QUALITY ASSURANCE PROJECT PLAN EPA REGION V

FOR:
COMPLETION OF REMOVAL ACTIVITIES

AT:
105 MAPLE STREET
VILLAGE OF WELLINGTON
LORAIN COUNTY, OHIO

PREPARED FOR:
SUNOCO LOGISTICS PARTNERS, LP and
SUN PIPELINE COMPANY

PREPARED BY:
HULL & ASSOCIATES, INC.
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PURSUANT TO:
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

ORDER FOR COMPLIANCE UNDER SECTION 311(c) and (e)
OF THE
CLEAN WATER ACT
DOCKET NO: V-W-11.C-987

JANUARY 2012

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LIST OF ACRONYMS

AAS	Atomic Absorption Spectrophotometer
BFB	p-bromofluorobenzene
COC	Chemical of Concern
DFTPP	Decafluorotriphenyl phosphine
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FOC	Field Operations Coordinator
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/ Mass Spectrophotometer
Hull	Hull & Associates, Inc.
ICP	Inductively Coupled Plasma Emission Spectrophotometer
LCS	Laboratory Control Sample
LUST	Leaking Underground Storage Tank
MDL	Method Detection Limit
MS	Matrix Spike
MS/MSD	Matrix Spike/ Matrix Spike Duplicate
NIST	National Institute of Standards and Technology
OEPA	Ohio Environmental Protection Agency
OVA	Organic Vapor Analyzer
OV-PID	Organic Vapor Photoionization Detector
PARCCS	Precision, Accuracy, Representativeness, Comparability, Completeness, Sensitivity
PID	Photoionization Detector
PM	Project Manager
QA	Quality Assurance
QAO	Quality Assurance Officer
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
REC	Recognized Environmental Condition
RPD	Relative Percent Difference
RSD	Relative Standard Deviations
SIN	Sample Identification Number
SOP	Standard Operating Procedure
SOW	Scope Of Work
SRM	Standard Reference Materials
VOC	Volatile Organic Compound

1.0 PROJECT MANAGEMENT

1.1 Project Organization and Responsibilities

The purpose of this document is to describe the personnel, procedures, and methods for ensuring the quality, accuracy, and precision of data associated with the Emergency Removal Action for the pipeline release located at 105 Maple Street in the Village of Wellington, Lorain County, Ohio (Site). The release was reported on January 12, 2012 and emergency response and removal actions have been on-going at the Site since then. On January 17th, 2012, Sunoco Logistics Partners, L.P. and Sun Pipeline Company (Respondents) entered into an Order for Compliance with EPA (Docket No. V-W-11.C-987) to perform removal actions in connection with the release. Specifically, the Order requires that the Respondents immediately conduct removal of the discharge and to mitigate or prevent a substantial threat of future discharge of oil.[1]

Hull & Associates, Inc. (Hull) has been retained by the Respondents to assist with source removal and mitigation activities at the Site. This Quality Assurance Project Plan (QAPP) has been prepared on behalf of the Respondents to meet the requirements of the Order. This QAPP will be effective for the duration of the removal and mitigation activities. This QAPP may be modified by addendum as necessary to address additional activities that may be required during the course of this work.

Hull will perform field monitoring and sampling activities associated with the removal and mitigation activities at the direction of the Respondents. EPA will coordinate with the Respondents. The lines of authority can be found on the Project Organization Chart, Figure 1. The project has had a dynamic scope and the project team and management team may be modified at certain times to meet the specific project needs. The various quality assurance and management responsibilities of key project personnel are defined below.

Respondent has been working cooperatively to mitigate and stabilize the release since it occurred and has developed this plan in a short time frame based on activities already performed and reasonably anticipated future activities to be performed under the Order. This project has been very fluid during the early stages of the response and plans may change

[1] The release actually consists of gasoline and this document will refer the release as gasoline within the document.

based upon further information learned in the future. Respondent will continue to cooperate and communicate with EPA as work at the Site continues and appreciates EPA's understanding of this needed flexibility.

1.1.1 Management Responsibilities

Jeffrey Lippert, EPA On-Scene Coordinator

Mr. Lippert is responsible for the direct review and approval of the Work Plans and this QAPP. Mr. Lippert is responsible for directing removal and mitigation work at the Site as it pertains to the Orders.

Incident Commanders

The following Sunoco Logistics personnel are serving as incident commanders on this project: Charlie Stewart, Dave Chalson, and Chad Arey.

Mr. Carl G. Borkland, HES&S Manager, Sunoco Logistics, L.P.

Mr. Borkland will be the primary communication link with the EPA regarding compliance with the Order.

Dave Peterson, Removal Action Project Lead

Mr. Peterson will be the Removal Action Project Lead and has overall responsibility to ensure that removal and mitigation activities are performed in accordance with the Work Plan and supporting documents including this QAPP. Mr. Peterson's responsibilities include technical quality control and project oversight. Mr. Peterson forms the primary communication link between Hull and the Respondents. Duties and responsibilities of the PM consist of the following:

1. administrate and supervise all phases of the project;
2. determine that project objectives are met within financial and time constraints;
3. work with the Quality Assurance Officer (QAO) and field personnel to plan and conduct project operations; and
4. review reports and other work products prior to their issuance.

1.1.2 Quality Assurance Responsibilities

TBD, EPA Quality Assurance Reviewer

The EPA Quality Assurance Reviewer will be responsible for reviewing and approving the QAPP.

Pam Olson, Hull QAO

Ms. Olson will be the QAO and be responsible for enforcing the provisions of the QAPP. Specific functions and duties of the QAO are to:

1. establish Quality Assurance/Quality Control (QA/QC) procedures for the project;
2. evaluate data quality and maintain QC records;
3. conduct field audits;
4. provide a communication link between project personnel and the laboratory;
5. monitor the progress of the field sampling personnel and provide PMs with periodic QA reports;
6. stop work at any time that the QAPP is not being adhered to, or if the quality of the results are jeopardized by the work in progress; and
7. provide updates to the QAPP as necessary.

Monica Williamson, Data Manager

1. Maintain a record of all samples collected and the sample identification information on each sample;
2. manage data acquired from the field and laboratory analyses; and
3. assemble data into report format.

1.1.3 Field Responsibilities

Jim Kirsch and Chett Siefring, Hull Field Operations Coordinators (FOC)

Mr. Kirsch will serve as the FOC during the day shift, and Mr. Siefring will serve as the FOC during the night shift. Mr. Kirsch and Mr. Siefring will be responsible for overseeing the day-to-day conduct of project activities. Duties and responsibilities of the FOC are to:

1. ensure the sampling activities are conducted in a manner that follows the procedures outlined in this plan and the Work Plan and supporting documents;

2. ensure field personnel are adequately trained and certified for assigned sampling tasks;

3. ensure that field personnel meet all health and safety training and monitoring requirements and adhere to the Property-Specific Work Plans and Health and Safety Plans;

4. coordinate sampling activities with the PM, QAO, and field personnel;

5. oversee the use, maintenance and operation of sampling equipment; and

6. report daily activities, problems, etc. to the QAO and PM.

Hull Field Technical Staff

1. Before sampling, meet with Hull project manager or his designee to discuss and establish sampling objectives, sampling methodology, number of samples, size of samples, sample preservation methods, COC requirements, analyses required, and which samples will be duplicated in the field.

2. Be responsible for collection of equipment needed for work, which would include personal protective equipment (PPE), sampling equipment, sample containers and coolers, monitoring devices, and any other equipment deemed necessary.

3. Oversee removal and mitigation work to ensure that proper procedures are followed.

4. Monitor hazardous conditions while conducting field operations.

5. Submit chain of custody (COC) records and field paperwork to field team leader.

Subcontractor (S&S Onsite Analytical, ltd.) Field Staff

S&S is responsible for coordinating on-site analytical services with Hull's PM and FOC. Specifically, operating and maintaining mobile laboratory equipment, ensuring that samples are analyzed in accordance with this document and best laboratory practices; maintain Chain of Custody procedures, and timely reporting of analytical results. S&S is responsible for completing analyses in accordance with their Standard Operating Procedures (SOPs) and EPA's analytical methods.

1.1.4 Laboratory Responsibilities

The primary analytical laboratory for this project is TestAmerica Inc. The majority of samples for this project will be directed to TestAmerica's North Canton, Ohio facility. The North Canton

laboratory will be responsible for distributing the samples to their other locations. Other labs may be utilized depending on future project scope and analytical needs. The locations for all analytical laboratories currently being used during this project are:

TestAmerica – North Canton Laboratory
4101 Shuffel Street NW
North Canton, OH 44720
330.497.9396

TestAmerica – Dayton Laboratory
4738 Gateway Circle
Dayton, OH 45440
937.294.6856

TestAmerica – Pittsburgh Laboratory
Pittsburgh Laboratory
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238
412.963.7058

Each of TestAmerica's laboratories have their own project organization with responsibilities similar to those of the field operations personnel.

Laboratory Director

The Laboratory Director will be primarily responsible for the overall operation of the laboratory including all samples analyzed and data reported. The Laboratory Director will also be responsible for initiating corrective action measures when analytical data do not meet the requirements of this plan or the laboratory's QAP.

Laboratory Project Manager

The Laboratory Project Manager will be the primary communications link between the laboratory and Hull's QAO. The Laboratory Project Manager will be responsible for relating any special needs of the field operations personnel to the laboratory. The Laboratory Project Manager will also provide the final review of all data packages before reporting results.

Laboratory Quality Assurance Officer (QAO)

The Laboratory QAO will be primarily responsible for implementing and monitoring compliance with the laboratory's QAP. The Laboratory QAO's duties will also include: conducting audits, reviewing all QC data, and reporting problems to the Laboratory Director for corrective action.

1.2 Special Training Requirements/Certifications

All field personnel will have completed Occupational Safety and Health Administration (OSHA) 40-hour and annual 8-hour refresher Hazardous Waste Operations and Emergency Response (HAZWOPR) Standard training, as required for personnel potentially exposed to hazardous substances, as specified by 29 CFR 1910.120. Personnel sampling other environmental media will follow Hull's SOPs provided in Appendix A and the Field Sampling and Analysis Plan (Hull Document #SLO012.300.0003).

1.3 Site History/Background Information

The release occurred at approximately 11:02 p.m. Eastern Standard Time on January 12, 2012. An Initial Pollution Incident Report (IPIR) was filed with Ohio EPA, Division of Emergency and Remedial Response and Spill ID Number 1201-47-0099/0 was assigned. The Wellington Fire Department responded to the scene on January 12, 2012 and constructed a dam to prevent the flow of gasoline from entering the Black River. On January 13, 2012, Respondent and EPA began managing containment and recovery through the establishment of a Unified Command System. Release stabilization and mitigation efforts have been continuous and are described in detail in this report.

1.4 Project Description and Schedule

The Respondents have retained Hull to act as its consultant for removal and mitigation activities at the Site in accordance with the Orders. The purpose of the project is to complete the emergency removal and mitigation activities necessary to prevent further releases to the environment. Specifically, this project consists of the excavation of visibly contaminated source area soils in the vicinity of the release and the removal of gasoline from surface waters in White Ditch (downstream impacted areas) as defined in the Work Plan Hull Document # SLO012.300.0002. The project schedule is included in the Work Plan.

1.5 Data Quality Objectives (DQOs)

1.5.1 Project Quality Objectives

The DQO process is a mechanism to translate general project goals into specific tasks, which are conducted to produce data needed to support decision making for the project. Sampling and analysis for this project are being conducted to support emergency removal and mitigation activities. It should be noted that these DQOs do not address assessment activities. Assessment activities will be conducted at a later date after the emergency removal action activities have been completed in accordance with the Orders.

Therefore the DQOs have been developed around determining that source areas are addressed and the potential for on-going releases to other areas have been mitigated. The majority of DQOs for this project are dependent upon disposal criteria. These data needs include the number and type of samples to be collected, analytical detection limits, and certainty.

The DQO process typically comprises a seven-step process. The following provides the general DQO steps that will be involved for this project.

1.5.1.1 Stating the Problem

Impacted soils in the vicinity of the release need to be removed to eliminate the primary source area. Potential migration pathways such as storm sewers need to be addressed to prevent continued migration to surrounding areas including White Ditch.

Gasoline has been released to White ditch and has been contained in Zones 1, 2, and 3 by various engineering controls such as booms and siphon dams. Gasoline recovery operations are being conducted in these areas coupled with air-sparging to reduce dissolved concentrations of chemicals of concern in surface water.

Ambient air quality in the area may be affected by the release and remedial efforts being conducted at the Site such as excavation and air-sparging. Additionally, potentially hazardous concentrations of vapors may accumulate in utilities such as storm sewer catch basins in the vicinity of the release.

Excavated soils, recovered gasoline, and other derived waste (e.g., PPE, saturated booms, etc.) may need to be characterized for disposal.

1.5.1.2 Identifying the Decision

Generally, the data will be used to evaluate whether source areas have been removed and the potential for on-going releases has been mitigated. Decisions will be also need to be made concerning the management and disposal of excavated soils and recovered gasoline.

1.5.1.3 Identifying Inputs to the Decision

Samples will be collected to support the decision and answer the questions posed in Section 1.5.1.2. These decision inputs are presented in the Work Plan and supporting documents.

1.5.1.4 Defining the Boundaries of the Project Area

A Property map showing the defined boundaries of the project area is provided in the Work Plan. In general, the Site has been divided into six distinct work zones. Soil removal activities are being conducted in Zones 1 and 2 in the vicinity of the release and adjacent to White Ditch. Gasoline recovery and surface water mitigation is being conducted in Zones 1-3. Additional, containment and monitoring activities were conducted in Zones 4-6. Finally, it should be noted that excavated soils have been stockpiled on-Site and loaded into roll-off containers and temporarily staged at various locations throughout the Village of Wellington.

1.5.1.5 Developing a Decision Rule

A decision rule usually compares an output parameter to an action level, which then is used to determine a course of action. The decision rules for an emergency removal action are more subjective than for an assessment investigation because we are relying on visual data and judgment as opposed to numerical cleanup criteria. As required by the Order, these removal actions are being done under the direction of the EPA.

Soils in the area of the release will be excavated based on visual observations of whether they are saturated with gasoline. As previously stated, decisions regarding the extent of soils to be removed are being made at the direction of the Unified Command. Soil samples will not be collected and analyzed by the fixed laboratory for delineation or confirmation purposes. Soil samples may be collected and analyzed by the on-site

laboratory for screening purposes. The Work Plan and supporting documents provide a detailed discussion of these removal activities.

