APPENDIX B

ONONDAGA LAKE PRE-DESIGN INVESTIGATION QUALITY ASSURANCE PROJECT PLAN

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LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
BFB	4-Bromofluorobenzene
ºC	Degrees Celsius
CAR	Corrective Action Request
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Emergency Response, Compensation, Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/s	centimeter per second
COC	Chain-of-Custody
CPOI	Chemical Parameter of Interest
CQAM	Corporate Quality Assurance Manager
CVAA	Cold Vapor Atomic Absorption
cy	cubic yards
DFTPP	decafluorotriphenylphosphine
DOT	Department of Transportation
DQO	Data Quality Objective
DUO	Data Use Objective
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
FS	Feasibility Study
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection

LIST OF ACRONYMS
(CONTINUED)

GC/MS	Gas Chromatography/Mass Spectroscopy
GM	General Manager
HSC	Health and Safety Coordinator
ICP	Inductively Coupled Plasma
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectroscopy
LCS	Laboratory Control Sample
LD	Laboratory Director
LIMS	Laboratory Information Management System
LNAPL	Light Non-aqueous Phase Liquid
LPM	Laboratory Project Manager
MD	Matrix Duplicate
mg/kg	milligram per kilogram
mL	milliliter
MS	Matrix Spike
MS/MD	Matrix Spike/Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Matrix Spike Duplicate
NCM	Nonconformance Memo
ng	nanograms
NIOSH	National Institute of Safety and Health
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
OM	Operations Manager
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS
(CONTINUED)

PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
PEC	Probable Effect Concentration
PID	Photoionization Detector
PRRL	Project Required Quantitation Limit
PSP	Project Safety Plan
PT	Performance Testing
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SMU	Sediment Management Unit
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
ug	Micrograms
USEPA	Unites States Environmental Protection Agency
VOC	Volatile Organic Compound
WP	Work Plan

SECTION B1

PROJECT DESCRIPTION

B1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to support sampling activities of the Onondaga Lake Pre-Design Investigation Phase I Work Plan (PDI Phase I Work Plan). The objective of PDI Phase I is to evaluate the physical characteristics and chemical constituents of sediments, surface water, porewater, and other media to provide data to support the remedial action design and decision-making process.

This QAPP specifies the quality assurance/quality control (QA/QC) procedures for field and laboratory sampling and measurements of the PDI Phase I work. The specific objectives of the QAPP are:

- Foster data quality that is sufficient to meet the investigation objectives and to support the remedial action decision-making process
- Provide a standard for control and review of measurement data to confirm that the data are scientifically sound, representative, comparable, defensible, and of known quality.

This QAPP is an appendix to the work plan. It is to be used in conjunction with the Sampling and Analysis Plan (SAP, Appendix A) and the Project Safety Plan (PSP, Appendix C). It has been prepared in accordance with USEPA guidance (USEPA, 2000a, 2002b).

The table below presents a cross-reference between the QAPP elements of EPA QA/G5 and elements of this QAPP.

Project Management	
QAPP Section B1	Title and Approval Sheet
QAPP Section B1	Table of Contents
QAPP Section B1	Distribution List
QAPP Section B2	Project/Task Organization
Workplan	Problem Definition/Background
SAP Section A3	Project/Task Description
QAPP Section B3	Quality Objectives and Criteria
QAPP Section B2.2	Special Training/Certification
QAPP Section B6	Documents and Records

Data Generation and Acquisition	
Workplan & SAP Section A3	Sampling Process Design (Experimental Design)
SAP Section A3	Sampling Methods
QAPP Section B4.2 & SAP A3.5	Sample Handling and Custody
QAPP Section B7	Analytical Methods
QAPP Section B8	Quality Control
QAPP Section B8.2	Instrument/Equipment Testing, Inspection, and Maintenance
QAPP Section B8.3	Instrument/Equipment Calibration and Frequency
QAPP Section B8.4	Inspection/Acceptance of Supplies and Consumables
SAP Section A3	Non-direct Measurements
QAPP Section B5 & SAP A3.5	Data Management
Assessment and Oversight	
QAPP Section B10.1	Assessments and Response Actions
QAPP Section B11	Reports to Management
Data Validation and Usability	
QAPP Section B9.1	Data Review, Verification, and Validation
QAPP Section B9.2	Verification and Validation Methods
QAPP Section B9.3	Reconciliation With User Requirements

