QUALITY ASSURANCE PROJECT PLAN (QAPP)

BROWNFIELD CLEANUP PROGRAMS
SITE INVESTIGATION WORK PLANS
BUILDINGS 7, 8 AND 10

GM COMPONENTS HOLDINGS LOCKPORT FACILITY
200 UPPER MOUNTAIN ROAD, LOCKPORT, NEW YORK

REVISION NUMBER 1
June 18, 2010

Prepared By: Haley & Aldrich of New York

Prepared For: GM Components Holding, LLC (GMCH)

Approved By: ______________________ Date: 6/16/10
James Hartnett GM Project Manager

Approved By: ______________________ Date: 6/16/10
Chris Boron Project Manager

Approved By: ______________________ Date: 6/16/10
Denis Conley Project Quality Assurance Officer

TABLE OF CONTENTS

Page

LIST OF TABLES

1.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and specific quality assurance / quality control (QA/QC) procedures associated with the Remedial Investigations at the GMCH-Lockport Facility located at 200 Upper Mountain Road in Lockport, New York. These investigation activities will be conducted in accordance with the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Agreements executed with GMCH on 20 May 2010. Three (3) separate BCP Sites associated with the GMCH Lockport Facility, as follows.

- GM Components Holdings, LLC Building 7, site ID #C932138 (Building 7)
- GM Components Holdings, LLC Building 8, site ID #C932139 (Building 8)
- GM Components Holdings, LLC Building 10, site ID #C932140 (Building 10)

Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described in this document apply to each Site Investigation and/or specifically referenced to related Remedial Investigation Work Plans (RIWPs).

1.1 INTRODUCTION

This QAPP has been prepared on behalf of GMCH, LLC as a component of the RIWPs, that also includes a Health and Safety Plan (HASP), and Citizen Participation Plan (CPP).

1.1.1 PROJECT OBJECTIVES AND DECISION STATEMENT

The primary objectives for data collection activities include:

i) Define the nature and extent of releases of hazardous wastes and/or hazardous constituents in environmental media (soil, groundwater, and/or soil vapor and indoor air) at the Site;
ii) Collect sufficient data and information to evaluate the risk to human health and the environment, if any, associated with any releases of hazardous waste and/or hazardous constituents; and
iii) Collect sufficient data to support the development of a Remedial Action Work Plan to address environmental media impacted by hazardous constituents at levels that exceed the applicable criteria provided by 6NYCRR Part 375.6.

The Decision Statement for the RI is as follows:

i) Determine whether interim remedial actions are necessary to control current unacceptable risks, if any, to human health or the environment; and

ii) Provide data for the development of a study of appropriate corrective measures (if warranted) to control current and future unacceptable risks to human health and the environment.

Specific data quality objectives (DQO) for field and laboratory data collection and analysis activities are discussed in Section 1.4 of this plan.

1.1.2 PROJECT STATUS/PHASE

The project status and investigation approach is presented in the RIWP. Section 1.1 summarizes the Site Description. Section 1.3 describes the Areas of Interest (AOI) to be investigated and gives a brief description of each area and the proposed investigation for each AOI at the Site.

1.1.3 QAPP PREPARATION GUIDELINES

As previously noted, this QAPP has been prepared to present the project specific QA/QC elements in accordance with “EPA Guidance for Quality Assurance Project Plans”, EPA QA/G-5, EPA/600/R-98/018, February 1998 and NYSDEC Division of Remediation DER-10, Technical Guidance for Site Investigation and Remediation, June 18, 2010.

1.2 SITE DESCRIPTION

The GMCH Lockport facility is located at 200 Upper Mountain Road in both the City and Town of Lockport, which is located in Niagara County, New York. The portion of the facility which includes Building 10 is located within the City of Lockport. The GMCH Lockport facility is approximately 342 acres in size and located in an area of mixed residential, agricultural, commercial, and industrial settings along Upper Mountain Road. Within the facility, Building 7, Building 8 and Building 9 are dedicated to manufacturing and engineering. Building 10 includes manufacturing operations staffed by non-GMCH personnel in the northern portion with the southern portion used by GMCH as a warehouse. Building 6 has been leased to Delphi Properties Management, LLC for vehicle component engineering and testing.

1.3 SITE BACKGROUND

The Site Background is provided in Section 1.3 of the RIWP and incorporated here by reference.

Background	Work Plan Section 1.3
Past Data Collection Activities	Work Plan Section 1.3

1.4 PROJECT OBJECTIVES AND INTENDED DATA USE

The objectives of the RI is to obtain Site specific data on the nature and extent of potential soil, groundwater, soil vapor and indoor air contamination and the degree to which the identified site conditions pose a threat to human health and the environment. It should be noted that the RIs for the three BCP Sites at the Lockport facility will be conducted concurrently. The data generated as part of each Building RI will be evaluated as an individual Site and as part of a site-wide investigation using data collected from the other RIs at the Lockport Facility.

In addition to the investigation activities to be conducted as part of the three BCP Sites, 18 existing monitoring wells will be sampled in 2010 as part of other on-going monitoring and/or investigation. This groundwater data will also be used in conjunction with the RIs to assess site-wide conditions. The specific objectives of the RI are as follows:

- Further assess Site geology;
- Further assess hydrogeology;
- Evaluate extent of contamination;
- Evaluate transport mechanisms;
- Assess the potential source(s) of contamination and assess impact to soil and groundwater; and
- Identify potential pathways for human exposure as part of a qualitative risk assessment.

1.4.1 TARGET PARAMETER LIST

The investigative program includes the sampling and analysis of environmental media for the presence of organic and inorganic constituents based on historical operations at the Site. The field and laboratory parameters are summarized below and presented in Table 1.1.

1.4.1.1 FIELD PARAMETERS

Concurrent with sample collection, several field parameters will be determined by the field sampling personnel. For soils and solid matrices, these field parameters will include visual observations, odor identification, and VOC screening using handheld monitoring equipment. For aqueous samples (groundwater), at a minimum, the following parameters will be determined with field testing equipment: pH, specific conductivity, and temperature. The low-flow purging techniques utilized for groundwater sampling, will also measure additional field parameters including turbidity, dissolved oxygen, and oxidation/reduction potential (ORP).

1.4.1.2 LABORATORY PARAMETERS

The laboratory parameters include target compound list (TCL) volatile organic compounds (VOCs), TCL-semi volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), and target analyte list (TAL) metals excluding earth metals aluminum, calcium, iron, magnesium, potassium, and sodium. The basis for the selected parameter list is provided in Section 1.3 and 1.4 of the RIWP.