Surface water samples are being collected from various locations in White Ditch to monitor the efficacy of gasoline containment and recovery efforts in the vicinity of the release. Surface water samples are being analyzed for BTEX and GRO by the on-site laboratory. Analytical results from these water samples will be evaluated to observe concentration changes over time and to determine whether the release is being adequately contained. Samples may be sent to the fixed laboratory in the future. The Work Plan and supporting documents provide a detailed discussion of the gasoline containment and recovery efforts in the White Ditch.

Ambient air monitoring for volatiles and LEL is being conducted in the field using real time instruments. These data will be evaluated to guide work efforts, select the appropriate level of PPE, and to ensure the health and safety of on-site workers and the general public. The Health & Safety Plan and supporting documents provide a detailed discussion of the ambient air monitoring program.

Soil samples will be collected from excavated soils after they have been placed in roll-off containers or stockpiled. These samples will be analyzed by the fixed laboratory for disposal purposes. Specifically, these samples will be analyzed for BTEX by EPA method 8260B, GRO by EPA method 8015 (modified), Flash Point by EPA method 1010B. Some soil samples may be analyzed for TCLP BTEX in accordance with EPA method 1311 and subsequent analysis by EPA method 8260. The decision rule for these samples will be based on the acceptance criteria established by the accepting facility. No sampling is required for disposal of recovered gasoline. The Work Plan and supporting documents provide a detailed discussion of the disposal of excavated soils and recovered gasoline.

1.5.1.6 Specifying Limits on Decision Errors

Limits for decisions errors will be based primarily on the disposal criteria for excavated soils and recovered gasoline. It should be noted again that further assessment and remedial activities will be conducted after the emergency removal and mitigation activities have been completed in accordance with the Order.

1.5.1.7 Optimizing the Design

In developing the DQOs for the emergency removal and mitigation activities, cost-effective sampling and analysis methods will be pursued. If obstacles exist in the process, then the DQO steps will be reassessed until a workable decision tree is produced. Under the Order, there may be less flexibility in design optimization.

1.6 Quality Assurance Objectives for Measurement

The overall QA objective for emergency removal and mitigation activities is to develop and implement procedures for field sampling; chain-of-custody preparation, laboratory analysis, and reporting that will provide legally defensible results. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment and corrective action are described in other sections of this QAPP.

Data quality objectives for measurements collected during these projects will be addressed in terms of precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS parameters). The collection of data for the emergency removal and mitigation activities require that the sampling be performed using standard methods, with properly operated and calibrated equipment, and conducted by trained personnel.

1.6.1 Precision

1.6.1.1 Definition

Precision is the degree of agreement among repeated measurements of the same parameter under the same or similar conditions. Precision is reported as either relative percent difference (RPD) or relative standard deviation (RSD), depending on the end use of the data.

1.6.1.2 Field Precision Objectives

Field precision will be assessed through collection and analysis of field duplicate samples. RPDs will be calculated for the detected analytes from investigative and field duplicate samples. Water matrix samples can be readily duplicated due to their homogeneous nature; conversely, the duplication of soil or sediment samples is much more difficult due to their heterogeneous nature. Due to this difficulty, RPDs of ±35 percent and ±50 percent for water and soil sample field duplicates, respectively, will be

used as advisory limits for analytes detected in both investigative and field duplicate samples at concentrations greater than or equal to five times its quantitation limit. Field duplicate samples will be collected at a minimum rate of one duplicate sample for every 20 investigative samples. Field duplicate samples will only be collected for the surface water samples. Field duplicate samples are not required for waste characterization and disposal purposes. QC objectives for field measurements are given in Table 1. Field duplicate sample frequencies are provided in Table 2.

1.6.1.3 Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of relative percent RPD and RSD for three or more replicate samples. Precision control limits for the subcontracted analytical laboratory will be consistent with the analytical method and their SOPs (available upon request).

Laboratory precision shall be assessed where appropriate with matrix spike/matrix spike duplicate and field duplicate samples at a rate of one per 20 samples for both soil and water. For those parameters not amenable to spiking, precision will be assessed through the analysis of a sample/sample duplicate pair. Multi-analyte spiking lists are included in the analytical subcontractor's SOPs (available upon request).

Matrix Spike, and for organics, the matrix spike duplicate samples will be selected by the analytical subcontractor. The laboratory will divide the pre-selected samples into equal aliquots, and then spike each of the aliquots with a known amount of analyte. The duplicate samples will then be included in the analytical sample set. Splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate sample. The relative percent difference (RPD) between the spike and duplicate spike will be calculated and plotted. The RPD is calculated according to the following formula:

$$\text{RPD} = \frac{\text{Spike 1 conc. - Spike 2 conc.}}{0.5\left(\text{Spike 1 conc. + Spike 2 conc.}\right)} \text{ x } 100$$

Additional information on laboratory precision is provided in the analytical subcontractor's method specific SOPs (available upon request).

1.6.2 Accuracy

1.6.2.1 Definition

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

1.6.2.2 Field Accuracy Objectives

Accuracy in the field is assessed using equipment rinseate blanks and trip blanks and through the adherence to all sample handling, preservation, and holding times. A trip blank will consist of a laboratory-prepared sample of reagent grade water. Trip blanks will accompany sample containers and be subjected to the same procedures as the investigative samples. Trip blanks are only required when volatile organic compounds (VOCs) will be analyzed. Trip blanks will be submitted for analysis at the rate of one trip blank per shipping container containing samples for VOC analyses to fix laboratory only.

Equipment rinseate blanks will be collected by pouring laboratory-prepared water or distilled water over or through non-disposable sampling equipment and collecting the rinseate in the proper analytical containers.

1.6.2.3 Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of MS/MSD, laboratory control samples (LCS) and surrogate compounds, and the determination of percent recoveries. Accuracy control limits for the analytical subcontractor are provided in their method specific SOPs (available upon request).

To assure the accuracy of the analytical procedures, an environmental sample will be randomly selected from each sample shipment received at the analytical subcontractor's laboratory, and spiked with a known amount of the analyte or analytes. At a minimum, a sample spike will be included in every set of twenty samples tested on each instrument for each sample matrix to be tested (i.e., soil, sediment, groundwater, and/or surface water). The increase in concentration of the analyte will be observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample to determine the percent recovery. Daily control charts will be plotted for each commonly analyzed compound and maintained on instrument-specific, matrix-specific, and analyte-specific bases.

Percent recovery for MS/MSD results is determined according to the following equation:

$$\%R = \frac{(\text{Spiked Sample Conc. - Sample Conc.})}{\text{Known Conc. Added}} \times 100$$

Percent recovery for LCS and surrogate compound results is determined according to the following equation:

$$\%R = \frac{\text{Experimental Conc.}}{\text{Known Amount Added}} \times 100$$

Additional information on laboratory accuracy is provided in the analytical subcontractor's method specific SOPs (available upon request).

1.6.3 Completeness

1.6.3.1 Definition

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

1.6.3.2 Field Completeness Objectives

Field completeness is a measure of the number of valid measurements obtained from all the measurements. The field completeness objective for this project will be greater than ninety percent.

1.6.3.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the number of valid measurements obtained from all the measurements taken. Laboratory completeness for this project, with respect to critical measurement parameters identified in Table 3, will be greater than ninety-five percent.

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

$$\text{Completeness} = \frac{\text{Number of Valid Measurements}}{\text{Number of Measurements Planned}} \text{ x } 100$$

1.6.4 Representativeness

1.6.4.1 Definition

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

1.6.4.2 Measures to Ensure Representativeness of Field Data

Representativeness will be achieved by insuring that sampling locations are properly selected and that a sufficient number of samples are collected. Representativeness is dependent upon the proper design of the sampling program and will be accomplished by ensuring that this QAPP and all relevant SOPs are followed. The QA goal will be to have samples and measurements representative of the media sampled.

1.6.4.3 Measures to Ensure Representativeness of Laboratory Data

Laboratory data representativeness will be ensured by using the proper analytical procedures, adherence to the approved SOPs, meeting sample holding times, and analyzing and assessing field duplicate samples.

1.6.5 Comparability

1.6.5.1 Definition

Comparability is an expression of the confidence with which one data set can be compared with another. Comparability is also dependent on similar QA objectives.

1.6.5.2 Measures to Ensure Comparability of Field Data

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

1.6.5.3 Measures to Ensure Comparability of Laboratory Data

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

1.6.6 Sensitivity

1.6.6.1 Definition

Sensitivity is the ability of a method or instrument to detect a parameter to be measured at a level of interest.

1.6.6.2 Measures to Ensure Field Sensitivity

The sensitivity of field instruments selected to measure specific parameters such as temperature, pH, etc. will be determined by analyzing calibration check solutions, where appropriate, that are at the lower end of the expected concentration range. The sensitivity of the photoionization detector (PID) used to screen samples for volatile organics is relative to background readings in ambient air.

1.6.6.3 Measures to Ensure Laboratory Sensitivity

The sensitivity requirements for laboratory analysis will be sufficient to meet the disposal facilities requirements. If analytical methods are not sufficient to meet the sensitivity requirements, alternative analytical methods may be utilized and this QAPP will be revised accordingly.

1.7 Documentation and Records

All field measurements are recorded on field data sheets or project notebooks. All analytical data will be retained and summarized on tables and/or figures. Per the Order, a final report will be submitted to EPA by March 9, 2012, which includes a summary detailing all work completed, including monitoring and analytical data, disposal records, and all documentation related to the response actions.

All records generated during these emergency response and mitigation activities will be kept on file by Hull. These records will be considered part of the final evidence files and will at a minimum include: field logbooks; field data and data deliverables; photographs; drawings; soil boring logs; laboratory data deliverables; data validation reports; progress reports, QA reports;

interim project reports, etc.; and all custody documentation (tags, forms, airbills, etc.). Final Evidence files are discussed in detail in Section 2.3.5 of this QAPP.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Process and Design

Sample locations, analytical parameters, and frequency of sampling are discussed in the Work Plan and supporting documents. Laboratory test parameters for the sampling program will include analysis for one or more of the following parameters discussed in Table 3. QA/QC samples will be submitted in accordance with the protocols presented in the following sections of this QAPP. Requirements for QA/QC samples are identified in Table 2.

2.2 Sample Method Requirements

2.2.1 General Sampling Requirements

The purpose of this section is to describe the general sampling procedures that will be used during emergency response and mitigation activities. Hull's relevant Standard Operating Procedures (SOPs) have been included in Appendix A. Sampling efforts will be uniform and follow the Work Plan and supporting documents to ensure the quality of the data collected. For all samples collected, sample aliquots for various parameters will always be collected in order of decreasing volatility (i.e., volatiles, semi-volatiles, metals, etc.).

2.2.2 Sampling Equipment Preparation and Decontamination

Sampling equipment that is to be reused will be thoroughly decontaminated between sampling locations and at the beginning and end of each day. Decontamination will consist of washing equipment with mild, non-phosphate soap such as *Liquinox*, and thoroughly rinsing with distilled water. If complete cleaning of any piece of sampling equipment is not possible, then it will be discarded and a clean article substituted. For a more detailed explanation of decontamination procedures see Hull SOP No. F1000 (Appendix A).

2.2.3 Sample Containers and Preservatives

Sample containers will consist of pre-cleaned and certified level two glass and plastic bottles. Table 4 lists the typical containers, preservatives, and holding times for analyses to be employed during the course of this project.

2.2.4 Sample Storage and Transportation

Field samples will be packaged and shipped according to Hull SOP No. F1013 (Appendix A). Coolers are the most common package or containment device used to ship samples. Coolers

are also used during sampling efforts to store and transport samples prior to shipping. It is very important that the samples be placed in an iced cooler immediately after collection. The ice in the cooler used for shipping will last much longer if the sample containers placed into it have been pre-chilled. Ice will be double-bagged to prevent leakage and possible water damage to samples, sample labels, and documentation. Any samples not placed on ice immediately upon collection will be discarded and a new sample will be collected.

2.3 Sample Handling and Custody Requirements

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

A sample or evidence file is under your custody if:

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

Field custody procedures are outlined in Section 2.3.1. The custody procedures for the analytical subcontractor are provided in their own QAP (available upon request).

2.3.1 Field Custody Procedures

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering and other sample designations are included in Section 2.3.3.2 of this QAPP. Examples of field custody documents and instructions for completion are presented in Hull SOP No. F3014, Appendix A of this QAPP.

1. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched, and ensuring that chain-of-custody procedures are followed. Field procedures have been designed such that as few people as possible will handle the samples. The possession and handling of samples will be documented from the time of collection to delivery to the laboratory. Field personnel will maintain custody of all samples until they are relinquished to another custodian, the laboratory, or to the freight shipper.

2. All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented in Section 2.3.3.2 of this QAPP.

3. Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the ballpoint pen would not function in freezing weather. Sample labeling procedures are discussed in further detail in Section 2.3.3.1 of this QAPP.

4. A properly completed chain-of-custody form will accompany all samples. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the 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 a mobile laboratory, to the permanent laboratory, or to/from a secure storage area

5. Samples will be properly packaged and shipped according to procedures found in Hull SOP No. F1013 (Appendix A).

The possession and handling of samples will be documented from the time of collection to delivery to the laboratory. Hull field personnel are responsible for ensuring that COC procedures are followed. Field personnel will maintain custody of all samples until they are relinquished to another custodian, the laboratory, or to the freight shipper.

All samples must be catalogued on a COC form using sample identification codes. A copy of the COC form is included in Appendix B. The date and time of collection will be recorded on the form, as well as the number of each type of sample, the method of preservation, and the type of analysis. The COC SOP is located in Appendix A.

2.3.2 Field Logbooks

Field logbooks may also provide a means of recording data collecting activities performed during the project. As such, entries will be described in as much detail as possible so that they could reconstruct a particular situation without reliance on memory. Field logbooks will be

bound field survey books or notebooks. Logbooks may be assigned to field personnel, but will be stored in the document control center when not in use.

The title page of each logbook will contain the following:

1. person to whom the logbook is assigned;
2. logbook number;
3. Site name;
4. project start date; and
5. end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection equipment being used, and the signature of the person making the entry will be entered. The names of visitors to the Property, field sampling or investigation team personnel and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in permanent ink, signed, and dated and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is signed and dated by the sampler. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

2.3.3 Sample Collection

Samples will be collected following the SOPs documented in Appendix A of this QAPP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers.

