are required and/or if particular or unconventional methods are required for the given field activity. Thus, the record keeping and QA/QC activities implemented by Roux Associates are based on technically sound standard practices and incorporate Roux Associates own, extensive experience in conducting hydrogeologic field activities.

## 2.0 MATERIALS

In order to track investigation activities, specific materials are required. These materials include the following:

a. A bound, waterproof field notebook.

b. Appropriate Roux Associates' forms (e.g., daily log, geologic log, monitoring well construction log, well sampling data form, location sketch, chain of custody, telephone conversation record, meeting notes, etc.).

c. Appropriate labels (e.g., sample, Roux Associates' Custody Seal, etc.)

d. Work plan/scope of work.

e. Health and safety plan (HASP).

f. Appropriate Roux Associates' SOPs.

g. Black pens, and indelible markers.

h. Camera and film.

## 3.0 DOCUMENTATION

3.1 Before the Roux Associates personnel leave the field, they must ensure that their field notes include comprehensive descriptions of the hydrogeologic conditions, and all investigation-related activities and results (onsite and offsite). This will safeguard against the inability to reconstruct and comprehend all aspects of the field investigation after its completion, and will serve to facilitate the writing of an accurate report. Properly documented information provides the QA/QC tracking (back-up) required for all Roux Associates' projects. General types of information that must be recorded (where pertinent to the investigation being conducted) include, but may not necessarily be limited to, the following:

a. List of Roux Associates personnel onsite.

b. Name, date, and time of arrival onsite by Roux Associates personnel, including temporary departures from, and returns to, the site during the work day.

c. Client and project number.

d. Name and location of study area.

e. Date and time of arrival onsite by non-Roux Associates personnel (names and affiliation) and equipment (e.g., subcontractors and facility personnel, and drilling equipment, respectively, etc.), including temporary departures from, and returns to, the site during the work day, and departure at the end of the work day.

f. List of non-Roux Associates personnel onsite.

g. Weather conditions at the beginning of the day as well as any changes in weather that occur during the working day.

h. Health and safety procedures including level of protection, monitoring of vital signs, frequency of air monitoring, and any change (i.e., downgrade or upgrade) in the level of protection for Roux Associates and other on-site personnel (e.g., subcontractors, facility personnel, etc.).

i. Health and safety procedures not in compliance with the HASP (for all on-site personnel).

j. Site reconnaissance information (e.g., topographic features, geologic features, surface-water bodies, seeps, areas of apparent contamination, facility/plant structures, etc.).

k. Air monitoring results (i.e., photoionization detector [PID], etc. measurements).

l. Task designation and work progress.

m. Work-related and site-related discussions with subcontractors, regulatory agency personnel, plant personnel, the general public, and Roux Associates personnel.

n. Delays, unusual situations, problems and accidents.

o. Field work not conducted in accordance with the work plan/scope of work, and rationale and justification for any change(s) in field procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

p. QA/QC procedures not conducted in accordance with the QA/QC procedures established in the work plan/scope of work and rationale and justification for any change(s) in QA/QC procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

q. Equipment and instrument problems.

r. Decontamination and calibration procedures.

s. Activities in and around the site and work area by any and all on-site personnel which may impact field activities.

t. Sketches, maps, and/or photographs (with dates and times) of the site, structures, equipment, etc. that would facilitate explanations of site conditions.

u. Contamination evidenced as a result of work-related activities (e.g., visible contaminants [sheen] in drilling fluids or on drilling equipment; sheen on, or staining of, sediments; color of, or separate [nonaqueous] phase on, water from borehole or well; vapors or odors emanating from a borehole or well; etc.); make all observations as objectively as possible (e.g., grey-blue, oil-like sheen; black and orange, rust-like stain; fuel-like odor; etc.) and avoid using nontechnical or negative-sounding terms (e.g., slimy, goopy, foul-smelling).

v. Date and time of final departure from the site of all personnel at the end of the work day.

3.2 In addition to the general types of information that must be recorded (as presented in Section 3.1), task-specific information must also be properly documented. Task-specific information which is required is provided in each respective task-oriented SOP, and the documentation procedures outlined in each SOP must be followed.

APPENDIX B

# APPENDIX B

Field Forms

# CUSTODY SEAL

DATE _____

SIGNATURE _____

ROUX

ROUX

# CHAIN OF CUSTODY

№ 02835Y

ROUX ASSOCIATES INC
*Environmental Consulting & Monogement*
1377 MOTOR PARKWAY
ISLANDIA, NEW YORK 11788
(516) 232-2600 FAX (516) 232-9898

ANALYSES

PAGE OF

PROJECT NAME

PROJECT NUMBER

PROJECT LOCATION

SAMPLER(S)

| SAMPLE DESIGNATION/LOCATION | DATE COLLECTED | TIME COLLECTED | SAMPLE MATRIX | | | | | | TOTAL BOTTLES | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
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| | | | | | | | | | | |

| RELINQUISHED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N | RECEIVED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N |
|---|---|---|---|---|---|---|---|---|---|
| RELINQUISHED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N | RECEIVED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N |
| RELINQUISHED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N | RECEIVED BY: (SIGNATURE) | FOR | DATE | TIME | SEAL INTACT Y OR N |

DELIVERY METHOD

ANALYTICAL LABORATORY

COMMENTS

CONSULTING GROUND WATER GEOLOGISTS

**ROUX ASSOCIATES INC**

# WELL LOG

Project _____

Client _____

Page _____ Of _____

Logged By _____

Owner _____

Well No. _____

Loc. _____

M.P. Elevation _____

Drilling Started _____ Ended _____

Driller _____

Type Of Rig _____

## WELL DATA

Hole Diam. (in.) _____

Final Depth (ft.) _____

Casing Diam. (in.) _____

Casing Length (ft.) _____

Screen Setting (ft.) _____

Screen Slot & Type _____

Well Status _____

## G W READINGS(1)

| Date | DTW MP(2) | Elev. W.T. |
|---|---|---|
| | | |

## SAMPLER

Type _____

Hammer _____ lb.

Fall _____ in.

## DEVELOPMENT

| SAMPLE No. | SAMPLE Rec. | SAMPLE Depth | SAMPLE Blows 6 | Strata Change & Gen. Desc. | Depth (ft.) | SAMPLE DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | | | |

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

# FIELD PROCEDURE MODIFICATION AUTHORIZATION

Project/Task Number: _____

Procedure Reference: _____

Requested Modification: _____

Reason for Modification: _____

Special Equipment, Material or Personnel Required: _____

Modification Requested By: _____ Date: _____

Approved By: _____ Date: _____ Title: _____

Comments:

*File original copy in project file. Copy to client.*