B1.1.1 QAPP Distribution List

This QAPP will be distributed to contractors performing in the implementation, oversight, analysis, and verification of pre-design field investigation activities at Onondaga Lake. The Quality Assurance Officer (QAO) will be responsible to maintain the current and approved version of the QAPP and to maintain and update the distribution list. Document control will be maintained by writing the current number of the version and the date it was revised on the front cover of the QAPP.

The following people and their organizations will need copies and updates of the approved QAPP (hard copy or electronic):

Name	Agency or Company
John McAuliffe	Honeywell
Ed Glaza	Parsons
Richard Cheatham	Parsons
Analytical Laboratory	Severn Trent Labs
Timothy Larson	NYSDEC
Bob Nunes	USEPA

SECTION B2

PROJECT ORGANIZATION

B2.1 PROJECT AND TEAM ORGANIZATION

This section describes the project organization and the function and responsibility of each group affected by the QAPP. The organization was designed to promote the exchange of information and for efficient project operation. The project organization is presented on Figure B2.1. Key contact information is summarized in Table B2.1.

Severn Trent laboratories will provide the analytical support on this project. Parsons will provide quality assurance (QA) oversight and data validation.

B2.1.1 NYSDEC

NYSDEC is overseeing Remedial Investigation/Feasibility Study (RI/FS) activities for Onondaga Lake and at related adjacent sites. As specified in the Consent Order (R7-0197-87-06), NYSDEC will review and approve plans, drawings, reports, and schedules submitted for the pre-design, remedial design, and remedial action. NYSDEC has designated Mr. Timothy Larson as the state's Project Manager.

B2.1.2 Honeywell International, Inc.

Honeywell International, Inc. is a respondent for the Onondaga Lake site. It is responsible for the design and implementation of a remedy for the site. Honeywell has designated Mr. John McAuliffe as the Program Director and primary contact for this project. Mr. McAuliffe is responsible to see that the project objectives are met.

B2.1.3 Parsons

Parsons is providing the management and technical staff to execute this project. Mr. Edward Glaza, PE, is the Project Manager for this project. He is responsible to Honeywell and Parsons' management to see that the project objectives are met. He will maintain the project schedule, keep the project within budget, and monitor the technical adequacy of the work performed. He will also be the primary point of contact for Honeywell on technical, schedule, and contractual issues.

Mr. Timothy Johnson is the Deputy Project Manager and assists Mr. Glaza. His specific responsibilities will be developed during the course of the project.

Mr. Richard Cheatham is the QAO and will review data quality objectives, set assessment criteria, and conduct audits to evaluate compliance. He is responsible to see that data comply with this QAPP and to oversee data verification and validation. He will routinely monitor the laboratory's progress and maintain the QAPP.

Ms. Laura White is the DBM and will be the point of contact for laboratory and project personnel with regard to database issues and data outputs. She will be responsible for

establishing and maintaining the project database, as well as for performing quality assurance/quality control procedures and ensuring the integrity of the project database.

B2.1.4 Analytical Services

The analytical laboratory (or laboratories) will analyze environmental samples collected at the Onondaga Lake Site. The laboratory is under the supervision of a General Manager or Laboratory Director and a Quality Assurance Manager (QAM). The lab's project manager will handle project sample receipt, analysis scheduling, and data reporting. In case of temporary absence, the direct supervisor will assume the responsibilities of the absent employee or delegate the responsibility to qualified personnel. Sample Management Staff are responsible for receiving, logging, and maintaining internal custody of samples during the sample's residence in the laboratory. Laboratory organization is summarized in Figure B2.2. Key laboratory contacts are summarized in Table B2.2.

B2.2 SPECIAL TRAINING/CERTIFICATION

Management and field personnel must review the requirements of this QAPP to make certain that persons assigned to specific tasks have appropriate credentials and experience. The Field Team Leaders will check that all onsite personnel have read and understood the QAPP.