2.3.3.1 Sample Labeling

All sample containers will be labeled at the time of sampling. Each label will be completed with the required information and then secured to the container with

transparent packing tape to prevent accidental loss or damage from water or mishandling. Required information on the sample label includes: sample identification number, date, time, and requested analyses. Additionally, any preservatives or special handling instructions will be clearly displayed on the label.

2.3.3.2 Sample Identification Numbers

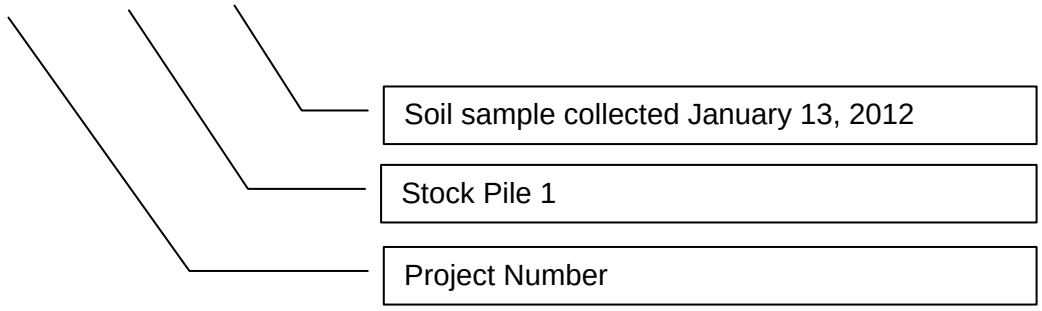
A unique sample identification number (SIN) will identify each sample collected for chemical analyses. These SINs include several key pieces of information such as the sample location, sample type/matrix, and the sampled depth interval or date sampled.

Soil Waste Characterization Samples

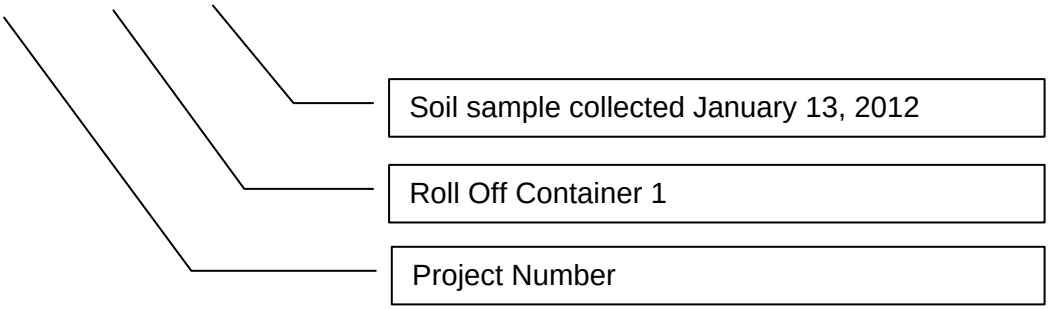
Soil samples of excavated materials will be collected directly from stock piles or roll-off containers. The sample type for soil samples is "S" and will be followed by a six-digit number to indicate the date the sample was collected from. The format for the date will be MMDDYY.

Some examples of nomenclature for soil samples follow:

SLO012 : SP1 : S011312



SLO012 : RO1: S011312



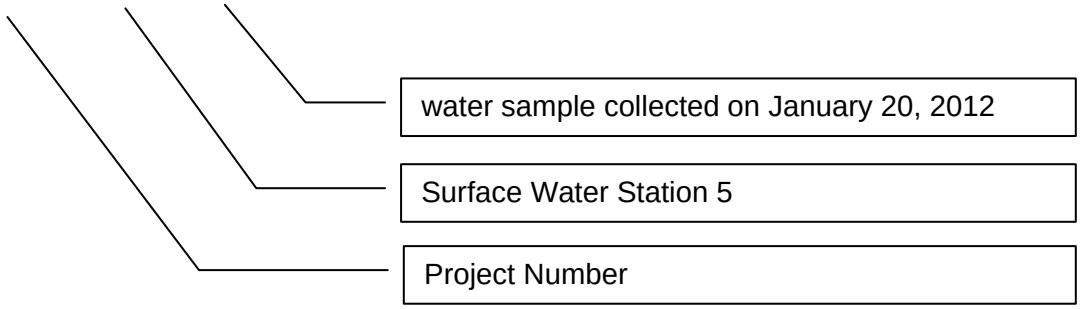
[2] The sampling team has used the roll off container number painted on the container as an identifier and sample name.

Water Samples

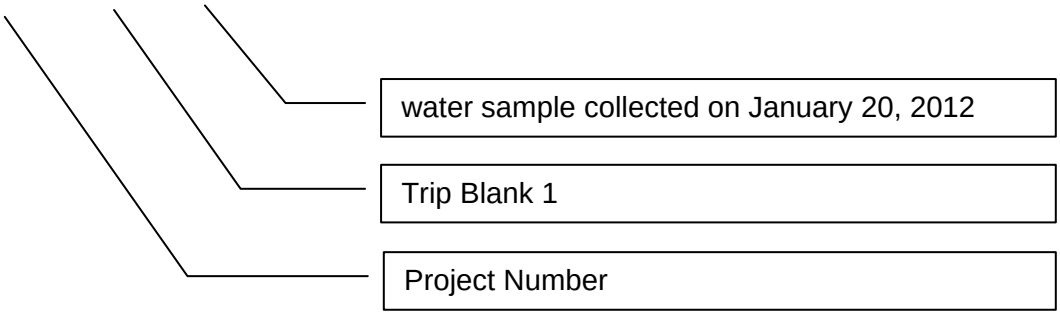
Surface water samples and trip blanks will be identified with a "W". The sample type will also include a six-digit number to indicate the date of sample collection. The format for the date will be MMDDYY.

Some examples of nomenclature for water samples follow:

SLO012 : SW5: W012012



SLO012 : TB1 : W012012



Other Sample Types

Other sample types identified with a sample type are air "A," sediment "D," asbestos "C," free products "P," and others "Z." The others category will be used for any sample types not listed. In general, the six-digit date identifier should follow the sample type code for these sample types.

Any questions regarding the sample identification number will be directed towards the QAO.

2.3.3.3 Field Sampling Data Sheets

All field notes will be recorded in field logbooks or may be recorded on the appropriate sampling sheets (as required).

A copy of all field data sheets, daily reports, and field notes will be given to the PM. The PM will keep copies of all notes. No one shall, at any time, remove information from job files, QA files, or the project notebook for field use or other use. If copies of previous work are required, then arrangements will be made with the PM to copy a portion of the file.

Field notebooks, field data sheets, or daily field reports will not be obscured, destroyed, or discarded, even if they contain errors or are illegible. Entries will be described in as much detail as possible so that persons going to the facility could reconstruct a particular situation without reliance on memory. All entries will be made in permanent ink, signed, and dated and no erasures will be made. Corrections will be made by drawing a single line through the error and writing in correct information. The use of white-out, obliterating, or writing directly over the erroneous entry is prohibited. All corrections will be dated and initialed by the person making the correction.

2.3.4 Laboratory Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts are used to trace the history of samples through the analytical process and to document and relate important aspects of the work, including the associated quality controls. All logbooks, bench sheets, instrument logs, and instrument printouts are part of the permanent record of the laboratory. The Laboratory Section Heads will periodically review laboratory notebooks for accuracy, completeness, and compliance with the Laboratory QAP. Completed workbooks and instrument logbooks will be submitted to the QA Officer(s) for storage.

In general, good laboratory practices require that the following (or equivalent) procedures be used. Each page, or as required, each entry, will be dated and initialed by the analyst when the record is made. Errors in entry will be crossed out in indelible ink with a single stroke. The use of white-out, obliterating, or writing directly over the erroneous entry is prohibited. The individual making the correction will initial all corrections.

2.3.5 Final Evidence Files

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

The final evidence file may include:

1. field logbooks;
2. field data and data deliverables;
3. photographs;
4. drawings;
5. soil boring logs;
6. laboratory data deliverables;
7. data validation reports;
8. progress reports, QA reports, interim project reports, etc.; and
9. all custody documentation (tags, forms, airbills, etc.).

2.4 Analytical Method Requirements

The analytical methods requirements are presented in the Work Plan and supporting documents and summarized on Table 3. Laboratory SOPs for the analytical methods found in Table 3 are available upon request.

2.4.1 Laboratory Addresses

The addresses of all laboratories are provided in Section 1.1.4 of this document.

2.4.2 Field Analytical Procedures

An on-site mobile laboratory is being used to screen soil samples and to analyze surface water samples. The mobile laboratory is owned and operated by S&S Onsite Analytical, ltd.

Specifically, S&S will be analyzing samples for BTEX and GRO in accordance with EPA methods 8260 and 8015 (modified), respectively. S&S's SOPs are available upon request.

2.4.3 Laboratory Analytical Procedures

The laboratory analytical procedures are documented in their QAP and SOPs (available upon request). These laboratory SOPs for sample preparation, cleanup and analysis are based on SW-846 Third Edition.

2.5 Quality Control Requirements

2.5.1 Level of Quality Control Effort

Equipment rinseate blanks, trip blanks, method blanks, field duplicates, laboratory duplicates, laboratory control, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Equipment rinseate blanks and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Equipment rinseate blank samples are analyzed to check for procedural contamination at the facility that may cause sample contamination. As this project is for removal action and the data is not being used for assessment purposes, field blank samples are not being collected. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Trip blanks pertain to volatile organic samples only. Trip blanks are prepared prior to the sampling event in the actual sample containers and are kept with the investigative samples throughout the sampling event. They are then packaged for shipment with other samples and sent for analysis. There should be one trip blank included in each sample shipping container, containing bottles for volatile organic analysis. At no time after their preparation are these sample containers opened before they reach the laboratory.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. MS/MSD analyses will be performed as part of the batch QC for each group of samples analyzed by the laboratory.

Where possible, the laboratory will attempt to have the MS/MSD performed on samples submitted for this project.

The general level of the QC effort will be a minimum of one field duplicate for every twenty or fewer surface water samples. Field duplicate samples are only being collected for surface water samples since duplicate data is not required for waste characterization and disposal purposes. One trip blank consisting of distilled or laboratory provided deionized water will be included along with each shipment of VOC samples to a fixed laboratory only. Table 2 summarizes the Quality Control Sample Frequencies to be used during the course of this project.

All samples will be sent to the designated laboratory for analysis. All analyses will be completed in accordance with the specified methods. The level of laboratory QC effort for these projects and quantitation limits will be in accordance with the laboratory's SOPs (available upon request).

It is the sampler's responsibility to collect the required quality control samples. If the required quality control samples are not collected, all samples will be discarded and new samples will be collected with the appropriate quality control samples.

2.5.2 Internal Quality Control

The purpose of internal quality control measures is to document the validity of analytical data generated by the laboratory. Laboratory internal quality control may include, but is not limited to, the analysis of method blanks, reference standards, analytical spikes, and surrogate spikes. Every analytical series will include some of these controls depending on the analytical methods used. The internal quality controls used by the laboratory will be combined so they are completely representative of every aspect of the analytical task from sample preparation to sample analysis.

The following sections present a summary of, and suggested frequencies for, various quality control measures that may be used dependent upon the analytical method(s) selected. Table 2 presents the actual quality control measures and frequencies that will be employed by the laboratory.

2.5.2.1 Blank Samples

Blanks are used to assess contamination introduced in transit, storage, or in the laboratory. The types and frequencies of laboratory blank samples are specified by the U.S.EPA methods used for analysis.

Method Blanks

Method blanks identify sources of contamination throughout the analytical process, whether a contribution of specific analytes or a source of interference, which will need to be identified, isolated, and corrected. To accomplish this, the method blank must be initiated at the beginning of the analytical process and include all aspects of the analytical work. This includes glassware, reagents, and instrumentation, as well as any other possible source of contamination. Minimum method blank analyses will be one method blank per analytical series at a frequency of one per 20 samples. Method blanks will meet the criteria specified in the subcontracted laboratory's SOPs (available upon request).

Container Blank

The same concept for the method blank will apply to the sample bottles furnished from the laboratory. The frequency of analysis will extend to each lot of processed sample containers. At a minimum, the analysis of a container blank should be performed whenever the preparation process, preservation reagent, or the type of container changes. It should be noted that these procedures are only applicable to analytical containers processed (i.e., cleaned and prepared) by the analytical subcontractor. Where applicable, only new analytical containers will be used during this project. Analytical containers will consist of I-Chem series 200 (or equivalent) glassware and will meet the EPA method specifications.

Holding Blanks

Another type of method blank is a holding blank. Holding blanks are associated with volatile organic analyses and indicate possible cross-contamination among samples while stored at the laboratory. At least one holding blank, per each group of samples, will be generated and analyzed with the samples.

2.5.2.2 Analytical Spikes

The purpose of an analytical spike is to assess the efficiency and proficiency of an analytical series. This includes quantitation standards, sample preparation, instrument set-up, and the premises inherent in quantitation. This control reflects the competency of sample analysis within an analytical series while it is less sensitive in reflecting the conditions that are within the control of the analyst. The types and frequencies of analytical spikes are specified by the EPA methods used for analysis.

Matrix Spike

Within an analytical series, a representative sample portion is designated as a separate sample and spiked with known concentrations of the analytes under consideration. Advantages of spikes are that the spiked portion is handled and prepared in exactly the same way as the samples. Sample related interference affecting analysis would be reflected in the results from the spiked sample. Results of spikes exceeding tolerances specified by the methods need to be evaluated thoroughly in conjunction with other measures of control.

Surrogate Spike

Surrogates, which have properties similar to the analytes of interest, are compounds unlikely to be found in nature. The intent of a surrogate spike is to provide broader insight to the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions, which may not be attributable to the sample matrix. If results of a surrogate spike analysis exceed method-specified tolerances, then the analytical results need to be evaluated thoroughly in conjunction with other control measures. Re-analysis of the sample with additional controls, or different analytical methodologies, will be necessary.

2.5.2.3 Replicate Analysis

Replicate analysis is a measure of analytical precision and can be limited in its scope. If used in conjunction with reference standards or analytical spikes, it can measure the reliability of the analytical systems. Replicate analyses can be significant in the interpretation of analytical results for samples with complex matrices.