Table 1.2 presents the estimated quantitation limits (EQL) for each compound or analyte. Method detection limit (MDL) studies have been performed in accordance with the procedures established in the Federal Register, Volume 49, number 209, October 26, 1984 pp. 198-199.

1.5 SAMPLING LOCATIONS

The RIWP provides a summary and rationale for the location of soil, groundwater, soil vapor (subslab) and indoor air samples within each BCP investigation area. It is possible, however, that depending on the nature of encountered field conditions, sampling locations may change. Any change of the sampling strategy will only be implemented after approval from the GM Project Manager and NYSDEC.

1.6 PROJECT SCHEDULE

The schedule of projected milestones is presented in the Section 6.0 of the individual Building RIWPs.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The GM Project Manager will have the primary responsibility for the implementation of the RIWP. Test America Buffalo will perform the analyses of environmental samples collected at the Site. This section defines the roles and responsibilities of the individuals who will perform the RI activities.

2.1 MANAGEMENT RESPONSIBILITIES

A description of the project organization and responsibilities of key personnel are as follows:

<u>Glen May - NYSDEC Project Manager -</u>

The NYSDEC Project Manager has the overall responsibility for regulatory oversight of all phases of the RI.

<u>James Hartnett– GM Project Manager</u>

The GM Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The GM Project Manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The GM Project Manager will provide the major point of contact and control matters concerning the project and represent the project team at regulatory agency meetings and public hearings. The Project Manager will define project objectives and develop a detailed project schedule. The GM Project Manager will establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task.

<u>David J. Hagen - Haley & Aldrich Project Director</u>

The Project Director will provide final review of significant work products and may participate in technical meetings with the NYSDEC. The Project Director will ensure that overall technical quality is maintained. He will be actively involved in the direction of the project. The Project Director has overall responsibility for ensuring that the project meets RI objectives.

Christopher Boron – Project Manager

The Project Manager is responsible for managing the implementation of the RIWP and coordinating the collection of data during the RI. The Project Manager is responsible for technical quality control and project oversight. The Project Manager also provides approval of the QAPP.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance team will consist of a Quality Assurance Officer and the Project Manager. Quality Assurance responsibilities are described as follows:

Denis Conley–Quality Assurance (QA) Officer

The QA Officer reports directly to the GM Project Manager and will be responsible for ensuring that all QA/QC procedures are being followed. The QA Officer will be responsible for overseeing the review of all field and laboratory data. Additional responsibilities include:

i) Assuring the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
ii) Conducting internal QA/QC of the investigation activities;
iii) Providing input to the Project Director and the Project Manager as to corrective actions required resulting from the above-mentioned evaluations;
iv) Preparation and review of data validation and audit reports; and
v) Approval of the QAPP.

The QA Officer will be assisted by the data validation staff in the evaluation and validation of field and laboratory generated data. The QA Officer will monitor the performance of the laboratory to ensure that the Data Quality Objectives for the project are met.

2.3 LABORATORY RESPONSIBILITIES

Test America Buffalo Laboratory will provide laboratory services for groundwater and soil analyses in support of the RIWP. Centek Laboratories of Syracuse New York will provide laboratory services for soil vapor and ambient air analyses.

Paul Morrow- Laboratory Project Manager – Test America Buffalo

David Linda- Laboratory Project Manager

The Laboratory Project Manager will report directly to the Project QA Officer and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports and approval of the laboratory's ability to adhere to the QAPP.

Data Validation Staff

The data validation staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 8.2.2 of this document and be presented in a formal written report for submittal to the Project Manager.

2.4 FIELD RESPONSIBILITIES

Jennifer Davide– Field QA Officer

The Field QA Officer is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field QA Officer works with the project Health & Safety Officer to conduct operations in compliance with the project Health & Safety Plan. The Field QA Officer will facilitate communication and coordinate efforts between the Project Director and the field team members.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The RIWP and associated QAPP are designed to produce data of the quality necessary to achieve the project objectives and meet or exceed the minimum standard requirements for field and analytical methods. The following sections provide the criteria used to measure the field and laboratory analytical data quality.

3.1 PRECISION

3.1.1 DEFINITION

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be stated in terms of relative percent difference (RPD). The overall precision of measurement data is a mixture of sampling and analytical factors. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The analytical results from the field duplicate samples will provide data on sampling precision. The results from the laboratory created duplicate samples will provide data on analytical precision.

3.1.2 FIELD PRECISION SAMPLE OBJECTIVES

Field precision will be assessed through collection and measurement of field duplicates at a rate of 1 duplicate per 20 investigative samples.

3.1.3 LABORATORY PRECISION SAMPLE OBJECTIVES

Laboratory duplicate analyses will be performed through the use of matrix spike/matrix spike duplicates (MS/MSD) for organic parameters and matrix duplicate (MD) analyses for certain inorganic parameters. The analytical data will be presented in summary table format.

3.2 ACCURACY

3.2.1 DEFINITION

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical procedure limitations.

3.2.2 FIELD ACCURACY OBJECTIVES

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Field equipment rinse and trip blanks will be collected as appropriate for each sampling effort.

Field equipment rinse blanks will be collected by passing laboratory purified water over and/or through the respective field equipment utilized during each sampling effort. One (1) equipment rinse blank sample will be collected for each type of field equipment used for the sampling effort.

Field equipment rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected. (Note: If dedicated or disposable sampling equipment is used, equipment rinse samples may not be collected as part of that field effort.)

Trip blank samples will be prepared by the laboratory and provided with each cooler that includes volatile organic compound (VOC) analysis containers. Trip blank samples will be analyzed for each VOC for which environmental media have been collected for analysis.

3.2.3 LABORATORY ACCURACY SAMPLE OBJECTIVES

Analytical bias will be assessed through the use of known laboratory control samples and site specific matrix spike sample analyses. Laboratory control samples (LCS) and MS/MSD sample analysis will be performed as prescribed by the analytical method SOPs. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One (1) set of MS/MSD analyses will be performed with each batch of twenty (20) project samples to assess the accuracy of identification and quantification of analytes within the site-specific sample matrices. Additional sample volume will be collected at sample locations selected for MS/MSD analyses so that MDLs and EQLs can be met.

The results of the LCS and MS/MSD analyses will be presented in a summary table reporting format and evaluated versus the acceptance criteria presented in the laboratory analytical reports.

The accuracy of organic parameter analyses is also monitored through the analysis of system monitoring or surrogate compounds. Surrogate compounds are added to each sample, standard, blank, and QC samples prior to the sample preparation and analysis. Surrogate compound percent recoveries provide information on the effect of the sample matrix on the accuracy of the analyses and are evaluated against the acceptance criteria presented in laboratory analytical reports.

3.3 REPRESENTATIVES

3.3.1 DEFINITION

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied by proper selection of sampling locations and quantity of samples collected.