Field personnel will be required to adhere to the Project Safety Plan (Appendix C). They must also follow applicable task-specific health and safety plans that project subcontractors develop before they begin investigation activities.

Laboratories will have trained and experienced staff capable of performing the analyses specified in this QAPP. Laboratories will have New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certification for appropriate analyses and laboratories performing Level IV analyses (as described in QAPP Section 3.2.1) should have Contract Laboratory Program (CLP) category certification. Additionally, the laboratories must be able to demonstrate that they have analyzed performance-evaluation or proficiency-testing samples within 12 months of beginning the analyses. All personnel performing data validation and verification must have experience in data validation, quality assurance oversight, and auditing.

Project Organization

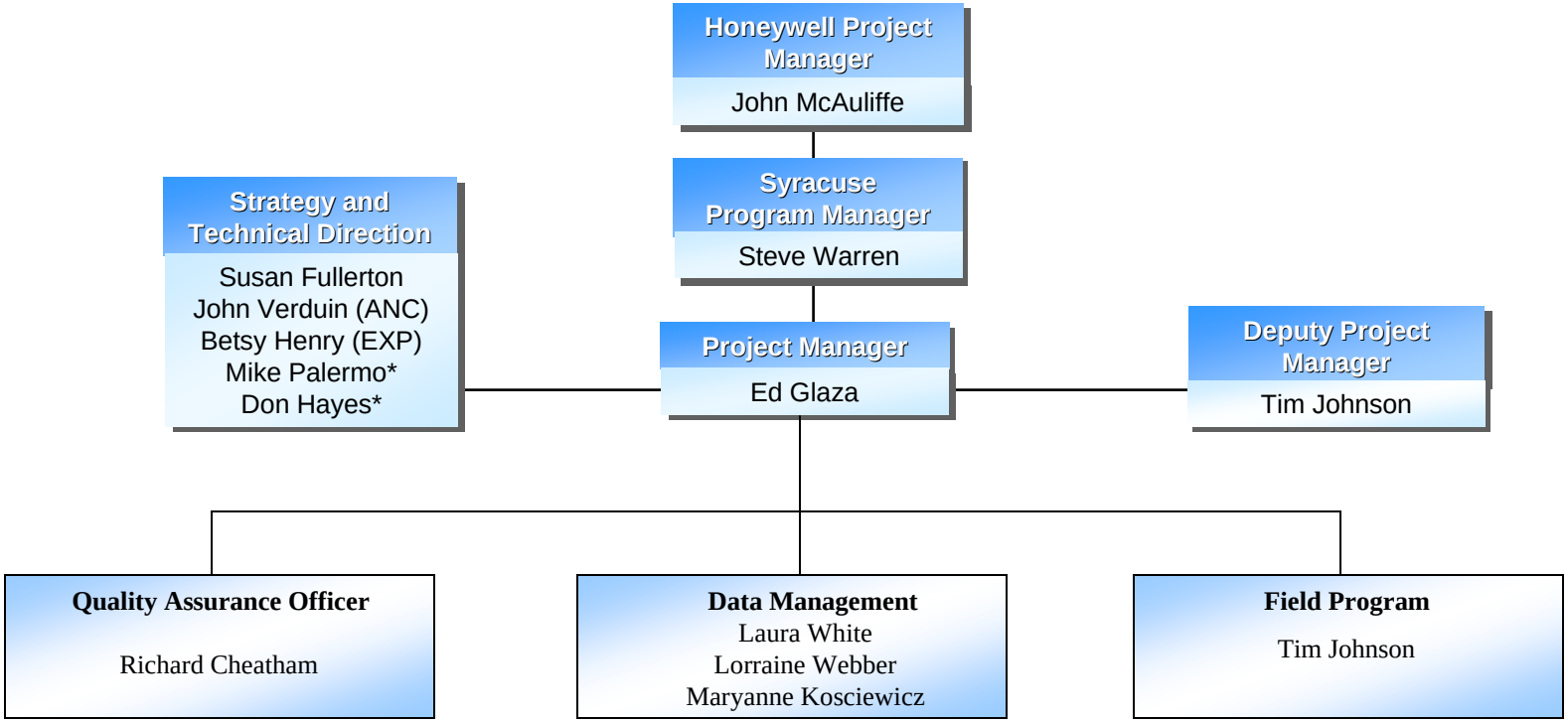

FIGURE B2.2 – LABORATORY ORGANIZATION

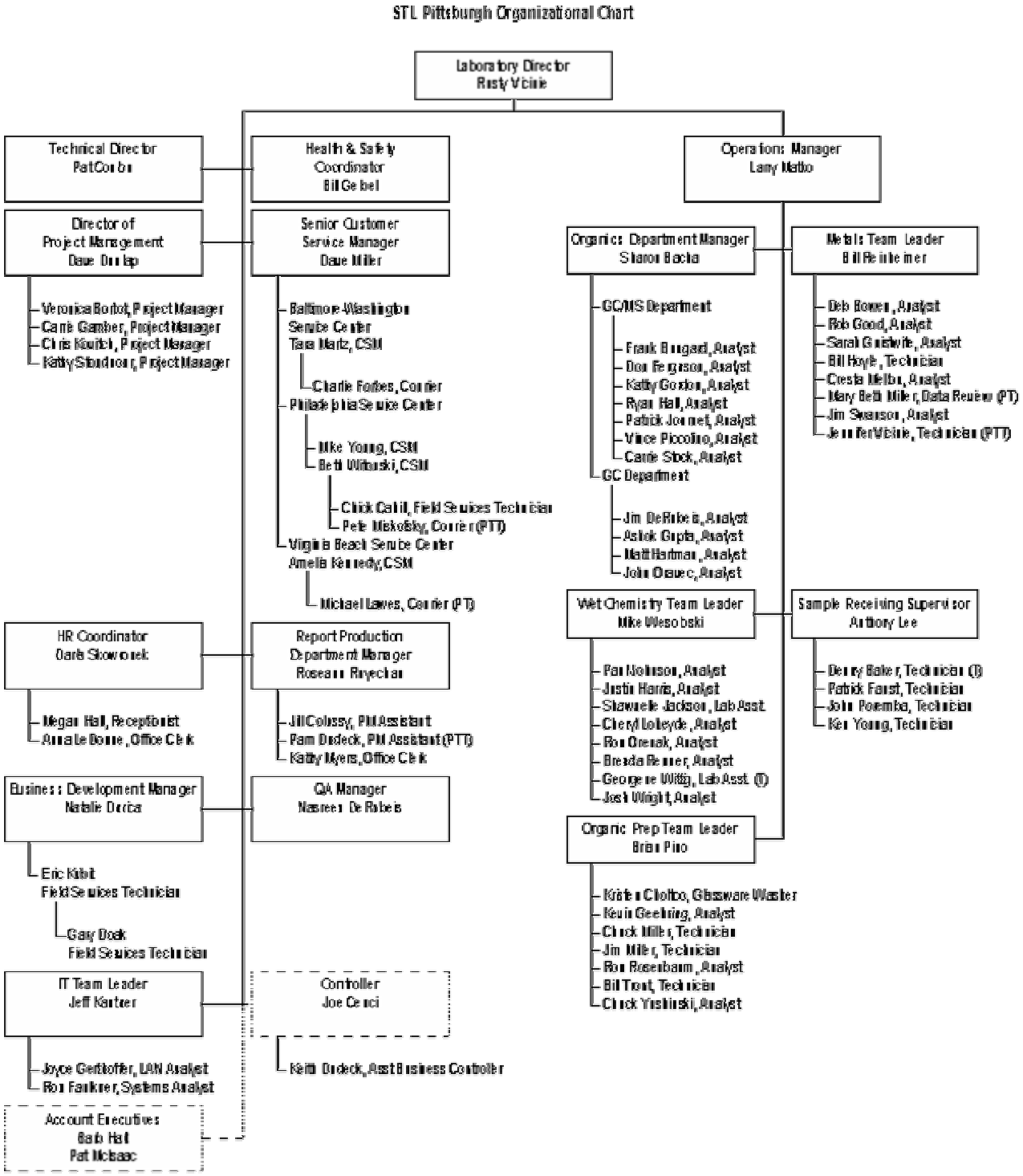

TABLE B2.1

KEY PROJECT CONTACTS

Name	Project Role	Affiliation	Telephone Number	Fax Number	E-mail Address
Ed Glaza	Project Manager	Parsons	(315) 451-9560	(315) 451-9570	Edward.Glaza@parsons.com
Tim Johnson	Deputy Project Manager	Parsons	(315) 451-9560	(315) 451-9570	Timothy.Johnson@parsons.com
Richard Cheatham	Quality Assurance Officer	Parsons	(303) 764-8823	(303) 831-8208	Richard.Cheatham@parsons.com
Laura White	Database Manager	Parsons	(315) 451-9560	(315) 451-9570	Laura.White@parsons.com