2.5.2.4 Calibration Check Standards

The purpose of a calibration check standard is to assess an instrument's stability. A calibration check standard will be analyzed at the beginning and end of an analytical series or periodically throughout large series of samples. A calibration check standard will be run after every ten samples. In analyses where internal standards are used, a calibration check standard need only be run at the beginning of an analytical series. If results of the calibration check standard exceed method specified tolerances, then samples analyzed since the last acceptable calibration check standard will be re-analyzed.

2.5.2.5 Internal Standards

Internal standards will be monitored when required by the method (e.g., EPA Method 624). The internal standard is present in all acquisitions with the exception of performance standards. The area of any compound cannot fall below 50% of its value in the preceding check standard, nor can it rise above 100% of its value. If internal standard areas in one or more samples exceed the specified tolerances, then the instrument will be recalibrated and all affected samples re-analyzed.

2.6 Instrument Maintenance Requirements

2.6.1 Field Instrument Preventative Maintenance

The field equipment for this QAPP includes Photoionization Detector (PID) and Lower Explosive Limit (LEL) meters. Specific preventative maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated daily before use. Backup instruments and equipment will be available on-Property or within one-day shipment to avoid delays in the field schedule.

2.6.2 Laboratory Instrument Preventative Maintenance

As part of the QA Program Plan, a routine preventative maintenance program is conducted by the analytical subcontractor to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees regularly perform routine scheduled maintenance and repair of [or coordinate with the vendor for the repair of] all instruments. All maintenance that is performed is documented in the laboratory's operating record. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance is carried out on a regular,

scheduled basis, and is documented in the laboratory instrument service logbook for each instrument. Emergency repair or scheduled manufacturer's maintenance is provided under a repair and maintenance contract with factory representatives. The laboratory will maintain an adequate supply of all necessary spare parts.

2.7 Instrument Calibration and Frequency

This section details the calibration procedures and frequency for both the field and laboratory instrumentation that will be used during this QAPP. Materials used for instrument calibration will be obtained from a suitable commercial source.

2.7.1 Field Equipment Calibration Procedures

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and instructions for each instrument to ensure that all maintenance requirements are being observed.

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications. The calibration of field instruments will be performed in strict accordance with the manufacturer's specifications. Field conditions, instrument response, and the manufacturer's recommendations will dictate the frequency of calibration. At a minimum, all instruments will be calibrated at the beginning of each day and after any extended breaks (e.g. lunch).

It is a requirement of Hull that records of instrument calibrations be kept for each instrument that is used during the project. Hull-owned equipment has dedicated logbooks to record calibration data that will accompany the instrument. If equipment is rented, the rental company will provide a record of their calibration. Subsequent field calibrations of rental equipment will be recorded in the samplers' logbooks.

2.7.2 Laboratory Instrumentation Calibration Procedures

Calibration procedures for a specific laboratory instrument will consist of initial calibration (3 or 5-points), initial calibration verification and continuing calibration verification. The analytical subcontractor SOPs (available upon request) provide a detailed description of the calibration procedures for each specific laboratory instrument. The SOP for each analysis performed in the

laboratory describes the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration. In all cases, the initial calibration will be verified using an independently prepared calibration verification solution.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables

An adequate supply of all supplies and consumables will be available for field and laboratory work. All supplies used in the field and laboratory will be inspected prior to use to ensure that they are free from visible defects. Sampling equipment and analytical supplies will be subject to the various QC measures (i.e., equipment blanks and method blanks) previously discussed. Any unacceptable supplies or consumables will be discarded and replaced with an acceptable item.

2.9 Data Acquisition Requirements (Non-Direct Measurements)

During the course of this project data may be acquired from other sources (i.e., ODNR, EPA, public records, etc.). These data will be evaluated to determine the applicability to the project. The source of any data acquired from outside sources will be clearly documented.

2.10 Data Management

Raw data obtained during field activities will be recorded on the appropriate field forms or in dedicated field notebooks as described in Section 2.3.3.3. These data will become part of the project files to be maintained as previously described in this QAPP. The analytical subcontractor will maintain all raw data for a minimum of 10 years. The analytical subcontractor will not destroy any data or records without the consent of Hull. The procedures to be employed for data verification, reduction, validation, and reporting are provided in Section 4.0 of the QAPP.

Analytical data reports generated by the analytical subcontractor will present all sample results, including all QA/QC samples. The data reports will include a laboratory narrative for the data set describing any out of control analyses and their effect on sample results, explanation of all lab applied qualifiers; all sample results including the % moisture content for soil samples, the method blank results, the calibration blank results, the spike and duplicate analysis results (or MS/MDS results) including the % recoveries and RPDs, the lab control sample (LCS) results

including % recoveries, summaries of daily calibration check samples (including notation of any outliers), surrogate results including % recoveries (as applicable per analysis), etc. Final soil results will be reported on a dry weight basis.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Performance and System Audits

Performance and system audits of both field and laboratory activities may be conducted to verify that sampling and analysis are performed within the constraints of this plan. These audits can either be conducted internally by field or laboratory staff or externally by state or federal agencies. The subcontracted laboratory will participate in any performance or system audit conducted or requested by Hull, appropriate state agencies, or the EPA.

3.1.1 Performance Audits

Performance audits may be conducted periodically to determine the accuracy of the total measurement system(s) or components. In this program, blind performance evaluation samples, submitted by state and federal agencies, are analyzed and evaluated throughout the year as part of an ongoing participation in their certification programs. Any deficiencies in the results of these analyses are reported to the laboratory and corrective action is initiated.

3.1.2 Laboratory Audits

In addition to blind sample analyses, the laboratory will also participate in any audits from state and federal agencies. These agencies submit a report noting any deficiencies and necessary corrective action. The laboratory will respond with evidence of compliance within a limited time.

The laboratory also maintains a schedule of internal audits whereby the Laboratory Quality Assurance Officer audits each section of the laboratory. When the audit is completed, a formal report will be issued to the Laboratory Director. This report shall note any deficiencies and a follow-up date to confirm corrective action.

3.1.3 System Audits

A system audit is an evaluation of the various components of the measurement system to assess their proper selection and use. This includes a careful evaluation of all laboratory quality control measures. System audits will be conducted internally by the laboratory. Additional system audits may be conducted externally by Hull or the EPA as required. Similarly, field audits may be conducted to determine compliance with the QAPP, Work Plans, and SOPs for field work.

3.1.4 Field Audits

Hull's QAO or designee may conduct internal audits of field activities involving sampling and measurements. These audits will include a thorough examination of field sampling records, field instrument operating records, sample collection, shipping and handling, Chain of Custody, etc. These audits should occur at the onset of the project to verify that the established procedures are followed. Follow-up audits may be conducted to correct deficiencies, and to verify the QA/QC procedures are being maintained throughout the project. If an audit is completed a written report will be submitted to the PM.

Hull personnel will participate in any external audit requested by state and federal agencies. The results and recommendations or any external audit should be reported to Hull's QAO and/or PM in a timely manner so that corrective actions may be initiated.

3.2 Corrective Action

Corrective actions may be required for either analytical and equipment problems or noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory analysis, and data review. Noncompliance problems are often associated with nonconformance to this plan or the EPA methods being used.

3.2.1 Laboratory Corrective Action

When deficiencies or "out-of-control" situations exist, the laboratory will provide a means of detecting and correcting these situations. An "out-of-control" situation is defined as data exceeding control limits. Samples analyzed during "out-of-control" situations will be re-analyzed prior to reporting results. The laboratory's corrective action procedures are documented in their QAP and their method specific SOPs (available upon request). In general, there are several levels of "out-of-control" situations that may occur in the laboratory during analysis.

3.2.1.1 Bench Level

Corrective action procedures will often be handled at the bench level. If an analyst finds a non-linear response during calibration of an instrument, then the instrument will be recalibrated before sample analysis. The problem may be corrected by a careful examination of the preparation or extraction procedure, spike and calibration mixes, or instrument sensitivity. If the problem persists, it will be brought to the management level.

3.2.1.2 Management Level

If resolution at the bench level was not achieved, or a deficiency is detected after the data has left the bench level, then corrective action becomes the responsibility of the Laboratory Manager or Director. Unacceptable matrix or surrogate spike recoveries detected by data review will be reported to the Laboratory Manager. A decision to re-analyze the sample or report results will be made depending on the circumstance.

3.2.1.3 Receiving Level

If discrepancies exist in either the documentation of a sample or its container, a decision will be made after consulting with the appropriate management personnel. Decisions will be fully documented. Some examples of container discrepancies are broken samples, inappropriate containers, or improper preservation. In these cases, corrective action will involve the Laboratory Project Manager contacting Hull's QAO.

3.2.2 Field Corrective Action

Corrective actions for field equipment problems will consist of reporting the problem to the PM and/or the QAO so that maintenance can be performed or new equipment can be acquired. Noncompliance problems will be reported immediately to the QAO. The QAO will consult with the PM and corrective actions will be initiated. Corrective actions may include resampling when necessary to meet the data quality objectives defined in this plan. The nature, extent, and corrective action for all non-compliances will be documented.

3.3 Quality Assurance Reports to Management

3.3.1 Internal Reporting

The Laboratory Quality Assurance Officer will report the status of the laboratory QA/QC program to the laboratory management. Each report should include:

1. periodic assessment of measurement data accuracy, precision, and completeness;
2. results of audits;
3. significant QA/QC problems and recommended solutions; and
4. resolutions of previously stated problems.

The laboratory will determine the content and frequency of these reports in accordance with its QAP and its SOPs. The laboratory will report to Hull's QAO if the laboratory's internal quality control issues have affected the results of Hull's samples.

3.3.2 Additional Reporting

Laboratory analytical reports will include a summary of the quality assurance activities and quality control data for the project as related to sample analysis. The Laboratory Project Manager will report suspected field QA/QC problems to Hull's QAO. Hull's QAO will report to Hull's PM when appropriate. These reports may be either oral or written depending upon the nature and complexity of the issues in the report. As required by the Orders, a completion report will be submitted to the EPA.

3.3.3 Internal Reporting

Hull's QAO will report any known issues potentially affecting the quality of the analytical or field data directly to the PM. The PM is responsible for further dissemination of these reports.

4.0 DATA REDUCTION, VERIFICATION, VALIDATION, AND REPORTING

4.1 Data Reduction, Verification, Validation, and Reporting

The quality of field and analytical data must be assessed to ensure that these data are being properly used. In order to support the removal and mitigation activities, all data must meet the DQOs identified in Section 1.5. All data generated through field activities or by the laboratory operation shall be reduced, verified, and validated prior to reporting. Data shall not be disseminated until it has been subjected to these procedures which are summarized in subsections below.

4.2 Data Reduction

Estimation of the potential effect that each deviation from this QAPP may have on the usability of associated data items, its contribution to the quality of reduced and analyzed data, and its effects on the decision are summarized below.

4.2.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Only direct-read instrumentation will be employed in the field. All field data will be written into field logbooks immediately after measurements are taken. If corrections are required, the error will be legibly crossed out with a single line and the correction will be made in a space adjacent to the original. All corrections will be initialed and dated by the individual making the correction. Later, when the results calculation forms required for this study are being filled out, the Field Operations Coordinator will review the forms to determine whether any errors have been made by the field crew.

4.2.2 Laboratory Data Reduction Procedures

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method/ per manufacturer's indication, otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. The equations that will be employed in reducing data are presented in the appropriate method SOP located in Appendix A of this QAPP. The formulae included in the SOPs make pertinent allowances for matrix type.

4.3 Data Verification and Validation

Data verification is the process of checking the completeness, correctness, and compliance of data with the field and analytical methods, SOPs, and this QAPP. Data validation is the process of assessing overall data quality with respect to the PARCCS parameters. Data verification and validation procedures shall be performed for both field and laboratory operations as described below.

4.3.1 Procedures Used to Verify and Validate Field Data

The QAO or designee will verify all data generated during field activities. Data verification will consist of reviewing all field data and documentation for transcription errors. Any data that are entered into project databases, spreadsheets, drawings, etc. will be checked against the original field measurements. Field custody records will be checked against the work plan to determine that the appropriate samples were collected. Similarly, the custody records will be checked against the analytical data generated by the laboratory to determine that all requested analyses were complete.

Any identified non-compliant data will be evaluated to determine the potential effect on overall validity and usability of the data generated. If the data are determined not suitable for its intended purpose it will not be used and new data may be collected.

4.3.2 Procedures to Verify and Validate Laboratory Data

The analytical subcontractor generating the data will perform initial data verification and validation prior to reporting any analytical results. Data verification and validation on the final analytical data reported by the analytical subcontractor will be performed by the QAO. At the discretion of the QAO, these final data may be subject to further data validation by a third-party data validation expert.

Data verification and validation is the process through which proper quantification, recording, transcription, and calculations are confirmed. It also confirms that the data is reasonable and complete. The process should be such that errors are minimized and that corrective action steps are taken when errors are detected. The laboratory's data verification and validation process includes three steps: primary, secondary, and final review.

4.3.2.1 Primary Review

The analyst performs the initial review of the data. The analyst is responsible for verifying the correctness of the data entered into the Laboratory Information Management System (LIMS). This review includes, but is not limited to, verifying that the quality control indicators (QCI) meet protocol criteria, calibration criteria are met, appropriate detection limits were used, and data were reduced correctly and that any corrective action was documented properly. The primary reviewer is responsible for verifying any documentation associated with the data, completing review records associated with the process, and compiling QC Reports. The analyst must perform primary review on 100% of the data generated.

4.3.2.2 Secondary Review

The Department Supervisor or second analyst can be responsible for a secondary review of the data. This step is intended as a validation of the primary review. Secondary review focuses on the calibration criteria, QCIs, compound identification, results expression, reporting limits, and level of documentation. Approximately 10% of the data are validated. If problems exist during this review, the data is returned, a 100% review is done, and corrective action is performed as appropriate.

4.3.2.3 Final Review

The Project Management Group, prior to releasing the final report, must perform final review of the completed project. This review ensures that the client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, Chain of Custody is completed, cover letters/narratives are present, flags are appropriate, and project specific requirements are met.

4.4 Data Reporting

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

4.4.1 Field Data Reporting

Field data will be reported in the field logbook on any applicable Field Data sheets. These data may be summarized on tables or figures. The QAO or designee will review all field data prior to release.

4.4.2 Laboratory Data Reporting

After the laboratory has verified and validated the analytical data it will be reported to Hull's QAO. The laboratory reports will consist of:

1. A summary page referencing the laboratories sample number, client sample number, date collected and date received for each sample submitted.
2. Analytical results for each sample documenting the results, QC flags, units, chronology of analytical events, reporting limits, analyst, and method references. Surrogate recoveries and other QC data (as appropriate) are also reported.
3. Definitions of quality control flags used in report.
4. Notes and comments of any identified QC problems or concerns that potentially affect the quality of the data generated.
5. Copy of the completed chain of custody record.