3.3.2 MEASURES TO ENSURE REPRESENTATIVES OF FIELD DATA MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA

Representativeness will be addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

For this project, sampling will be biased; that is, sampling associated with the soil and groundwater will be based on the observed presence/absence of site specific contaminants, and/or site knowledge. Specific sampling technique descriptions, which allow consistency, repetitiveness and thus representativeness, are provided as Field Method Guidelines (FMGs).

3.3.3 MEASURES TO ENSURE REPRESENTATIVES OF LABORATORY DATA

Representativeness in the laboratory is ensured by using proper analytical procedures, and analyzing field duplicate samples. By definition, field duplicate samples are collected to be representative of a given point in space and time. Thus, sample duplicates provide both precision and representativeness information.

3.4 COMPLETENESS

3.4.1 DEFINITION

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the amount that was expected to be obtained under normal conditions. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a high degree of confidence.

3.4.2 FIELD COMPLETENESS OBJECTIVES

Completeness is a measure of the amount of valid measurements obtained from measurements taken in this project. Field completeness objective for this project will be > 90 percent.

3.4.3 LABORATORY COMPLETENESS OBJECTIVES

Laboratory data completeness objective is a measure of the amount of valid data obtained from laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort. Corrective actions such as revised sample handling procedures will be implemented if problems are noted.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total data set. The completeness objective will be greater than (>) 90 percent.

3.5 COMPARABILITY

3.5.1 DEFINITION

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another.

3.5.2 MEASURES TO ENSURE COMPARABILITY OF FIELD DATA

Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through using standard operating procedures to collect, preserve, store, and analyze representative samples and the reporting of analytical results. The FMG for the various activities to be conducted during this RI provides guidelines to generate reproducible results.

3.5.3 MEASURES TO ENSURE COMPARABILITY OF LABORATORY DATA

Comparability of laboratory data will also be measured with the results from the analysis of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST) for instrument initial and continuing calibration verification. The reported analytical data will be presented in standard units of mass of contaminant within a known volume or mass of environmental media.

i) Solid Matrices - micrograms (μg) contaminant per kilogram (kg) for organic analyses, and milligrams (mg) contaminant per kilogram (kg) for inorganic analyses of media (Dry Weight).
ii) Aqueous Matrices – micrograms (μg) contaminant per liter (L) of media for organic analyses, and milligrams (mg) per liter (L) for inorganic analyses.
iii) Non-Aqueous Phase Liquids – (NAPL) – milligrams (mg) contaminant per kilogram (kg) of media.
iv) Gaseous Matrices – micrograms (μg) contaminant per cubic meter (M^3) of media

3.6 DECISION RULES

3.6.1 DEFINITION

The decision rule is a statement that prescribes a course of action or non-action to be taken, based on assumptions to test its logical and empirical consequences.

3.6.2 DECISION RULE OBJECTIVE

The rationale for sample locations, sample number, and analytical parameters is provided in the main text of the RIWP. The decision rule for the sampling and analysis data collected is also provided in the RIWP, and supplemented as follows:

1. Define statistical parameters characterizing the population (e.g., mean, maximum, and percentile) and incorporate the scale of decision making (e.g. AOI size). Samples will be collected discreetly and biased towards locations with the highest likelihood to encounter maximum contaminant levels to provide an indication of impacted zones.

2. Identify action levels (e.g., Soil Screening Levels; Risk-based Screening Levels; Preliminary Remediation Goals (PRGs)); or a reference-based standard based on a Site Conceptual Model that will be developed as part of the RI.

3. The maximum contaminant concentration or the 95th percent Upper Confidence Limit of the valid data set for each parameter detected within an AOI will be used to conduct a preliminary baseline human health and ecological risk assessment for the determination of appropriate corrective actions.

3.7 LEVEL OF QUALITY CONTROL EFFORT

Equipment rinse, trip, and method blanks samples, field duplicate samples, laboratory control and MS/MSD/MD samples will be prepared and analyzed to determine the data quality provided by the sampling and analysis activities conducted during the execution of the RI.

- Equipment rinse blanks will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blanks will provide the means to assess the quality of data resulting from the field program. Equipment rinse blank samples will be analyzed to check for contamination of equipment introduced during sampling at the Site. One (1) rinse blank will be collected for each type of non-dedicated or non-disposable equipment during sampling activities.

- Trip blanks are used to assess the potential for contamination during sample storage and shipment. The trip blank consists of laboratory purified water that has been purged with an inert gas by the laboratory and provided with the sample containers to be used for the sampling of VOCs. Trip blanks will be preserved and handled in the same manner as the investigation samples. One trip blank will be included along with each shipment cooler containing project samples to be analyzed for VOCs.

- Method blank samples will be prepared by the laboratory and analyzed concurrently with project samples to assess potential contamination introduced during the analytical process.

- Field duplicate samples are analyzed to check for sampling and analytical reproducibility. One field duplicate will be collected for every 20 or fewer investigative samples collected during sampling activities.

- Matrix spikes will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected at the Site. Matrix spikes will be performed in duplicate for all TCL/TAL parameters. One MS/MSD will be collected for every 20 or fewer investigative samples per sample matrix (i.e. soil, groundwater, air). Soil MS/MSD samples require a triple sample volume for VOCs only. Aqueous MS/MSD samples require triple the normal sample volume for VOCs analysis and double the volume for the remaining parameters. MS/MSD samples for air will be prepared from the same container as the analytical sample, so no additional sample volume is required.

4.0 SAMPLING PROCEDURES

Samples of groundwater, soil, and air will be obtained during the RI. The sampling procedures for the RI will be consistent for the objectives of the project. The RIWP describes each of the sampling tasks and objectives.

Refer to the RIWP for the investigation Field Method Guidelines.

4.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the project laboratory. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the U.S. EPA, “Specifications and Guidance for Obtaining Contaminant-Free Sample Containers”, April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used will be maintained by the laboratory and will be available upon request. The appropriate sample containers, preservation method, maximum holding times, and shipping information for each target parameter and sampling task are provided in Table 4.1.

4.2 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information. Field blank and field duplicate samples also will be numbered with a unique sample number to prevent analytical bias of field QC samples.

Refer to Section 2.3 the RIWP for the sample labeling procedures.

4.3 FIELD QC SAMPLE COLLECTION

4.3.1 EQUIPMENT RINSE BLANK SAMPLE COLLECTION

Equipment rinse blank samples will be collected when non-dedicated or non-disposable sampling equipment is used to collect samples. Equipment rinse blanks consist of purified water that has been routed through decontaminated sampling equipment and collected into the appropriate containers. The containers will be filled in order of decreasing analyte volatility (i.e., VOCs first, SVOCs second, which are followed by the containers for the remaining analyses).