TABLE B2.2

LABORATORY KEY PROJECT CONTACTS

Technical Expert	Project Role	Affiliation	Telephone Number	Fax Number	E-mail Address
Dave Dunlap	Project Manager	STL Pittsburgh	412.963.7058	412-963-2468	ddunlap@stl-inc.com
Patrick Conlon	Technical Manager	STL Pittsburgh	412.963.7058	412-963-2468	paconlon@stl-inc.com
Albert' Rusty' Vicinie	Laboratory Director	STL Pittsburgh	412.963.7058	412-963-2468	rvicnie@stl-inc.com
Nasareen DeRubis	Quality Assurance Manager	STL Pittsburgh	412.963.7058	412-963-2468	Nderbis@stl-inc.com
Kris Dusablon	Project Manager	STL Burlington	802.655.1203	802 655 1248	kdusablon@stl-inc.com
Kristen McCracken	Quality Assurance Manager	STL Burlington	802.655.1203	802 655 1248	kmccracken@stl-inc.com
Chris Ouelette	Laboratory Director	STL Burlington	802.655.1203	802 655 1248	Couelette@stl-inc.com
Bryce Stearn	Technical Manager	STL Burlington	802.655.1203	802 655 1248	bstearn@stl-inc.com

SECTION B3

DATA QUALITY OBJECTIVES AND DATA QUALITY CRITERIA

B3.1 INTRODUCTION

A systematic planning process will develop site-specific data quality objective (DQOs). These DQOs will clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential errors. These parameters, in turn, will be the basis for establishing the quality and quantity of data needed to support the utility of the data. This section was prepared in accordance with USEPA Guidance for the Data Quality Objectives Process (USEPA, August 2000). Project DQOs will be developed using the "seven-step" DQO process, consisting of the following steps:

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify inputs to the decision

Step 4: Define the study boundaries

Step 5: Define the decision rule

Step 6: Specify tolerable limits of decision error

Step 7: Optimize the design

Data quality objectives specify the underlying reason for collecting the data and the data type, quality, quantity, and uses needed to make decision, and they provide the basis for designing data collection activities. DQOs and quality assurance objectives are related data quality planning and evaluation tools for all sampling and analysis tools. Analytical quality assurance objectives and criteria, and the associated analytical methods are identified in QAPP Section 3 and 7. The project task, activities, and procedures described in the SAP Section A3, are developed with reference to the DQO process.

The purpose of this QAPP is to provide a standard for control and review of measurement data to ensure they are scientifically sound, representative, comparable, defensible, and of known quality. The data will be used to evaluate the physical and chemical attributes of samples collected from the Site. The project objective for analytical testing is to characterize the physical characteristics and chemical constituents of sediments to provide data to support the remedial action decision-making process.

The data produced during the field investigation will be compared with the defined QA objectives and criteria for precision, accuracy, representativeness, completeness, sensitivity, and comparability (PARCC) to see that the data reported represent actual conditions at the Site.