If the need for third-party data validation arises, the laboratory will prepare an additional report for the data validator. This report will be a "CLP like" deliverable package (Level IV).

4.5 Data Acquisition/Data Quality Management and Reconciliation with DQOs

The original laboratory data received by the QAO will be maintained in the QA files after the review process is completed. The QAO will give a copy of all laboratory data to the Hull Project Manager after review. No one shall, at any time, remove information from job files, QA files, or the project notebook for field use or other use. If additional copies of laboratory data are required, then arrangements will be made with Hull's QAO to copy a portion of the file. Job files, QA files, and project notebooks will be kept at Hull's office for a period of 5 years, after that they will be moved to a secure, fireproof storage facility.

Data will also be received electronically from the laboratory and uploaded to our database. These data will be double checked against the hardcopy reports for accuracy. After being

double checked, the data will be tabulated for risk assessment purposes. All finalized tables will be logged and entered into Hull's database, which only Hull's employees are able to access.

These finalized tables will be included into the final report that is submitted to EPA.

These data will be reconciled with the DQOs presented in Section 1.5. Specifically, these data will be qualitatively and quantitatively assessed to determine that appropriate sample collection and analytical procedures were used. These assessments will include:

1. determination of adherence to applicable SOPs;
2. determination that samples collected from the proposed sample locations;
3. evaluation of detection limits, matrix interferences, and other factors potentially biasing data;
4. evaluation of the results of data verification and validation assessments;
5. were the DQO procedures followed and/or refined during the investigation; and
6. are there any data gaps identified that need to be further evaluated.

4.5.1 Accuracy/Bias

As a means to meet the needs of the data users, the data will follow the measurement performance criteria for accuracy/bias established in Section 1.6.2.

4.5.1.1 Sample Contamination

Data from QC verification samples will be reviewed to evaluate the accuracy and potential bias of sample results. Field sample collection and transport contamination should be differentiated from contamination introduced at the time of sample preparation and analysis. Note that sample contamination may result in either negative or positive bias. Bias from sample contamination is not as critical for emergency removal and mitigation activities since all impacted areas will be subject to subsequent assessment investigations to determine the nature and extent of contamination at the Site.

4.5.1.2 Analytical Accuracy/Bias

The data from method/preparation blank samples, field blank samples, trip blank samples, surrogate spikes, MS/MSD samples, and LCSs will be used to determine

accuracy and potential bias of the sample data. If the Data Validation Report indicates that contamination and/or analytical inaccuracies/bias exist for a particular data set, then the impact of that contamination and/or analytical inaccuracies/bias on data usability will be discussed in the completion report issued to U.S. EPA.

4.5.1.3 Overall Accuracy/Bias

The data from the method/preparation blank samples provide an indication of laboratory contamination that may result in bias of sample data.

Sample data associated with method/preparation blank contamination are evaluated during data validation procedure to verify if analytes detected in the samples and the associated method/preparation blanks are "real" or are the result of laboratory contamination. The evaluation procedure involves comparing the concentration of the analyte in the sample to the concentration of the method/preparation blank, taking into account adjustments for sample dilution and dry-weight reporting. In general, the sample data are considered non-detects if the sample concentration is less than five times (ten times for common laboratory contaminants) the method/preparation blank concentration. Typically, the common quantitation limit for the affected analyte is elevated to the concentration detected in the sample.

The data from field blanks and trip blanks provide an indication of field and transportation conditions that may result in bias of sample data. The evaluation procedure and qualification of sample data associated with field blank and trip blank contamination is performed in the same as the evaluation procedure for method blank sample contamination, taking into account the difference in units for aqueous field blank samples collected during soil sampling events.

Matrix spike sample data can provide information regarding the accuracy/bias of the analytical methods relative to the sample matrix. Matrix spike samples are field samples that have been fortified with target analytes prior to sample preparation and analysis. The percent recovery data provide an indication of the effect that the sample matrix may have on the preparation and analysis procedure. Sample data exhibiting matrix effects will be identified during data verification/validation process.

Surrogate spike recoveries provide information regarding the accuracy/bias of the organic analyses on an individual sample basis. Surrogate compounds are not expected to be found in the samples and are added to every sample prior to sample preparation/purging. The percent recovery data provide an indication of the effect that the sample matrix may have on the preparation and analysis procedure. Sample data exhibiting matrix effects will be identified during data verification/validation process.

Analytical accuracy/bias will be determined by evaluating the percent recovery data of LCSs. LCSs are artificial samples prepared in the laboratory using a blank matrix that is fortified with analytes from a standard reference material independent of the calibration standards. LCSs are prepared and analyzed in the same manner as the field samples. The data from LCS analyses will provide an indication of the accuracy and bias of the analytical method for each target analyte.

Percent recovery is calculated using the following formula:

$$\%R = \frac{SSR - SR}{SA} \quad X \quad 100$$

where: SSR = Spiked Sample Result
SR = Sample Result or Background
SA = Spike Added

The percent recovery of LCSs is determined by dividing the measured value by the true value and multiplying by 100.

Overall accuracy/bias for the sampling events will be determined by calculating the percent accuracy measurements that meet the criteria specified in Section 1.6.2 of this QAPP. Overall accuracy will be considered acceptable if the surrogate percent recoveries are met for at least 75 percent of the samples, the LCS percent recoveries are met for all samples, and the MS/MSD percent recoveries are met for at least 75 percent of the samples.

4.5.2 Accuracy/Bias

Sources of sampling and analytical error will be identified and corrected as early as possible to the onset of sample collection activities. An ongoing data assessment process will be incorporated during the project, rather than just as a final step, to facilitate the early detection and correction of problems, ensuring that project quality objectives are met.

Data that do not meet the measurement performance criteria specified in this QAPP will be identified and the impact on the project quality objectives will be assessed and discussed in the completion report. Specific actions for data that do not meet the measurement performance criteria depend on the use of the data and may require that additional samples are collected or the use of the data to be restricted.

5.0 REFERENCES

A variety of technical manuals, administrative documents, and publications were referred to in preparing this document. Some of the references consulted are presented below. Referenced documents and publications may or may not have been reviewed in their entirety. The guidelines and procedures presented in the documents and publications referenced have not been strictly adhered to unless stated otherwise.

U.S. EPA. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. EPA/600/4-83-004. February 1983.

U.S. EPA. Data Quality Objectives for Remedial Response Activities: Development Process. EPA/540/6-87/003. March 1987.

U.S. EPA. Data Quality Objectives for Remedial Response Activities: Example Scenario. EPA/540/6-87/004. March 1987.

U.S. EPA. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/001. December 1987.

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

U.S. EPA. Quality Assurance/ Quality Control Guidance for Removal Activities. EPA/540/G-90/004. April 1990.

U.S. EPA. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, 3rd Edition. Updates II and III, 1998.

U.S. EPA. Quality Assurance Guidance for Conducting Brownfields Site Assessments. EPA 540-R-98-038. September 1998.

U.S. EPA. Region 5: Instructions on the Preparation of A Superfund Division Quality Assurance Project Plan. Revision 0 June 2000.

TABLES

SUNOCO LOGISTICS
QUALITY ASSURANCE PROJECT PLAN

TABLE 1

QA OBJECTIVES FOR FIELD MEASUREMENTS

PARAMETER	METHOD REFERENCE	PRECISION[2]	ACCURACY[3]	COMPLETENESS
VOCs	MiniRAE 2000	0.1 ppm	1 ppm .	95%
VOCs	MiniRAE 3000	0.1 ppm	1 ppm	95%
LEL Oxygen	VRAE	0.1% 0.1%	1% 0.1%	95% 95%
Benzene	UltraRAE 1000	0.05ppm	0.05ppm	95%
LEL Oxygen VOCs	Multi-RAE plus	0.1% 0.1% 0.1 ppm	1% 0.1% 1ppm	95% 95% 95%
LEL Oxygen	QRAE	0.1% 0.1%	1% 0.1%	95% 95%

NOTES:
1.
2. Expressed as the acceptable deviation from the scale.
3. Expected based on equipment manufacturer specifications.

SUNOCO LOGISTICS
QUALITY ASSURANCE PROJECT PLAN

TABLE 2

QUALITY CONTROL FREQUENCIES

QUALITY CONTROL SAMPLES	FREQUENCY OF SAMPLES	DETAILS
Field Samples		
Field Sample Duplicates	One duplicate sample for every 20 or fewer surface water samples.	Duplicate sample to be collected by the same methods at the same time as the original sample. Used to verify sample and analytical reproducibility.
Field (Equipment Rinseate) Blanks	One field blank for every 20 or fewer samples for samples collected with reusable sampling equipment and being analyzed by fixed laboratory (not on-site screening)	Distilled water placed into contact with sampling equipment. Used to access quality of data from field sampling and decontamination procedures.
Trip Blanks	One blank per sample shipment of VOC samples being analyzed by fixed laboratory (not on-site screening).	Laboratory prepared organic-free blank to assess potential contamination during sample container shipment and storage.
[redacted]	[redacted]	[redacted]
Laboratory Samples		
Matrix Spike, Matrix Spike Duplicate (MS/MSD) or Sample/Sample Duplicate	One MS/MSD per every 20 investigative samples	Laboratory spike sample to evaluate matrix and measurement methodology.
Method Blanks	One per every 20 investigative samples.	Laboratory blank sample to assess potential for contamination from laboratory instruments or procedures.
Laboratory Control Samples and Duplicates	Analyzed as per method requirements and laboratory SOPs	Evaluates laboratory reproducibility.

SUNOCO LOGISTICS
QUALITY ASSURANCE PROJECT PLAN

TABLE 3

LIST OF ANTICIPATED ANALYTICAL PROCEDURES

Analyte Group		EPA Method Number
Volatile Organics	BTEX	8260
	TPH – Gasoline Range Organics	8015(mod)
Waste Characterization	TCLP BTEX	1311/1312/8260
	Ignitability	SW-846 Section 7

SUNOCO LOGISTICS
QUALITY ASSURANCE PROJECT PLAN

TABLE 4

SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

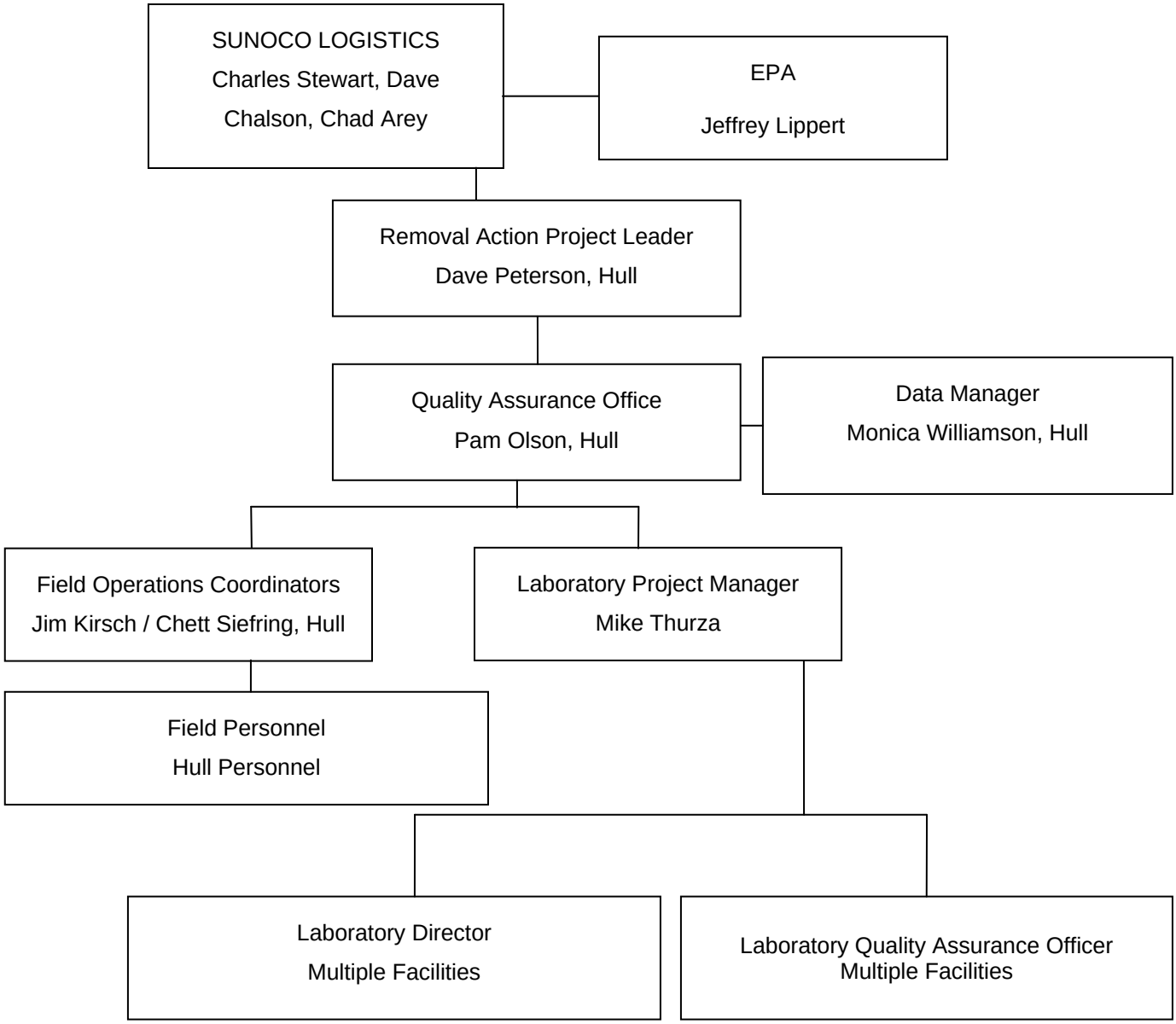
Matrix	Analysis	Sample Amount Required/ Container	Preservation	Holding Time
SOIL	BTEX	4oz, Borosilicate glass jar with Teflon cap	Cool to 4˚ C	14 days
	Total Petroleum Hydrocarbons GRO	5 g, polyethylene container or Borosilicate glass jar with Teflon lined cap	Cool to 4˚ C, requires preservation at the lab within 48 hours of collection	14 days
	TCLP BTEX	4oz, Borosilicate glass jar with Teflon cap	Cool to 4˚ C	14 days
	Ignitablity	4oz, Borosilicate glass jar with Teflon cap	Cool to 4˚ C	14 days
WATER	BTEX	3 - 40 ml, glass VOA with septa caps	Cool to 4˚ C, HCL, pH<2	14 days
	Total Petroleum Hydrocarbons GRO	40 ml, glass VOA with septa caps	Cool to 4˚ C, HCL, pH<2	14 days

FIGURE

SUNOCO LOGISTICS
QUALITY ASSURANCE PROJECT PLAN

FIGURE 1

PROJECT ORGANIZATION CHART



APPENDIX A

Field SOPs

SOP INDEX

SOP No. F1000 *(1999rev)*
DECONTAMINATION OF FIELD EQUIPMENT

1.0 Purpose

This SOP describes the minimum procedures that will be followed when decontaminating field equipment. The equipment may include split spoon soil samplers, bailers, trowels, shovels, hand augers, drilling rigs, or any other type of reusable equipment used during field investigations.