4.3.2 FIELD DUPLICATE SAMPLE COLLECTION

4.3.2.1 WATER SAMPLES

Field duplicate samples will be collected concurrently with the investigative sample alternating the filling of each sample container using the procedures identified in the RIWPs.

4.3.2.2 SOIL SAMPLES

Soil sample field duplicates will be collected concurrently with the investigative sample using the procedures identified in the RIWPs.

4.3.3 MS/MSD SAMPLE COLLECTION

MS/MSD sample collection for aqueous samples requires triple the sample volume for VOC analysis and double the volume for remaining parameters. The sampling procedure specified in Section 4.3.2.1 is used to collect aqueous samples. Soil MS/MSD samples require triple volume for VOC analyses. No additional volume is required for remaining soil parameters. Section 4.3.2.2 describes the sampling procedures for soil sample collection.

5.0 CUSTODY PROCEDURES

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

Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample. 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 the view of the person after being in actual possession of the person;
3. the item was in actual possession but is stored to prevent tampering; or
4. the item is in a designated and identified secure area.

5.1 FIELD CUSTODY PROCEDURES

Field personnel will be required to keep written records of field activities on applicable preprinted field forms or in a bound field notebook. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Project Manager. Each member of the field team will be assigned a logbook. Each logbook title page should include field team member’s name, project name, project start date, project end date, and unique logbook number.

5.1.1 FIELD PROCEDURES

The data quality can be affected by sample collection activities. If the integrity of collected samples is questionable, the data, regardless of its analytical quality, will also be questionable. The following procedure describes the process to maintain the integrity of the samples:

i) Upon collection, samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. The sample container, preservation methods, shipping, and packaging requirements are presented in Table 4.1.

ii) Samples will be assigned a unique sample number and will be affixed to a sample label. The information to be placed on the sample label will include the sample ID number, the sample type, the sampler's name, date collected, preservation technique, and analytical parameter and method to be performed. Information on the labels will be completed with a ballpoint pen or indelible marker.

iii) Samples will be preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms.

iv) Appropriate volumes will be collected to ensure that the EQLs can be successfully achieved and that the required QC Sample Analyses can be completed.

5.1.2 TRANSFER OF CUSTODY AND SHIPMENT PROCEDURES

i) A chain-of-custody (COC) record will be completed during sample collection and will accompany each shipment identifying the contents of the shipment to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record.

ii) Samples will be shipped or delivered in a timely fashion to the laboratory so that holding-times and/or analysis times as prescribed by the methodology can be met.

iii) Samples will also be transported in containers (coolers) packed with ice to maintain the temperatures prescribed in Table 4.1. Samples will be packaged for shipment and shipped to the appropriate laboratory for analysis with a separate signed chain-of-custody record enclosed in each sample cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.

iv) If samples are split with the NYSDEC, a separate chain-of-custody will be prepared for the samples and marked to indicate to whom the samples are being split. The person relinquishing the samples to the NYSDEC or the Site will require the representatives signature acknowledging sample receipt.

v) If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of permanent documentation. Commercial carriers are not required to sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A sample custodian will be assigned the responsibility of sample control and will receive incoming samples. Once received, the custodian will document that the custody tape on the coolers is unbroken, that each sample is received in good condition (i.e., unbroken, cooled, etc.), that the associated paperwork, such as chain-of-custody forms have been completed and will sign the chain-of-custody forms. In special cases, the custodian will document from appropriate sub-samples that chain-of-custody with proper preservation has been accomplished. The custodian will also document that sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage (refrigerated storage, if required). The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log. The laboratory date of receipt will also be noted.

5.3 STORAGE OF SAMPLES

Sample containers with volume remaining will be returned to secure and limited access storage. Upon completion of all laboratory analyses for each sample submittal and generation of the laboratory report, samples will be stored by the sample custodian. The length of time that samples are held will be at least thirty (30) days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all Federal, State, and local requirements.

Laboratory custody procedures and document control for those samples analyzed by the project laboratory will be carried out using the laboratory’s standard operating procedures.

5.4 FINAL PROJECT FILES CUSTODY PROCEDURES

The final project file will be the central repository for documents with information relevant to sampling and analysis activities as described in this QAPP. The Project Manager will be the custodian of the project file. The project files for the RI, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews will be maintained in a secured, limited access area and under custody of the Project Director or his designee.

The laboratory will be responsible for maintaining analytical logbooks, laboratory data and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six (6) years at which time the laboratory will contact GMCH regarding the disposition of the project related files.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy for the instruments and measurement equipment, which will be used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

6.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

The field instruments to be used during the Site investigations will include dissolved oxygen meters, pH meters, turbidity meters, specific conductance meters and photo-ionization detector (PID) systems. Field instruments will be used for real-time sample measurement during monitoring well sampling and organics screening for both on-site screening of soil samples and for health and safety air monitoring, as described in the HASP.

Field instruments will be calibrated prior to use and the calibration will be verified in accordance with the manufacturer’s specifications. Calibration and pre-operation inspection information will be noted on the Field Sampling Record, along with the results of the field measurements.

6.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Calibration procedures for a specific laboratory instrument will consist of initial calibration, initial calibration verification and continuing calibration verification. The initial calibration will be verified using an independently prepared calibration verification solution. Materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the use of laboratory materials including solutions, standards and reagents through well-documented procedures. Solid chemicals and acids/bases used by the laboratory will be reagent grade or better. Gases will be high purity or better. Standard Reference Materials (SRMs) or Performance Evaluation (PE) Materials will be obtained from approved vendors of the National Institute of Standards and Technology (formerly National Bureau of Standards), the U.S. EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources. Materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, expiration date and all other pertinent information.

7.0 ANALYTICAL PROCEDURES

Analytical procedures to be utilized for off-Site analysis of environmental samples will be based on referenced U.S. EPA analytical protocols and the laboratory SOPs that implement these methods.

7.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH/temperature, specific conductivity, dissolved oxygen, turbidity and ORP during sampling of groundwater, and the qualitative measurement of VOC during the collection of soil samples at the Site.

7.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory preparation and analytical procedures are presented in Table 7.1. The referenced methods are from the U.S. EPA method requirements promulgated by:

- "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 EPA, U.S. EPA Office of Solid Waste, 3rd Edition and promulgated updates, 1986;
- “Methods for Chemical Analysis of Water and Wastes”, EPA-600/4-79-020, March 1983;
- "Standard Methods for the Examination of Water and Wastewater", APHA, AWWA & WEF, 19th Edition, 1995, and;
- “Standard Operating Procedure RSK 175”, U.S.EPA Robert S. Kerr Environmental Research Laboratory, Ada OK.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

Data generated through in field activities or by the laboratory operation shall be reduced and validated prior to reporting in accordance with the following procedures:

8.1 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. The pH, conductivity, temperature, turbidity and organic vapor readings collected in the field will be generated from direct read instruments following calibration per manufacturer's recommendations. Such data will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry. Later, when the results forms required for this study are being filled out, the Project Coordinator will proof the forms to determine whether any transcription errors have been made by the field crew.