This data assessment activity is an on-going coordinated process with data production and is intended to assure that data produced during the project are acceptable for use in subsequent evaluations. Both statistical and qualitative evaluations will be used to assess the quality of the data. The primary evaluation of the data will be based upon the field quality control samples described in Section B8.1 and summarized on Table B8.1, the laboratory quality control samples described in Section B8.1 and summarized on Table B8.2, and on the QC requirements and criteria summarized in Attachment 3. The "blank" samples (laboratory QC blank samples and field QC blank samples) will be used to evaluate whether or not the laboratory and/or field sample handling represent a possible source of sample contamination. Laboratory duplicate sample results will be used to evaluate analytical precision. Field duplicate sample results will be used to evaluate the overall precision of the sampling and analysis process, as well as sample representativeness and site heterogeneity. Laboratory control samples will be used to evaluate the accuracy of analytical results, as will other analysis-specific criteria, such as surrogate compound recoveries for VOCs and SVOCs. Matrix spike/matrix spike duplicate (MS/MSD) analysis of project samples will be used to evaluate potential sample matrix effects on the analytical results (both of the sample utilized for MS/MSD and of other samples collected from the site). For all sample results, the impact of sample-specific, analysis-specific, and site-specific factors will be evaluated and an assessment will be made as to their impact, if any, on the data. Project general advisory QC limits for precision and accuracy of soil/sediment and water analyses are summarized on Table B3.2. Project advisory QC limits for precision and accuracy for sediment and for air sample analyses for the bench-scale testing associated with the Air Emissions and Odor Evaluation (PDI Phase I WP Appendix A) are summarized on Tables B3.3A and B3.3B, respectively. Duplicate sample (field and laboratory QC samples) results will be used to evaluate data precision.

B3.1.1 Data Use Objectives

Data use objectives define why analyses are being conducted and how ultimately the data will be used to meet the overall project objectives. For the PDI Phase I, these project objectives are stated in the PDI Phase I Work Plan. The field efforts and analyses discussed in PDI WP Appendices A and D are based on these stated objectives.

B3.1.2 Measurement Performance Criteria

Measurement performance criteria describe how the DQOs will be satisfied. For each DQO, the types of measurements to be conducted are introduced, and their performance requirements are discussed in Section A3 of the SAP specific to a particular data collection method, and in the Air Emission and Odor Work Plan.

B3.2 DATA QUALITY OBJECTIVES (PARCC AND SENSITIVITY PARAMETERS)

B3.2.1 Introduction

DQOs are based on the premise that different data uses require different levels of data quality. The term *data quality* refers to a degree of uncertainty with respect to PARCC data quality indicators. Specific objectives are established to develop sampling protocols and identify

applicable documentation, sample handling procedures, and measurement system procedures. These DQOs are established by onsite conditions, objectives of the project, and knowledge of available measurement systems. Project DQOs are presented and discussed in detail in this QAPP and in the PDI Phase I SAP. A wide range of data quality is achieved through the use of various analytical methods. The following data quality levels are widely accepted as descriptions of the different kinds of data that can be generated for various purposes:

- **Level I, Field screening or analysis using portable instruments (e.g., photoionization detector [PID]):** Results are often not compound-specific but results are available in real time. Depending on the analysis being performed and the instrumentation used, the results may be considered qualitative, semi-quantitative, or quantitative.
- **Level II, Field analysis using more sophisticated portable analytical instruments (e.g., on-site mobile laboratory):** There is a wide range in the quality of data that can be generated depending on the use of suitable calibration standards, reference materials, and sample preparation equipment. Results are available in real-time or typically within hours of sample collection.
- **Level III, All analyses performed in an off-site analytical laboratory using methods other than USEPA-approved analytical methods**: These data generally do not include the level of formal documentation required under Level IV and are not subject to formal data validation. These data are typically used for engineering studies (e.g., treatability testing), site investigations and remedial design.
- **Level IV, Data generated using USEPA methods and enhanced by a rigorous QA program, supporting documentation, and data validation procedures:** These data are typically used for engineering studies (e.g., treatability testing), risk assessment, site investigations, and remedial design, and may be suitable for litigation/enforcement activities. Results are both qualitative and quantitative.