Decontamination will be performed as a both a quality assurance measure and as a safety precaution. Specifically, the purpose for these decontamination procedures is to minimize the potential for cross contamination between sampling locations and prevent potentially contaminated materials from being transported off-site.

2.0 Equipment and Materials

Equipment and materials required for decontamination of field equipment may include, but will not necessarily be limited to:

- high-pressure steam cleaner;
- cleaning fluids: non-phosphatic soap and/or detergents, potable water, distilled/deionized water;
- shovels and brushes;
- paper towels;
- disposable gloves;
- waste storage containers: plastic bags, drums, boxes;
- cleaning containers: plastic buckets, etc.;
- plastic sheeting; and
- personal protective equipment.

3.0 General

A. All decontamination will be performed under the assumption that the equipment is contaminated. At a minimum, clean, unused vinyl or latex gloves will be worn during all decontamination activities. Additional personal protective equipment will be worn as required.

B. An adequate supply of all decontamination equipment and materials will be available on site.

C. All equipment will be decontaminated before leaving the site.

D. Decontamination of vehicles or large equipment will generally be conducted in a designated area. Smaller equipment may be decontaminated at the sampling location.

E. All decontamination materials that cannot be re-used will be properly packaged for disposal based on the nature of contamination.

4.0 Procedures

The following sections present the minimum procedures that will be used to decontaminate field equipment If different or more extensive procedures are required, they will be pre-approved by the Project Manager and Quality Assurance Officer.

4.1 Drilling Rig and Associated Equipment

A. All equipment coming in contact with potential contamination, both as part of subsurface equipment advancement and aboveground contact with drilling fluids, extracted soils, ground water, drill rig lubricants and fuels, etc., will be decontaminated prior to use. At the discretion of the Project Manager, decontamination of the entire drilling rig may be required due to the adherence of foreign substances as a result of operations, transportation from off-site, or travel between soil boring locations.

B. A high-pressure steam cleaner will be used to clean the inside and outside of drilling equipment that will not come into contact with test samples. Decontamination of sampling equipment (e.g., split-spoon samplers) is described in section 4.2.

C. All liquid and solid material produced from this operation will be collected and properly contained until such time as it can be properly disposed of.

D. The date, time, and decontamination procedure used will be recorded on the boring log, daily field report or in a field notebook.

4.2 Sampling Equipment (split spoons, trowels, etc.)

Sampling equipment will be decontaminated between sample locations and sample intervals to minimize the potential for cross-contamination.

A. The sampler will be completely disassembled and any adhered soil will be removed.

B. The sampler will be placed in a bucket containing a non-phosphatic soap and water (e.g., *Liquinox*™) and scrubbed until visibly clean. The soap and water will be changed as necessary.

C. The sampler will then be thoroughly rinsed with potable water until all soap solution is removed. All rinse water will be collected and containerized.

D. The sampler will be reassembled and given a final rinse with distilled/deionized water.

E. If the sampler is not to be used immediately it must be stored in a location or manner that will prevent it from becoming re-contaminated.

4.3 Ground-water Pumps

This procedure will be employed to decontaminate the non-dedicated pumps that are used during well purging, development, and sampling operations.

A. Any dedicated tubing that was used with the pump will be removed and properly discarded.

B. All exterior surfaces will be wiped with clean paper towels and any extraneous materials will be removed using a stiff brush.

C. The pump and all associated downhole equipment will be placed in a suitably sized container of non-phosphatic soap (e.g., *Liquinox*™) and potable water. If the tubing on the pump is to be re-used, the pump will be turned on to circulate the solution through the pump and tubing.

D. The pump will then be thoroughly rinsed with potable water. If the tubing on the pump is to be reused then the pump will be turned on until the internal portions of the pump and tubing are free of cleaning solution. The last rinse applied to the pump system will always be distilled water.

F. The pump and associated downhole equipment will be properly stored to ensure that the system remains clean during transportation to other well heads. The pump will not be allowed to come in contact with the ground at any time during handling and transportation. If this occurs, the pump and associated downhole equipment will be re-cleaned.

G. All liquids and waste materials produced during this operation will be properly stored and disposed of as determined by the Project Manager.

4.4 Bailers

This section documents the procedures that will be followed to decontaminate non-dedicated bailers used for purging or sampling ground water.

A. The bailer will be scrubbed with non-phosphatic soap and water solution. The inside of the bailer will be scrubbed with a cylinder brush to ensure that interior walls are thoroughly cleaned.

B. The bailer will be rinsed with potable water until it is free of the soap solution. A final rinse of distilled water will then be applied.

C. The bailer will be properly stored if it is not to be immediately used. To properly store the bailer, the entire bailer will be placed in its dedicated storage tube or wrapped in inert material (e.g., *Saran* wrap, aluminum foil, etc.).

D. All liquids and waste materials produced during this operation will be properly stored and disposed of as determined by the Project Manager

4.5 Well Casing and Screen Pre-Installation Decontamination Procedures

This section documents the procedures that will be followed to decontaminate well construction materials prior to installation. The following procedures apply to both PVC and Type 304 stainless steel casing and screen materials.

A. All personnel handling the well materials must wear clean and unused vinyl or latex gloves.

B. The well casing and screen will be removed from the packaging. The well materials will be placed on clean sawhorses or equivalent support device. The well materials will be washed with a clean stiff brush and a non-phosphatic soap and water solution (e.g., *Liquinox*™).

C. The well materials will then be rinsed with potable water.

D. A high pressure steam cleaner may then be used to thoroughly remove any remaining soap or soiled areas.

E. The final step will be to rinse the well materials with distilled water. The well materials will remain on the saw horses until well construction commences.

4.6 Interface Probe and Water Level Indicator

The entire length of the probe and tape that was inserted into the well will be decontaminated by washing with a non-phosphate detergent (e.g., *Liquinox*™) and then rinsing with distilled water.

5.0 Documentation

The procedure(s) employed, date(s), and time(s) will be recorded on the appropriate documentation (e.g., daily field reports, field notebooks, boring logs, etc.). Any deviation from these procedures must be noted. Deviations must be approved by the Project Manager and Quality Assurance Officer.

6.0 Special Notes

None

SOP No. F1013 (2001-REV)
PACKAGING AND SHIPPING OF NON-HAZARDOUS SAMPLES

1.0 Purpose

The purpose of this SOP is to describe the procedures that shall be used to package and ship all non-hazardous samples. These procedures are the recommended handling procedures for all sample shipments to minimize the loss of samples associated with breakage and/or being received above the method required temperature. These requirements are mandatory for all samples being transported by non-project personnel. Project personnel include all HAI employees as well as personnel directly employed by the analytical subcontractor. Third-party courier services, regardless of whether contracted internally or by the analytical laboratory, are always considered non-project personnel. Strict adherence to these procedures shall help ensure sample integrity even if delivery is delayed.

2.0 Equipment and Materials

- duct tape
- clear packing tape
- custody seals
- zip-loc (or equivalent) bags, various sizes
- packing material (styrofoam peanuts, bubble wrap, etc.)
- mailing label (in addition to any shipping papers)

3.0 Procedures

The following procedures shall be adhered to for packaging and shipping of all non-hazardous samples. If any materials are known or suspected to be hazardous, they shall be packaged and shipped in accordance HAI SOP No. F1014.

A. Coolers

Coolers are the most common package or containment device used to ship samples. Coolers are also used during sampling efforts to store and transport samples prior to shipping. It is very important that samples be placed in an iced cooler immediately after collection. The ice in the cooler used for shipping will last much longer if the sample containers placed into it have been pre-chilled. The following procedures shall be used when packing the cooler for shipment:

1. Secure the drain on the cooler with packing tape or duct tape to prevent accidental opening.

2. Place each individual sample (soil and/or groundwater) in a *Ziploc* bag. VOA vials that are aliquots from the same sample can be placed in the same bag. It is recommended that the VOA vials be wrapped with bubble wrap or paper towel to prevent excessive contact during shipping.

3. Place the samples into the cooler. Situate the sample containers so that they do not touch each other. This is very important for aqueous samples in glass containers as they are more prone to break.

4. Use plastic bubble wrap or styrofoam peanuts as packing or filler material to prevent the samples from colliding and breaking during transportation. Do not use shredded paper because if the paper becomes wet it will no longer be useful to prevent samples from colliding. Only a minimum amount of packing material should be used as these materials insulate the samples and prevent them from being properly chilled. Plastic sample containers can be placed between glass containers. Bags of ice may be also be used as packaging material between samples. Sample containers should be snug and not easily moved with in the cooler.

5. Fill the cooler with ice. Ice must be double-bagged in *Ziploc* bags. Forty to fifty percent of the cooler capacity should contain ice in order to keep the samples cold during transport. If a commercial carrier such as FedEx or UPS is shipping the samples it is best to use more ice in case delivery is delayed. Less ice may be used if the samples will be delivered by hand. As a rule of thumb, an average cooler with a capacity of approximately 48 quarts will require two to three - eight pound bags of ice.

6. Temperature blanks shall be placed at the top of the cooler directly under the ice.

7. Place the chain-of-custody (COC) record in a *Ziploc* bag and tape it to the underside of lid of the cooler. If samples are packed in multiple coolers, the number of coolers should be marked on the COC record and a photocopy of the COC shall be placed in each cooler.

8. Tape the cooler shut to prevent accidental opening or potential leakage. Tape shall be placed around the entire perimeter of the lid and then around the body of cooler in two or three places. Do not tape down or otherwise restrict access to the cooler handles. Coolers used for shipping should not have any broken or missing handles.

9. Custody seals shall then be placed on the cooler to document the integrity of the shipping container. A minimum of two custody seals shall be placed on each cooler in a manner that the cooler cannot be opened with out breaking the seal. Each custody seal shall be signed and dated by the person packing the cooler and the seals shall covered by clear packing tape to prevent accidental loss or damage during shipping.

10. Affix a mailing label with the laboratory's address on the cooler. Apply clear tape over the address label to prevent accidental loss or damage during shipping. This label is required in addition to any shipping papers required by carriers.

B. Boxes

Some samples do not require temperature control and may be shipped in boxes. The boxes should be sturdy enough to withstand rough handling. No liquids shall ever be shipped by box. Materials suitable to be shipped by box include:

1. Air samples in summa canisters or airtight gas sampling bags or other non-pressurized sample containers.

2. Bulk asbestos samples.

3. Soil samples for geotechnical analyses.

These materials may be securely packed in a suitable box. The box shall be sealed with packing tape and affixed with address labels and custody seals as described above.

4.0 Documentation

A copy of any applicable shipping papers shall be retained for future reference. Any pertinent shipping information should be recorded on the Daily Field Report or in the field notebook for the project.

5.0 Special Notes

None

6.0 References

None

SOP No. F2024 *(2011rev)*
PROCEDURE FOR PROPER CONTAINMENT/STORAGE OF USED DRILLING FLUIDS, DECON. FLUIDS, PURGED GROUND WATER, INVESTIGATION-DERIVED SOLIDS, AND SELECTED EXCAVATED MATERIALS

1.0 Purpose

This SOP documents the procedures to properly contain or store drilling fluids that are recirculated from a borehole, extracted from a monitoring well, or generated during decontamination activities. Also, this SOP documents the procedures to be followed to properly contain auger cuttings, unused soil samples or soils excavated in areas of known or suspected contamination.

2.0 Equipment and Materials

- Five-gallon buckets
- Thirty-gallon trash can
- Portable water tank (of appropriate size)
- DOT- approved, closed-top, 55-gallon steel drum, Type 17E
- DOT-approved 55-gallon steel drums with locking open-top lids, Type 17H
- Roll-off Box
- Paint pen or permanent marker (indelible)
- Shovel
- Hand tools including hammer, bung wrench and ratchet equipped wth15/16” socket
- Visqueen
- Straw bales
- Stakes or concrete blocks
- Drum funnel

3.0 General

A. Management of Purge Water, Drilling Fluids, and Decontamination Fluids

1.0 Monitoring Wells/Extraction Wells Purge Water -Groundwater extracted from a monitoring well/extraction well and not used for laboratory analysis must be temporarily stored in a DOT-approved fifty-five gallon steel drum with a closed top unless otherwise directed by the Project Manager. As directed by the Project Manager, drums containing volatile free products should be fitted with bung caps capable of venting the vapors and grounded (if necessary). The drum shall be marked with the date of generation, the identification of the well the water was purged from, and the words "Purge Water." Purge water shall never be disposed of on the ground, into a sewer, or into a nearby stream unless permission has been granted from the appropriate regulatory agency. Purged groundwater may be processed on-Site if a groundwater treatment system is present.

2.0 Drilling Fluids - Water that is introduced to a boring by the drill rig to aid in the drilling procedure shall not be recirculated back through the boring

unless approved by the Project Manager. If water must be contained for disposal, the fluids shall be directed from the augers, casing or rods into a portable storage tank or tub via an overflow adapter. The contents of the portable tank shall be disposed as directed by the Project Manager.

3.0 Aquifer Test Purge Water - Water that is removed from the aquifer during a long duration pumping or step-drawdown aquifer test shall be disposed of as directed by the Project Manager.

Water extracted from a monitoring well to determine in-situ aquifer characteristics shall be stored in a portable container, or DOT approved drums near the well and disposed as directed by the Project Manager. The portable container shall be marked with the date of generation and the identification of the test well that water was extracted from.