8.2 LABORATORY DATA REDUCTION PROCEDURES

For this project, the equations that will be employed in reducing data are found in the appropriate chapter of SW-846, Third Edition. Such formulae make pertinent allowances for matrix type. Calculations are checked at the conclusion of each operating day. Errors are noted; corrections are made, but the original notations are crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis.

Quality control data (e.g., laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QA Officer for review. If approved, data are logged into the project database format. Unacceptable data shall be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

8.2 DATA VALIDATION

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

8.2.1 PROCEDURES USED TO EVALUATE FIELD DATA

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

8.2.2 PROCEDURES TO VALIDATE LABORATORY DATA

The Project QA Officer or designee will perform analytical data validation using the following documents as guidance for the review process.

- "U.S. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review", EPA-540/R-99/008, October 1999 and the
- "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review ", EPA-540/R-94-013, February 1994.

Completeness checks will be administered on data to determine whether deliverables specified in the QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries and supporting raw data from instrument printouts. The review will determine whether required items are present and request copies of missing deliverables.

8.3 DATA REPORTING

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

8.3.1 FIELD DATA REPORTING

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

8.3.2 LABORATORY DATA REPORTNG

The laboratory data reporting package will be sufficient to perform a data validation in accordance with protocols described in Section 8.2.2. The Laboratory Project Manager will perform a final review of the data packages and case narratives to determine whether the report meets the project requirements.

The project laboratory will provide electronic data deliverables (EDDs) in an EQuIS® 4-file format. The laboratory data will be downloaded into the EDDs directly from the laboratory information management system (LIMS). The EDDs are imported into EQuIS and the data are maintained in the database for reporting and presentation.

9.0 PERFORMANCE AND SYSTEM AUDITS

A performance audit is an independently obtained quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

9.1 FIELD PERFORMANCE AND SYSTEM AUDITS

9.1.1 INTERNAL FIELD AUDIT RESPONSIBILITIES

Internal audits of field activities include the review of sampling and field measurements conducted by the Field QA Officer. The audits will verify that proper field procedures are being followed. The audits will include examination of the following:

i) Field sampling records, screening results, instrument operating records;
ii) Sample collection;
iii) Handling and packaging in compliance with procedures;
iv) Maintenance of QA procedures; and
v) Chain-of-custody form reviews.

Follow up audits will be conducted to correct deficiencies and to verify that procedures are maintained throughout the investigation.

9.1.2 EXTERNAL FIELD AUDIT RESPONSIBILITIES

External audits may be conducted by the NYSDEC Project Manager at any time during the field operations. These audits may or may not be announced and are at the discretion of the regulatory agency.

9.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

9.2.1 INTERNAL LABORATORY AUDIT RESPONSIBILITIES

The laboratory system audits will be conducted at the discretion of the Project QA Officer or designee. Laboratory performance audits may be conducted prior to field activities or on an annual basis, depending on the duration of the project.

The system audit will include an examination of laboratory documentation including: sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis, and instrument operating records.

At the conclusion of internal or external system audits, reports will be provided to the laboratory's operating divisions for appropriate comment and corrective action where necessary. Written response to internal as well as external audits will be required.

9.2.2 EXTERNAL LABORATORY AUDIT RESPONSIBILITIES

External audits will be conducted as required, by appropriate NYSDEC QA personnel and may be conducted at least once prior to sampling and analysis activities.

10.0 PREVENTATIVE MAINTENANCE

10.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

The field equipment preventative maintenance program ensures the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities.
- Maintenance schedules.
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the personnel in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. In addition, the field personnel will be responsible for determining that critical spare parts are included with the field equipment. The inventory will include parts that are subject to frequent failure, have limited use and/or cannot be obtained in a timely manner.

10.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventative maintenance. The extent of the preventative maintenance will be a function of the complexity of the equipment.

Generally, annual preventative maintenance service will involve cleaning, adjusting, inspecting and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

Maintenance records will be placed on file at the laboratory and can be made available upon request.

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

11.1 FIELD MEASUREMENTS

Field generated information such as pH and specific conductance data will be reviewed for validity. The review will be performed by the Project Manager and typically include bound logbooks/forms, data entry and calculation checks. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a single sample and will be measured by determining the relative percent difference of the readings as defined in Section 11.2.1. Accuracy will be measured by determining the percent recovery of calibration check standards as defined in Section 11.2.2. Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

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

11.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy and completeness detailed in the following subsections:

11.2.1 PRECISION

The precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD/MD analyses. The relative percent difference (RPD) will be calculated for each pair of duplicate analyses (laboratory MS/MSDs and field duplicates).

11.2.2 ACCURACY

The accuracy of laboratory results will be assessed for compliance with the established QC criteria that are described in Sections 3.0 and 8.0 of the QAPP using the analytical results of method blanks, reagent/preparation blank, SRMs or QC check samples and MS/MSD samples. The percent recovery (%R) of matrix spike samples and SRMs will be calculated.

11.2.3 COMPLETENESS

Completeness will be assessed by comparing the number of valid (usable) results (as determined by the Project QA Officer) to the total possible number of results using the formula presented in Section 12.1.

11.3 STATISTICAL EVALUATIONS

In the examination of data and determination of their precision and accuracy, standard statistical formulae will be used. Further details are provided in the following subsections

11.3.1 PERCENT RECOVERY

The percent recovery of a parameter is calculated by dividing the amount recovered by the true amount added and multiplying by 100. The percent recoveries of spiked samples are evaluated to establish the analytical accuracy of a measurement. Percent recovery is calculated using the following formula:

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

where:

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

11.3.2 RELATIVE PERCENT DIFFERENCE

The relative percent difference (RPD) is calculated by dividing the absolute value of the difference between two numbers by their arithmetic mean and multiplying by 100. The RPD is used to evaluate the analytical precision of two replicate measurements (e.g., matrix spike/matrix spike duplicate). RPD is calculated using the following formula:

$$\text{RPD} \quad = \quad \frac{(R_1 - R_2)}{R_1 + R_2} \ \text{X} \ 100$$

where:

R_1 = value of first result

R_2 = VALUE OF SECOND RESULT

12.0 CORRECTIVE ACTION

12.1 FIELD CORRECTIVE ACTION

Corrective action is intended to address problems that arise by identification, recommendation, approval, and implementation of measures that counter unacceptable procedures or deficient quality control performance. The Field QA Officer and Project QA Officer will be responsible for ensuring the quality of the sampling procedures and environmental data and as such, will be responsible for initiating corrective action when appropriate.

12.2 LABORATORY CORRECTIVE ACTION

The following paragraphs define the corrective action decision process relative to possible non-compliant events encountered during laboratory analysis of the project samples. Corrective actions will be initiated by the laboratory QA personnel and will be implemented by laboratory staff chemists under the oversight of the laboratory QA personnel. As with field corrective actions, the laboratory QA personnel will document the problem, the corrective action undertaken and the resolution of the problem.

12.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT

The Project QA Officer may identify the need for corrective action during either the data validation or data assessment processes. Potential types of corrective action may include re-sampling by the field team or re-injection/reanalysis of samples by the laboratory (if possible).

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g., the holding time for samples is not exceeded). When the Project QA Officer identifies a corrective action situation, the GM Project Manager will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. corrective actions will be documented by the Project Manager.

13.0 QUALITY ASSURANCE (QA) REPORTS

Critically important to the successful implementation of the QAPP is a reporting system that provides the means by which the program can be reviewed, problems identified and programmatic changes made to improve the plan.

QA reports to management include:

- Audit reports, internal and external audits with responses
- Performance evaluation sample results; internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Project QA Officer when appropriate and presented to the project and/or laboratory management personnel.

14.0 REFERENCES

1. New York State Department of Environmental Conservation, (2009). Technical Guidance for Site Investigation and Remediation (DRAFT DER-10). June 18, 2010.

2. United States Environmental Protection Agency, (1999). EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. EPA QA/R-5 Interim Final, November 1999.

3. United States Environmental Protection Agency (1991). Preparation Aids for the Development of Category I Quality Assurance Project Plans. U.S. EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio, February 1991.

4. United States Environmental Protection Agency, (1993). Data Quality Objectives Process for Superfund Interim Final Guidance. U.S. EPA/540/R-93-071, Office of Solid Waste and Emergency Response (OSWER), September 1993.

5. United States Environmental Protection Agency, (1992). Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 9240.0-05A, April 1992.

6. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-99-012.

7. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-94-013.

8. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Office of Solid Waste, U.S. EPA, SW-846, November 1986, with updates.

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

Target Compound List (TCL) Volatile Organic Compounds (VOC) [3]

Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
2-Butanone
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Cyclohexane
Dibromochloromethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
2-Hexanone
Isopropylbenzene
Methyl acetate
Methylene chloride
Methylcyclohexane
4-Methyl-2-pentanone
Methyl tert-butyl ether
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

TCL VOC (continued)

1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,1,2-Trichloro-1,2,2-trifluoroethane
Vinyl chloride
Xylenes (total)

TCL Semi-Volatile Organic Compounds (SVOC)

Acenaphthene
Acenaphthylene
Acetophenone
Anthracene
Atrazine
Benzaldehyde
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
1,1'-Biphenyl
4-Bromophenylphenyl ether
Butylbenzylphthalate
di-n-Butyphthalate
Caprolactam
Carbazole
4-Chloroaniline
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
2,2'-oxibis(1-Chloropropane)
4-Chloro-3-methylphenol
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenyl phenyl ether
Chrysene
Dibenz(a,h)anthracene
Dibenzofuran
3,3'-Dichlorobenzidine
2,4-Dichorophenol
Diethylphthalate
2,4-Dimethylphenol
Dimethylphthalate
4,6-Dinitro-2-methylphenol

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

TCL Semi-Volatile Organic Compounds (cont'd)

- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- bis(2-Ethylhexyl)phthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- 2-Methylnaphthalene
- 2-Methylphenol
- 4-Methylphenol
- Naphthalene
- 2-Nitroaniline
- 3-Nitroaniline
- 4-Nitroaniline
- Nitrobenzene
- 2-Nitrophenol
- 4-Nitrophenol
- N-Nitroso-di-n-propylamine
- N-Nitrosodiphenylamine (diphenylamine)
- di-n-Octylphthalate
- Pentachlorophenol
- Phenanthrene
- Phenol
- Pyrene
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

TCL Polychlorinated Biphenyls (PCB)

- Aroclor 1016
- Aroclor 1221
- Aroclor 1232
- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

TAL Inorganics

Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Manganese
Mercury
Nickel
Selenium
Silver
Thallium
Vanadium
Zinc
Cyanide (total)

Notes:

[1] - Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.

[2] - Method Detection Limits (MDL) are also presented for guidance only. Actual MDLs will vary depending on sample specific preparation factors. The MDLs are also highly matrix dependant and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes. Laboratory MDLs are updated on a periodic basis and the MDLs in effect when the samples are analyzed will be used for reporting purposes.

[3] - U.S. EPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration", OLM4.2, May 1999 Target Compound List.

TABLE 1.2

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

	Estimated Quantitation Limits (EQL) [1]			*Method Detection Limits (MDL)* [2]		
	***Water* (μg/L)**	***Air*** (ppbV)	***Soil* (μg/kg)**	***Water* (μg/L)**	***Air*** (ppbV)	***Soil* (μg/kg)**
Target Compound List (TCL) Volatile Organic Compounds (VOC) [3]						
Acetone	25	0.3	750	1.1	0.047	75
Benzene	1	0.15	50	0.37	0.026	17
Bromodichloromethane	1	0.15	100	0.32	0.031	10
Bromoform	1	0.15	100	0.37	0.034	16
Bromomethane	1	0.15	250	0.3	0.035	26
2-Butanone	25	0.3	750	0.59	0.048	81
Carbon disulfide	5	0.15	250	0.24	0.025	35
Carbon tetrachloride	1	0.15	50	0.37	0.034	10
Chlorobenzene	1	0.15	50	0.38	0.031	8.1
Chloroethane	1	0.15	250	0.29	0.034	37
Chloroform	1	0.15	50	0.35	0.022	10
Chloromethane	1	0.15	250	0.49	0.034	15
Cyclohexane	1	0.15	1,200	0.33	0.09	8.5
Dibromochloromethane	1	0.15	50	0.37	0.044	13
1,2-Dibromo-3-chloropropane	1	NA	250	0.82	NA	81
1,2-Dibromoethane	1	0.15	250	0.34	0.05	19
1,2-Dichlorobenzene	1	0.15	100	0.38	0.034	16
1,3-Dichlorobenzene	1	0.15	100	0.38	0.034	9.5
1,4-Dichlorobenzene	1	0.15	100	0.38	0.024	16
Dichlorodifluoromethane	1	0.15	100	0.49	0.025	38
1,1-Dichloroethane	1	0.15	50	0.3	0.068	14
1,2-Dichloroethane	1	0.15	50	0.28	0.024	11
1,1-Dichloroethene	1	0.15	50	0.31	0.065	17
cis-1,2-Dichloroethene	1	0.15	50	0.35	0.022	16
trans-1,2-Dichloroethene	1	0.15	50	0.33	0.025	18
1,2-Dichloropropane	1	0.15	50	0.41	0.038	9.4
cis-1,3-Dichloropropene	1	0.15	50	0.35	0.035	12
trans-1,3-Dichloropropene	1	0.15	50	0.35	0.042	11
Ethylbenzene	1	0.15	50	0.41	0.031	14
2-Hexanone	50	0.3	2,500	0.58	0.054	30
Isopropylbenzene	5	NA	250	0.39	NA	7.9
Methyl acetate	10	NA	1,200	0.54	NA	45
Methylene chloride	5	0.15	250	0.29	0.05	41
Methylcyclohexane	1	NA	1,200	0.42	NA	16
4-Methyl-2-pentanone	50	0.3	2,500	0.26	0.102	29
Methyl tert-butyl ether	5	0.15	250	0.27	0.031	11
Styrene	1	0.15	50	0.35	0.022	17
1,1,2,2-Tetrachloroethane	1	0.15	100	0.4	0.022	11
Tetrachloroethene	1	0.15	50	0.42	0.042	15
Toluene	1	0.15	100	0.39	0.034	10
1,2,4-Trichlorobenzene	5	0.15	250	0.4	0.038	11
1,1,1-Trichloroethane	1	0.15	50	0.39	0.042	9.9