4.0 Decontamination Fluids - Any fluids generated from decontamination procedures shall be stored in DOT-approved fifty-five gallon steel drums with a closed top, unless a Site-specific decontamination plan has other directives. The date of generation and the words "Decon Fluids" will be clearly marked on the drum.

B. Management of Drill Cuttings and Excavated Materials

1.0 Auger Cuttings - Soil produced from drilling operations (e.g., auger cuttings, unused samples) that is not saved for physical or chemical analysis shall be containerized on-site in DOT approved 55-gallon drums, containerized in lined roll-off boxes or stockpiled on and covered with V*isqueen*, that is secured to keep the cover in-place, consistent with the procedures described in Section 4.0.

Excavated Soils – On-Site management of soil excavated from areas of known or suspected contamination will be stockpiled on and covered with visqueen that is secured to keep the cover in-place or containerized in lined roll-off boxes, consistent with the procedures described in Section 4.0

4.0 Procedures

A. Drum Storage - Drums used to containerize auger cuttings, drilling fluids, purge water, decontamination water, etc. shall be clean DOT-approved 55-gallon steel drums with closed tops or locking open-top lids.

Auger cuttings and fluids, etc. shall be placed in drums as soon as possible to avoid contaminating the ground surface near the boring. Each drum shall be clearly labeled to identify the date of generation and the boring or well the material originated. If multiple drums are needed for a particular boring, they shall be consecutively numbered as they are generated. An example of proper drum labeling is as follows:

8/6/11	8/6/11
SB5-001	MW5-001
(Soil Boring 5 - Drum No. 001)	Monitoring Well 5 – Drum No.001
Project Number	Project Number
Auger Cuttings	Purge Water

Drums may also be labeled with a self-adhesive label, which may include the following information:

Generator's Name and Address
Site Number
Date
Soil Boring/Monitoring Well Number(s)
Contents

Soil from different soil boring locations shall not be mixed unless otherwise directed by the Project Manager. After the drums of soil are properly labeled and secured with a tight fitting lid, drums will be moved to a drum staging area. The location of the drum staging area shall be coordinated with the site owner/operator and Project Manager. The location selected should be away from traffic patterns, but accessible for future pick-up.

B. Stockpiling - Excavated soils shall be stockpiled consistent with Figure F2024-1. Mixing auger cuttings from different locations shall be verified with the Project Manager and the location of the stockpile shall be coordinated with the site owner/operator. Prior to selecting a location, the volume of soil to be stockpiled will be estimated to determine the space requirements for stockpiling. The location selected should be away from traffic patterns, but accessible for future pick-up. It may be appropriate to form separate stockpiles for soils generated from different sources.

C. Roll-off box - Excavated soils or auger cuttings shall be placed in lined roll-off boxes. The mixing of auger cuttings or excavated soils from different locations shall be verified with the Project Manager. Roll-off boxes shall be equipped with a lid or a good quality tarp for covering. All locking devices on lids and strapping devices on tarps shall be in good working condition. Tarps showing signs of wear, holes, tears or degradation shall be repaired or replaced. Strapping devices showing signs of damage or degradation shall be disposed and replaced. Following filling activities covers on roll-off boxes shall be closed and secured. The roll-off box storage location shall be coordinated with the site owner/operator. The location selected should be away from traffic patterns, but accessible for future pick-up.

Records shall be kept of contents in each box. These records may include the following information:

Roll-off box identification number
Generator's Name and Address
Site Number

Date
Soil Boring Number(s)
Excavation location
Contents

C. Soil Disposal - Prior to beginning the project, if possible, the Project Manager shall determine the soil disposal alternatives. If required, sampling for the purposes of waste profiling and disposal facility approval shall be completed following drilling and/or excavation, providing data consistent with the needs and requirements of the selected disposal facility(ies). Waste characterization sampling procedures are outlined in SOP F3028.

5.0 Documentation

A. For Drilling Fluids, Purge and Decontamination Water

1.0 The volume of water extracted from a well from developing or purging activities shall be recorded on the Groundwater Data Sheet or in the field notebook.

2.0 The volume of water that is extracted from a monitoring well/extraction well shall be recorded on the Aquifer Test Data Sheet or in the field notebook.

3.0 The volume of water collected from a boring during drilling procedures shall be recorded on the Soil Boring Log or in the field notebook.

4.0 The volume of decontamination fluids shall be recorded in a field notebook, Soil Boring Log, or Groundwater Data Sheet.

B. For Drill Cuttings and Excavated Material

1.0 If auger cuttings are placed in drums, the following information shall be included on the soil boring log, field notebook, or in the daily field report:

- the number of drums generated
- labeling procedures
- the type of drums used

2.0 If auger cuttings or excavated soils are stockpiled, this information shall be noted on the soil boring log, field notebook, or the daily field report. The estimated volume of soil produced from each source shall also be noted.

3.0 If auger cuttings or excavated soils are placed in roll-off boxes, this information shall be noted on the soil boring log, field notebook, or the daily field report. The estimated volume of soil produced from each source shall also be noted.

4.0 Photographs can be taken of the drum staging area, the soil stockpile or the roll-off box staging area to document that proper handling procedures were followed.

6.0 Special Notes

Investigative derived wastes shall be disposed of in an expeditious manner in accordance with local laws and regulations and not stored on-site for more than 90 days to avoid potential RCRA TSD reporting obligations. Waste staging shall be coordinated with facility personnel so these areas remain accessible and located in a safe, secure location.

Drum labels shall be filled out legibly with a ball point pen, permanent marker or paint pen. If drums are exposed to the weather labeling can fade from sun exposure.

7.0 Applicable Standards and References

None

SOP No. F3011 *(2011rev)*
SURFACE-WATER SAMPLE COLLECTION

1.0 Purpose

This section documents the procedures for collecting water samples from surface water and outfalls.

2.0 Equipment and Materials (as required)

- pH meter
- turbidity meter (optional)
- specific conductivity meter
- thermometer
- *latex* gloves
- unpreserved storage container for sampled water
- .45 micron filter(s) (metals analysis only)
- syringe or inline filtration system (i.e. peristaltic pump and associated tubing)
- 500 ml sampling jar

3.0 Procedures

A. The sample vial will be submerged in the surface water body, or positioned at the "end of pipe" for an outfall location. The vial's mouth should be positioned so that it faces upstream while the sampling personnel are standing downstream or within the outfall flow. **NOTE:** If preservatives are to be added to the sample, the sample container cannot be utilized as the sampling device. A certified clean glass laboratory jar with a minimum volume of 500 ml shall be utilized as the sampling device. Collection of the sample will be done in a manner that will minimize agitation of the water.

B. If necessary, a field determination of pH, conductivity, turbidity, and temperature will be made following the manufacturer's recommendations for calibration and operation of the relevant meters. All samples will be properly packed in the shipping cooler prior to leaving the sampling location.

C. If volatile organic compounds (VOCs) are to be analyzed, the sample will then be transferred from the sample jar to a VOC vial. A convex meniscus should form on the mouth of the vial. The vial will be capped tightly to eliminate headspace and the sealed vials will be checked for air bubbles.

D. The sample vials will be labeled at the sampling location.

E. All materials used during sample collection must be either properly disposed, or in the case of reusable equipment, must be properly decontaminated following the procedures documented in HAI SOP No. F1000.

F. Dependent upon project-specific needs, field filtering using a 0.45 micron filter for dissolved metals may be required. In this case, in-line filtering is preferred; however,

open system techniques are acceptable. The sample should be pressurized through the filter media using a syringe immediately upon collection and prior to preservation.

4.0 Documentation

A number of different documents will be completed and maintained as part of the sampling effort. The documents must provide a summary of the sample-collection procedures and conditions, shipment method, the analyses requested, and the custody history. The following is a list of the documents that must be filled out:

- water sample collection record/field notebook
- sample labels
- chain-of-custody records
- shipping receipt (e.g., *Federal Express* receipt)

5.0 Special Notes

None

6.0 Applicable Standards and References

None

SOP No. F3014 *(2002rev)*
CHAIN-OF-CUSTODY PROCEDURES

1.0 Purpose

This SOP documents the chain-of-custody (COC) procedures that will be employed during all sampling activities.

2.0 Equipment and Materials

- Indelible ink ball-point pens
- Chain-of-custody records
- One-gallon size *Zip-Loc* (or equivalent) storage bags

3.0 General

A completed COC record must accompany every sample from the point of collection to delivery to the laboratory. A single COC record may accompany several samples as long as all the samples are contained in a single unit (e.g., cooler, box, etc.). If a single COC is to be used for multiple samples in multiple coolers then a photocopy of the original COC must be placed in each cooler. All COCs will be kept in one-gallon *Zip-Loc* bags to prevent damage from melting ice, broken samples, and bad weather. A copy of every completed COC record will be retained in the project files.

4.0 Procedures

4.1 Completion of COC Record

A. The COC record is initiated in the field by the sampler(s) immediately after a sample is collected. Figure F3014-1 illustrates a properly completed COC.

B. The sample identification number will be recorded on the COC. Each sample number consists of three distinct data fields. A space for each data field is provided on the COC. These data fields include; Project Number, Sample Location, and Sample Type & ID.

C. The number of containers that makes a complete sample will be recorded in the box labeled "No. of Cont.". A sample may consist of multiple containers depending upon the analytical procedures requested.

D. If the sample is to be analyzed for metals, the box labeled "Metals" shall be completed to indicate whether the sample fractions for metals have been filtered. A "F" will be used to indicate that the metals were filtered and a "N" will indicate that they were not filtered. Occasionally, some samples may require metal fractions to be filtered and not filtered (e.g., analyses for dissolved and total metals). In this case a "B" will be used to indicate that the sample contains both filtered and non-filtered fractions. If the sample does not require analyses for metals or is not applicable to filtering (i.e., solid sample) a single line will be drawn through this box.

E. The date and time (military) of sample collection will be recorded in the box labeled "Sampling Date/Time". It is very important to note the exact time each sample was collected.

F. The requested analytical methods will be recorded in the diagonal spaces provided under the box labeled "Analyses". The analytical method should always be referenced. Generalized descriptions such as “Metals” are not acceptable unless they reference a specific list (i.e., RCRA metals, Priority Pollutant List metals, etc).

G. Any preservatives added to the containers for each analytical method will be indicated by recording the letter in the box labeled "Preservatives" that corresponds to the preservative added. The preservatives and corresponding letters are listed near the top of the COC record.

H. A check mark or an “X” will be made under each fraction for which a particular sample will be analyzed. Drawing a line down the column or using quotes is not acceptable.

I. Any comments relating to the collected sample(s) can be recorded in the box labeled "Comments". These comments may indicate special handling or analytical instructions for the laboratory (e.g., compositing instructions, confirm MTBE, etc.) or may be used to indicate the location of sample collection.

J. Additional information required on the COC record includes the person the analytical reports should be sent to, client, site, project description, project number and phase, names of all samplers involved in sample collection, where the samples are to be delivered, method of delivery, and airbill number (if applicable).

4.2 Transfer of Custody

A. The COC record must document the transfer of custody each time the sample(s) changes hands. The National Enforcement Investigations Center (NEIC) of the EPA defines custody as:

1. the sample is in your physical possession;

2. the sample is within view after being in your physical possession;

3. the sample was in your possession and then you locked it or sealed it to prevent tampering; and/or

4. the sample is placed in a designated secure place with limited access to authorized personnel only.

B. When transferring custody of samples, the person in custody (e.g., the sampler) must sign the box labeled "Relinquished By" and fill in the date and time (military time) the custody of the samples was relinquished. The person accepting custody of the samples must then sign the box labeled "Received By" and complete the date and time (military time) the custody of the samples was accepted.

C. The above procedures must be followed until the samples are delivered to the laboratory. Both internal (within the same organization) and external (between different organizations) transfers need to be documented. In cases where a commercial courier (e.g., Federal Express) is used to deliver the samples, the person relinquishing custody to the courier should put the name of the courier in the "Received By" box and seal the COC inside the cooler. Most couriers have a policy against signing for custody of samples.

D. The pink copy (bottom) of the COC will be retained by the sampler before the samples are shipped and the remaining copies (white and yellow) of the COC are delivered to the laboratory. The pink copy will then be immediately given to the QAO. The white copy will be returned by the laboratory with the final report.

5.0 Documentation

Chain-of-custody record

6.0 Special Notes

If samples are shipped via commercial courier on Friday the air bill needs to be checked for Saturday delivery.

Sample cooler packing instructions are documented in Hull's SOP F1013.

If samples are known to contain flammable or hazardous materials they need to be shipped accordingly. Check with the courier for specific shipping, labeling and packing requirements.

7.0 Applicable Standards and References

U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

U.S. Environmental Protection Agency. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/001, December 1987.

Figure 3014-1

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CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

NO.

☒ Dublin, OH	☐ Indianapolis, IN	☐ Mason, OH	☐ Solon, OH	☐ Toledo, OH
6397 Emerald Parkway Suite 200 Dublin, OH 43016 Phone: (614)793-8777 Fax: (614)793-9070	6330 E. 75th St. Suite 174 Indianapolis, IN 46250 Phone: (317)558-0558 Fax: (317)558-0553	4900 Parkway Dr. Suite 100 Mason, OH 45040 Phone: (513)459-9677 Fax: (513)459-9869	6161 Cochran Road Suite A Solon, OH 44139 Phone: (440)519-2555 Fax: (440)519-2560	3401 Glendale Ave. Suite 300 Toledo, OH 43614 Phone: (419)385-2018 Fax: (419)385-5487

REPORT TO: K. Wildman

Client: ABC Company
Site: Anytown, U.S.A
Project #: ABCØØ1 Phase: Ø1.SMP
Samplers: J. Small, T. Lurge

SAMPLE TYPES: A - AIR; C - ASBESTOS; D- SEDIMENT; G- GROUNDWATER; P- PRODUCT; S- SOIL; W- WATER; Z- OTHERS

PRESERVATIVES: A - Cool only, <4 deg. C; B - HNO_3 pH<2; C - H_2SO_4 pH<2; D - NaOH pH>12; E - ZnAcetate + NaOH, pH>9; F - $(NH_4)_2S_2O_8$ (0.008%); G - HCL pH <2

METALS: F - FILTERED; N - NOT FILTERED; B - BOTH

All samples are kept at 4 degrees Celsius.