TABLE 1.2

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

	Estimated Quantitation Limits (EQL) [1]		*Method Detection Limits (MDL)* [2]	
	Water (µg/L)	*Soil (µg/kg)*	*Water (µg/L)*	*Soil (µg/kg)*
TCL VOC (continued)				
1,1,2-Trichloroethane	1	50	0.36	16
Trichloroethene	1	50	0.42	17
Trichlorofluoromethane	1	100	0.54	19
1,1,2-Trichloro-1,2,2-trifluoroethane	1	250	0.32	37
Vinyl chloride	1	100	0.36	11
Xylenes (total)	3	150	0.44	19
TCL Semi-Volatile Organic Compounds (SVOC)				
Acenaphthene	5	330	0.8	14
Acenaphthylene	5	330	0.71	19
Acetophenone	5	330	2.6	20
Anthracene	5	330	0.68	17
Atrazine	5	330	2.5	22
Benzaldehyde	10	330	2.8	14
Benzo(a)anthracene	4	330	0.7	23
Benzo(a)pyrene	4	330	0.73	15
Benzo(b)fluoranthene	4	330	0.94	20
Benzo(g,h,i)perylene	5	330	0.85	16
Benzo(k)fluoranthene	5	330	0.84	16
1,1'-Biphenyl	10	330	2.6	18
4-Bromophenylphenyl ether	5	330	0.88	15
Butylbenzylphthalate	5	330	0.88	21
di-n-Butyphthalate	5	330	0.67	23
Caprolactam	10	330	2.5	28
Carbazole	10	330	0.82	19
4-Chloroaniline	20	1,700	0.61	20
bis(2-Chloroethoxy)methane	5	330	0.87	26
bis(2-Chloroethyl)ether	4	330	0.97	18
2,2'-oxibis(1-Chloropropane)	5	330	0.78	27
4-Chloro-3-methylphenol	5	330	0.99	19
2-Chloronaphthalene	5	330	0.85	17
2-Chlorophenol	5	330	1	18
4-Chlorophenyl phenyl ether	5	330	0.79	17
Chrysene	5	330	0.75	22
Dibenz(a,h)anthracene	4	330	0.79	18
Dibenzofuran	5	330	1.1	17
3,3'-Dichlorobenzidine	4	2,000	0.93	18
2,4-Dichorophenol	10	330	0.85	16
Diethylphthalate	5	330	0.65	19
2,4-Dimethylphenol	5	330	0.85	18
Dimethylphthalate	5	330	0.76	17
4,6-Dinitro-2-methylphenol	20	1,700	1.3	48

TABLE 1.2

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

	Estimated Quantitation Limits (EQL) [1]		*Method Detection Limits (MDL)* [2]	
	Water (µg/L)	*Soil (µg/kg)*	*Water (µg/L)*	*Soil (µg/kg)*
TCL Semi-Volatile Organic Compounds (cont'd)				
2,4-Dinitrophenol	20	1,700	3	47
2,4-Dinitrotoluene	5	330	0.79	22
2,6-Dinitrotoluene	5	330	0.57	15
bis(2-Ethylhexyl)phthalate	5	330	2.7	13
Fluoranthene	5	330	0.81	16
Fluorene	5	330	1	15
Hexachlorobenzene	5	330	0.74	22
Hexachlorobutadiene	5	330	0.73	16
Hexachlorocyclopentadiene	5	330	1.1	10
Hexachloroethane	5	330	0.74	17
Indeno(1,2,3-cd)pyrene	4	330	0.63	19
Isophorone	5	330	0.63	22
2-Methylnaphthalene	5	330	0.64	17
2-Methylphenol	5	330	1.1	21
4-Methylphenol	5	330	1.3	20
Naphthalene	5	330	0.75	17
2-Nitroaniline	20	1,700	0.7	13
3-Nitroaniline	20	1,700	0.71	22
4-Nitroaniline	20	1,700	1.3	17
Nitrobenzene	4	330	0.81	24
2-Nitrophenol	5	330	2.1	21
4-Nitrophenol	20	1,700	1.9	53
N-Nitroso-di-n-propylamine	5	330	0.67	15
N-Nitrosodiphenylamine	5	330	1.4	19
di-n-Octylphthalate	5	330	1.1	64
Pentachlorophenol	20	800	2.4	60
Phenanthrene	5	330	0.82	21
Phenol	5	330	2.6	18
Pyrene	5	330	1.1	21
2,4,5-Trichlorophenol	5	330	1.2	15
2,4,6-Trichlorophenol	4	330	1.7	19
TCL Polychlorinated Biphenyls (PCB)				
Aroclor 1016	0.2	330	0.054	5.3
Aroclor 1221	0.2	330	0.10	19
Aroclor 1232	0.4	330	0.1	11
Aroclor 1242	0.2	330	0.075	18
Aroclor 1248	0.2	330	0.061	4.6
Aroclor 1254	0.2	330	0.082	20
Aroclor 1260	0.2	330	0.044	7.4

TABLE 1.2

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

	Estimated Quantitation Limits (EQL) [1]		*Method Detection Limits (MDL)* [2]	
	Water (mg/L)	*Soil (mg/kg)*	*Water (mg/L)*	*Soil (mg/kg)*
TAL Inorganics				
Antimony	0.002	0.5	0.00012	0.23
Arsenic	0.01	0.1	0.0021	0.021
Barium	0.1	1.0	0.00094	0.066
Beryllium	0.001	0.2	0.0006	0.068
Cadmium	0.0005	0.05	0.000075	0.0023
Chromium	0.005	0.5	0.0015	0.13
Cobalt	0.007	0.5	0.00074	0.053
Copper	0.002	1.0	0.00033	0.14
Lead	0.003	0.3	0.0016	0.19
Manganese	0.015	1.0	0.00068	0.071
Mercury	0.0002	0.1	0.000087	0.016
Nickel	0.025	1.0	0.0029	0.15
Selenium	0.002	0.2	0.0003	0.052
Silver	0.0005	0.5	0.00013	0.1
Thallium	0.001	0.1	0.000033	0.0041
Vanadium	0.007	1.0	0.00067	0.069
Zinc	0.01	1.0	0.0022	0.24
Cyanide (total)	0.005	0.2	0.0018	0.088
Additional Parameters				
Hexavalent chromium	0.02	0.8	0.005	0.2

Notes:

[1] - Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.

[2] - Method Detection Limits (MDL) are also presented for guidance only. Actual MDLs will vary depending on sample specific preparation factors. The MDLs are also highly matrix dependant and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes. Laboratory MDLs are updated on a periodic basis and the MDLs in effect when the samples are analyzed will be used for reporting purposes.

[3] - U.S. EPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration", OLM4.2, May 1999 Target Compound List.

TABLE 4.1
SAMPLE CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS

Analyses [1]	***Sample Containers*** [2]	***Preservation***	***Maximum Holding Time From Sample Collection*** [3]	***Volume of Sample***	***Shipping***	***Normal Packaging***
Soil						
Volatile Organic Compounds	Three 4 oz. Jars per analysis	Iced, </= 4 +/- 2 C	48 hours for extraction 14 days after extraction for analysis	Fill completely	Overnight or hand deliver	Foil Pouch
Semi Volatile Organic Compounds and Polychlorinated biphenyls	One 8-ounce glass jar per analysis	Iced, </= 4 +/- 2 C	14 days for extraction 40 days after	Fill to shoulder of jar	Overnight or hand deliver	Bubble Pack or Foam Chips
Target Analyte List Metals	One 4-ounce glass jar per analysis	Iced, </= 4 +/- 2 C	180 days (mercury 28 days) for analysis	Fill to shoulder of jar	Overnight or hand deliver	Bubble Pack or Foam Chips
Total Cyanide	One 4-ounce glass jar	Iced, </= 4 +/- 2 C	14 days for analysis	Fill to shoulder of jar	Overnight or hand deliver	Bubble Pack or Foam Chips

Notes:

[1] Analyses-sample containers, preservation, shipping and packaging requirement are applicable to TCL/TAL parameter groups.

[2] Multiple analysess for a soil sample may not require additional containers for each parameter.

[3] The technical holding times are based on time elapsed from sample collection.

TABLE 4.1
SAMPLE CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS

Analysis [1]	***Sample Containers*** [2]	***Preservation***	***Maximum Holding Time From Sample Collection*** [3]	***Volume of Sample***	***Shipping***	***Normal Packaging***
Groundwater						
Volatile Organic Compounds	Three 40 mL teflon-lined septum vials per analysis	HCL to pH <2 Iced, </= 4 +/- 2 C	14 days for analysis	Fill completely, no air bubbles	Overnight or hand deliver	Foam Liner or Bubble Pack
Volatile Organic Compounds (Bedrock Wells)	Three 40 mL teflon-lined septum vials per analysis	Iced, </= 4 +/- 2 C	7 days for analysis	Fill completely, no air bubbles	Overnight or hand deliver	Foam Liner or Bubble Pack
Semi Volatile Organic Compounds and Polychlorinated biphenyls	Two 1 liter amber glass bottles per analysis	Iced, </= 4 +/- 2 C	7 days for extraction 40 days after extraction for analysis	Fill to neck of bottle	Overnight or hand deliver	Bubble Pack or Foam Chips
Target Analyte List Metals	One 1 liter plastic bottle	HNO_3 to pH <2, Iced, </= 4 +/- 2 C	180 days (mercury 28 days) for analysis	Fill to neck of bottle	Overnight or hand deliver	Bubble Pack or Foam Chips
Total Cyanide	One 500 ml plastic bottle	NaOH to pH>12 Iced, </= 4 +/- 2 C	14 days for analysis	Fill to neck of bottle	Overnight or hand deliver	Bubble Pack or Foam Chips
Indoor/Outdoor Air/Subslab Vapor						
Volatile Organic Compounds	One 6-L SUMMA Canister or equivalent	None	30 days to analysis	Final pressure <5 inches Hg	Overnight or hand deliver	Cardboard Shipping Box

TABLE 7.1

SUMMARY OF ANALYTICAL METHODS

Parameter [1]	*Preparation Method* [2]	*Analytical Method* [2]
Groundwater and Surface Water Samples		
VOC	SW-846 5030B	SW-846 8260B
SVOC	SW-846 3520C	SW-846 8270C
PCB	SW-846 3500C	SW-846 8082
Metals		
ICP Metals	SW-846 3010A/3020A	SW-846 6010B
ICP/MS Metals	SW-846 3010A/3020A	SW-846 6020
Mercury	SW-846 7470A	SW-846 7470A
Cyanide (total)	SW-846 9012A	SW-846 9012A
Soil Samples		
VOC	SW-846 5030B	SW-846 8260B
SVOC	SW-846 3550B	SW-846 8270C
PCB	SW-846 3550B	SW-846 8082
Metals[3]		
ICP Metals	SW-846 3050A	SW-846 6010B
ICP/MS Metals	SW-846 3050A	SW-846 6020
Mercury	SW-846 7471A	SW-846 7471A
Cyanide total)	SW-846 9012A	SW-846 9012A
Soil Vapor / Air Samples		
VOC	NA	TO-15

Notes:

[1] Refer to Tables 1.2 for the compounds/elements of each parameter group.

[2] Preparation and Analytical Method References:
- SW-846 - "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods " 3rd Edition, and Promulgated Updates, November 1986.
- TO-15 - "Compedium of Methods for the Analysis of Toxic Organics in Air" USEPA 1999 .

[3] Metals by Method

VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
PCB = Polychlorinated Biphenyls
NA = Not Applicable