PROJECT NO.	SAMPLE LOCATION	SAMPLE TYPE & ID	NO. OF CONT.	METALS	COLLECTION DATE/TIME	PRESERVATIVES	ANALYSES: A	A	G	B							COMMENTS
							VOCs - 8260	PAHs - 8310	VOCs - 8260	RCRA metals							
ABCØØ1	MW-1	SØ2ØØ3Ø	2	–	11/8/02 0905		X	X									
ABCØØ1	MW-2	SØ3ØØ35	2	–	11/8/02 1013		X	X									(Hold sample)
ABCØØ1	MW-3	SØ8Ø1ØØ	2	–	11/8/02 1315		X	X									
ABCØØ1	MW-1	GW1Ø8Ø2	3	F	11/8/02 1528				X	X							
ABCØØ1	FB1	WW1Ø8Ø2	2	–	11/8/02 1530				X								
ABCØØ1	TB1	WW1Ø8Ø2	2	–	11/8/02 –				X								

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
J. Small	11/9/02	1430	FEDEX	11/9/02	1430
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:	DATE:	TIME:

COOLER TEMPERATURE AS RECEIVED: °C

DISTRIBUTION:
WHITE - LAB USE (MUST BE RETURNED WITH REPORT)
YELLOW - LAB USE
PINK - RETAINED BY HULL

Deliver To: SONIC LAB, INC
Method of Delivery: FEDEX
Airbill Number: 798321ØØ9X
NOTES: VAP Project
TURN AROUND TIME: 14 DAYS

SOP No. F3021 ***(2000rev)***
SURFACE AND SHALLOW SUBSURFACE SOIL, SLUDGE, OR SEDIMENT SAMPLING

1.0 Purpose

These procedures will be followed when collecting surface or shallow subsurface soil, sludge or sediment samples. The procedure describes recovery of samples from dry, saturated or submerged soil, sludge or sediment.

2.0 Equipment and Materials

For sampling dry or saturated soil, sludge or sediment (non-submerged)

- sampling spoon, trowel, or scoop (cleaned, and not plated or painted)
- Encore sampler for VOCs (refer to SOP No. F3022 for this sampling device)
- stainless steel mixing bowl or *Teflon* tray
- sample containers
- sampling gloves
- decontamination supplies

For sampling submerged soil, sludge or sediment

- Optional sampling equipment depending on conditions, including depth:
  - stainless steel spoon or similar device (cleaned)
  - dual purpose soil recovery probe with plastic sleeve inserts
  - modified AMS soft sediment sampler
  - core sampler with butterfly valve and hammer attachment
  - Eckmann or Ponar dredge with appropriate line
  - clear PVC pipe, beveled cut on entry end, core catcher installed
  - PVC pipe of appropriate diameter for core hole casing
- appropriate laboratory sample containers
- stainless steel mixing bowl or Teflon tray
- sampling gloves
- decontamination supplies

3.0 Procedures

The sampling procedure varies depending upon whether the soil, sludge or sediment is submerged or not, and how deeply it is submerged. Ideally, an initial bathymetric survey will guide the choice of sampling technique at various locations.

3.1 Sampling dry or saturated soil, sludge or sediment (non-submerged)

Under these conditions, a spoon is used to obtain samples.

Discrete Samples

A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified in SOP No. F1000.

B. If a shallow subsurface sample is desired, the trowel or spade will be used to remove the top layer of soil to the desired sample depth.

C. A sampling device (e.g., spoon) will be used to remove the sample from the soil on the blade of the trowel or spade, avoiding the thin layer of soil from the area which comes in direct contact with the trowel or spade.

D. The sample will be placed into an appropriate sample container.

E. The sample container will be labeled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.

F. The labeled sample container will be placed in an appropriate transport container with ice (if required) as soon as possible.

G. All sampling equipment will be decontaminated between sample locations in accordance with the procedures specified in SOP No. F1000.

Composite Samples

Discrete samples that comprise a composite sample will be collected as described above; however, a stainless steel mixing bowl or *Teflon* tray will be used for mixing the discrete samples prior to placing the sample in the laboratory-supplied sample containers. Composite sampling is generally not recommended when samples are to be analyzed for volatile organics (see SOP No. F3022 for use of Encore sampler).

3.2 Sampling submerged soil, sludge or sediment

In very shallow water (e.g., less than one foot), it may be possible to obtain surface or shallow subsurface sediment samples with a spoon as described in section 3.1 above. In deeper water, surface sediment samples (top one to two inches) of soft sediment may be obtained with a dredge (e.g., Eckmann, Ponar, or other equivalent device) if there is no leaf litter layer or other obstruction. Where samples must be obtained from sediments deeper than one to two inches, or where surface litter or sediment density precludes efficient dredge operation, core sampling must be conducted.

Sampling using a dredge

A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified SOP No. F1000.

B. The appropriate length of suitable suspension cord will be attached to the decontaminated sampler. A 3/16 inch diameter braided line will normally provide sufficient strength; however, a 3/8 inch diameter line will allow easier hand hoisting.

C. The distance beneath the surface to the sample location will be marked on the sample line. A second mark will be identified on the sample line that is approximately one meter less to indicate proximity to the sample depth. This will identify the depth where the lowering rate will be reduced to minimize unnecessary disturbance of the sludges or sediments. If sampling relatively shallow streams, it is not necessary to mark the line because the sampler will be lowered very slowly until the bottom is contacted.

D. The free end of sample line will be tied to a fixed support to prevent the accidental loss of sampler. Allow sufficient slack in the line to perform sampling activities.

E. The sampler jaws will be opened until they latch. From this point on, the sampler will be supported by its sample line only or the sampler may be tripped and the jaws will close prematurely.

F. The sampler will be slowly lowered until the proximity mark (the first mark encountered) is reached or the bottom is contacted.

G. The rate of descent will be slowed through the last meter of fall until contact with the bottom is felt.

H. The sample line will be allowed to go slack several inches. In strong currents, more slack may be necessary to release the mechanism. In shallow streams, the top of the clamshells may be gently pushed with a probe to allow the clamshells to sink deeper into the sediments and maximize recovery.

I. The sampler will be raised clear of the liquid surface.

J. The sampler will be placed into a stainless steel or *Teflon* tray and opened. The sampler will be lifted clear of the tray.

K. The sample will be collected with the sampling device (e.g., spoon) and placed into an appropriate sample container.

L. The sample container will be labeled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.

M. The labeled sample container will be placed in an appropriate transport container on ice (if required) as soon as possible.

N. All sampling equipment will be decontaminated in accordance with the procedures specified in SOP No. F1000.

Sampling with a core sampler

The following general procedures are applicable to all coring devices. Equipment-specific procedures will be used where / when applicable.

Discrete Samples

A. Samples recovered from the first depth interval (zero to twelve inches) may be obtained with a stainless steel spoon if water depth allows. The sample will be placed in a properly labeled laboratory container. The labeling must include the date of collection, project no., sample location, sample number, sampling depth interval, and sampler's ID number.

B. If required for the samplers being used, plastic sampling sleeves will be inserted in all samplers before samples are recovered. The sleeves will be used once and then discarded in an appropriate container.

C. All depth intervals will be sampled with the appropriate core sampling device. The sample will then be transferred to the sample containers by pouring the sediments into the appropriate containers. If it is not possible to pour the sediments, a clean stainless steel spoon or spatula may be used to facilitate the transfer.

D. Sampling equipment shall be decontaminated between sample intervals, as well as between sampling locations, in accordance with SOP No. F1000.

Composite Samples

Composite samples are typically comprised of samples from equivalent sediment depths at multiple locations.

A. Composite samples, consisting of a pre-determined number of discrete samples, may be recovered using the soil recovery probe. Dedicated plastic sampling sleeves will be used for these composite samples. The probe will be driven to an appropriate depth, and a sample recovered from the appropriate depth at each sampling location. The equal volume samples will then be composited by mixing in a stainless steel pan and then placed in a properly labeled laboratory container. The sampling equipment shall be decontaminated between sampling zones in accordance with SOP No. F1000 (i.e., between areas represented by a composite sample).

B. Where exact mapping of sample locations is required, the discrete sample locations shall be marked in such a way that they can be properly mapped.

4.0 Documentation

Each sample container will be labeled as directed by the Project Work Plan or by the Project Manager and a chain-of-custody record will be completed. A field log book or other Field Data Sheet will be kept describing the sampling procedures, the sample locations, all sample identification numbers, and any deviations from this SOP. A map or site sketch will be constructed of all sample locations using field measurements or from coordinates obtained from a qualified surveyor. If necessary, an elevation of the sample location will be obtained and referenced to an appropriate benchmark.

5.0 Special Notes

The decontamination process will be repeated after each use and between all discrete sample locations. If compositing strategies are used, decontamination may only be required between composite samples (i.e., not between discrete samples that form a single composite). Sample gloves shall be changed in between each location.

6.0 Applicable Standards and References

U.S. EPA. Characterization of Hazardous Waste Sites, A Methods Manual - Vol. II, Available Sampling Methods. 2nd Ed. 12/84. EPA/600/4-84/076.

SOP No. F4008 *(2000rev)*
SOIL/WATER SAMPLE HEADSPACE SCREENING
WITH A PHOTOIONIZATION DETECTOR OR FLAME IONIZATION DETECTOR

1.0 Purpose

This section documents the procedures that will be followed to perform headspace screening on soil and water samples using a photoionization detector (PID) or a flame ionization detector (FID).

2.0 Equipment and Materials

- PID equipped with the appropriate eV bulb, or FID, as determined in the project work plan or as determined by the Project Manager
- adequate supply of calibration gas
- clean glass jars with lids
- 1 qt. *Zip-loc* baggies or equivalent
- aluminum foil

3.0 Procedures

A. The PID or FID will be calibrated in the field in accordance with the manufacturers' requirements. Calibration should be performed at a minimum interval of once per day, specifically at the beginning of each day. The time, date, and other pertinent calibration information (e.g., span setting, if appropriate) will be recorded in the field notebook and equipment calibration log.

B. When the sample (e.g., soil or water) is collected, it will be placed into the glass sample jar until the jar is approximately half full. The mouth of the jar will be sealed with clean aluminum foil and the lid placed on the jar so that the foil is sealed against the jar. The sample jar will be agitated for at least fifteen seconds, taking care to avoid piercing the foil seal. The sample will be allowed to develop for five to ten minutes in a warm area. The probe will be inserted through the foil seal and the maximum instrument response (which should occur after two to five seconds) will be recorded.

As an alternative, *Zip-loc* baggies or equivalents may be used to screen soil samples. The sample will be prepared in the same manner as with a glass jar. After the sample has developed, the probe will be inserted through a small opening in the upper portion of the baggie to obtain the maximum headspace reading. The opening should be immediately closed around the probe to minimize any dilution of the headspace vapor. The bag should not be squeezed during headspace measurement.

C. Special care will be taken to avoid inserting the probe directly into the sample (e.g., soil or water), thus preventing permanent damage to the instrument.

4.0 Documentation

PID or FID readings and calibration data will be recorded in the equipment calibration log, and field notebook, or on an appropriate data sheet.

5.0 Special Notes

Where feasible, use of the PID shall be avoided in atmospheres with high humidity. The meter response is affected by high humidity. In addition, a PID or FID should be acclimated to the atmosphere that will be measured (i.e., the instrument will not be used immediately after taking it from a heated car or building to a cool outdoors). The instrument should be allowed to equilibrate for approximately fifteen to thirty minutes before it is used.

FIDs are sensitive to methane. If methane gas is present or suspected, the sample must be screened with a charcoal filter and without the filter. The difference in results is the concentration of volatile organics present in the sample.

6.0 Applicable Standards and References

Calabrese, E.J and P.T. Kostecki. Petroleum Contaminated Soils, Volume 2. Lewis Publishers, Inc. pp 133-135. 1989.

APPENDIX B

COC Form

Hull & associates, inc.

CHAIN OF CUSTODY RECORD

PAGE ____ OF ____

NO. 9819

Dublin, OH ☐
6397 Emerald Pkwy
Suite 200
Dublin, OH 43016
P: (614) 793-8777
F: (614) 793-9070

Indianapolis, IN ☐
6435 Castleway W. Dr.
Suite 119
Indianapolis, IN 46250
P: (800) 241-7173
F: (614) 793-9070

Mason, OH ☐
4770 Duke Dr.
Suite 300
Mason, OH 45040
P: (513) 459-9677
F: (513) 459-9869

Bedford, OH ☐
4 Hemisphere Way
Bedford, OH 44146
P: (440) 232-9945
F: (440) 232-9946

Toledo, OH ☐
3401 Glendale Ave.
Suite 300
Toledo, OH 43614
P: (419) 385-2018
F: (419) 385-5487

Pittsburgh, PA ☐
300 Business Center Dr.
Suite 320
Pittsburgh, PA 15205
P: (412) 446-0315
F: (412) 446-0324

REPORT TO: _____

Client: _____

Site: _____

Project #: _____ Phase: _____

Samplers: _____

SAMPLE TYPES	PRESERVATIVES		METALS
A - AIR	A - Cool only, <4 deg. C	H - EDTA	F - Filtered
C - ASBESTOS	B - HNO_3 pH<2	I - 5ml 1:1 HCL	N - Not filtered
D - SEDIMENT	C - H_2SO_4 pH<2	J - None	B - Both
G - GROUNDWATER	D - NaOH pH>12	K - Stored in dark	
P - PRODUCT	E - ZnAcetate + NaOH, pH>9	L - NH_4Cl	
S - SOIL	F - $Na_2S_2O_3$ (0.008%)	M - Methanol	
W - WATER	G - HCL pH <2	S - Sodium bisulfate	
Z - OTHERS			

All samples are kept at 4 degrees Celsius.

ANALYSES

PRESERVATIVES

PROJECT NO.	SAMPLE LOCATION	SAMPLE TYPE & ID	NO. OF CONT.	METALS	COLLECTION DATE/TIME												COMMENTS
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												
	:	:			/												

RELINQUISHED BY:	DATE: / TIME:	RECEIVED BY:	DATE: / TIME:
RELINQUISHED BY:	DATE: / TIME:	RECEIVED BY:	DATE: / TIME:
RELINQUISHED BY:	DATE: / TIME:	RECEIVED FOR LAB BY:	DATE: / TIME:

COOLER TEMPERATURE AS RECEIVED: °C

DISTRIBUTION:
WHITE - LAB USE (MUST BE RETURNED WITH REPORT)
YELLOW - LAB USE
PINK - RETAINED BY HULL

Deliver To: _____

Method of Delivery: _____

Airbill Number: _____

NOTES: _____

TURN AROUND TIME: _____ DAYS