Project data quality level requirements for sediment, soil, and water sample analyses have been determined to be as follows:

- Level I data quality will be obtained for field screening data collected with portable instruments such as pH meters, temperature probes, and Photoionization Detectors (PIDs) which will be used for health and safety and field operational monitoring. In addition, these instruments or field test kits may be used to produce data for determining where to collect a sample to assess impacts and for field screening of samples to be designated for laboratory confirmation analyses.
- A Level II data quality assurance program will be executed by the field team for obtaining data associated with Membrane Interface Probe (MIP), Cone Penetrometer Test (CPT), and Standard Penetration Test (SPT), vane shear tests, and other selected field tests.

- A Level III data quality assurance program will be executed by the laboratory for chemical analyses not required to be Level IV, such as grain size, Atterberg limits, specific gravity, pH, hardness, TDS, and seepage-induced consolidation tests.
- A Level IV data quality assurance program will be executed, in general, by the laboratory for chemical analyses necessary to meet the PDI Phase I WP DQOs.
- The Data Quality Levels for the bench-scale testing associated with the Air Emissions and Odor Work Plan

Project DQO Levels are summarized on Table B3.1 by analytical parameter or analysis type (i.e., field test or bench test).

Project data quality level requirements for the bench-scale testing associated with the Air Emissions and Odor Work Plan (PDI Phase I WP Appendix D) are summarized on Table B3.1 and are as follows:

- Level I data quality will be obtained for selected parameters, including: temperature, humidity, percent solids, and turbidity (using a field instrument).
- Level II data quality will be obtained for selected parameters, including: Hydrogen Sulfide and Ammonia, as well as for air flow.
- Level III data quality will be obtained for selected parameters, including: total Mercury, TCL VOCs, TCL SVOCs, and TOC. These analyses will be performed using standard analytical methods as incorporated into the laboratory SOPs.

B3.2.2 PARCC Parameters (Data Quality Indicators)

B3.2.2.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), absolute difference (D), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

The objectives for precision for each chemical are based on the capabilities of the approved EPA analytical method with respect to laboratory performance. Table B3.2 presents the quantitative objectives for precision for the various parameter groups for laboratory performance and evaluation of sample measurement bias.

For this project, field-sampling precision will be determined by analyzing coded (blind) duplicate samples for the same parameters, and then, during data validation, calculating the RPD for duplicate sample results.

The laboratory will determine analytical precision by calculating the RPD or D, as applicable to the analytical method being used, e.g., pH will be evaluated using D.

The laboratory will determine analytical precision by calculating the RPD for the results of the analysis of the laboratory duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD	=	Relative percent difference
V1, V2	=	Values to be compared
|V1 - V2|	=	Absolute value of the difference between the two values
(V1 + V2)/2	=	Average of the two values

For data evaluation purposes, in instances where both sample concentrations are less than five times (<5x) the RL, duplicate precision will be evaluated using the calculated D result. In this instance, the applicable precision criterion will be two times the RL (2xRL). If a value is not detected, the RPD criterion will be considered to be not applicable and the RPD will not be calculated (i.e. precision will not be quantitatively determined).

B3.2.2.2 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987) or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity that is recovered or measured. The recovery of a given analyte depends on the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are less than the quantitation limits are less accurate because they are more affected by such factors as instrument "noise." Higher concentrations will not be as affected by instrument noise or other variables and, thus, will be more accurate.

The objectives for accuracy for each chemical are based on the capabilities of the approved USEPA analytical method with respect to laboratory performance. Table B3.2 presents the quantitative objectives for accuracy for the various parameter groups for laboratory performance and evaluation of sample measurement bias.

Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), the percent recoveries of matrix spike compounds added to selected samples, and the percent recoveries of spike compounds added to laboratory control samples (LCS). An LCS will be analyzed to provide additional information on analytical accuracy. Additionally, initial and continuing calibrations

must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a *spike*, added to a sample (matrix spike or laboratory control). The accuracy on a per sample basis will be measured using surrogates for the organics analyses. Positive detects from the PCB analysis will be confirmed using second column confirmation. The laboratory will report the lower of the two values with respect to the dual GC column analysis performed. When the percent difference (%D) between the results for the two columns exceeds 25%, the laboratory will qualify the reported result with the *P* qualifier. The %R is calculated as follows:

$$\text{Matrix Spike Recovery: } \%\text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

where:

%R	=	Percent recovery
SSR	=	Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added
SR	=	Sample result: the background value; *i.e.*, the concentration of the analyte obtained by analyzing the sample
SA	=	Spiked analyte: concentration of the analyte spike added to the sample

$$\text{Surrogate Recovery: } \%\text{ Recovery} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$$

$$\text{LCS Recovery: } \%\text{ Recovery} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$$

B3.2.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter and is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. An important factor in the selection of sample locations and sampling procedures will be obtaining representative samples.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree technically possible, that the data derived represents the in-place quality of the material sampled. Care will be exercised to see that chemical compounds are not introduced to the

sample from sample containers, handling, and analysis. Field blanks, trip blanks, and laboratory method/prep blanks will be analyzed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded (blind) field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis such that the reported results are representative of the sample received. Chain-of-custody procedures will be followed to document the possession of sample containers from the time of container preparation through sample collection and receipt back at the laboratory. Field QC samples will be collected and analyzed to provide information to evaluate sample representativeness. Details of field QC sample collection (rinse blanks, trip blanks, temperature blanks, field duplicates) and chain-of-custody procedures are presented in Section B4.2 and Section B8.1.1.

B3.2.2.4 Completeness

Completeness is defined as the percentage of measurements that meet the project's data quality objectives (USEPA, 1987). Completeness is calculated for each method (or analyte) and sample matrix for an assigned group of samples. Completeness for a data set represents the results usable for data interpretation and decision making. The completeness objective for this project for the analytical and field data is 90%. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness

V = Number of measurements judged valid (not rejected during data validation)

T = Total number of measurements

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of results. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason, negatively affect influence completeness and are subtracted from the total number of results to calculate completeness.

B3.2.2.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be managed by:

- Using identified standard methods (including laboratory standard operating procedures) for both sampling and analysis phases of this project
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST)
- Requiring that calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable)
- Using standard reporting units and reporting formats including the reporting of QC data
- Performing data validation on the Level IV analytical results, including the use of data qualifiers in all cases where appropriate
- Evaluating the sample collection information and analytical QC sample results associated with Level III analytical results
- Requiring that the significance of all validation qualifiers be assessed any time an analytical result is used for any purpose.

By taking these steps during the investigation, future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

B3.2.3 Sensitivity and Quantitation Limits

When selecting an analytical method during the DQO process, the achievable detection limit (MDL) and method reporting limit (RL) must be evaluated to verify that the method will meet the project quantitation limits necessary to support project decision making requirements. This process ensures that the analytical method sensitivity has been considered and that the methods used can produce data that satisfy users' needs while making the most effective use of resources. The concentration of any one target compound that can be detected and/or quantified is a measure of sensitivity for that compound. Sensitivity is instrument-, compound-, method-, and matrix-specific and achieving the required project quantitation limit (RL) and/or method detection limit (MDL) objectives depends on instrument sensitivity and potential matrix effects. With regard to instrument sensitivity, it is important to monitor the instrument performance to ensure consistent instrument performance at the low end of the calibration range. Instrument sensitivity will be monitored through the analysis of method/prep blanks, calibration check samples, and low standard evaluations.

Laboratories generally establish limits that are reported with the analytical results; these results may be called reporting limits, detection limits, quantitation limits, or other terms. These laboratory-specific limits, apply undiluted analyses and must be less than or equal to the project RLs. The RL, also known as the practical quantitation limit (PQL), represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation. Throughout various documents RL and PQL may be interchanged, but they effectively have the same meaning. The RLs are established based on specific knowledge about the analyte, sample matrix, project specific requirements, and

regulatory requirements. The RL is typically established by the laboratory at the level of the lowest calibration standard and is generally in the range of two to ten times the MDL.

The method detection limit (MDL) is defined as "the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero" (40 CFR 136 Appendix B). The MDL is the lowest concentration at which a specific analyte in a matrix can be measured and reported with 99% confidence that the analyte concentration is greater than zero. MDLs are experimentally determined and verified for each target analyte of the methods in the sampling program. The laboratory will determine MDLs for each analyte and matrix type prior to analysis of project samples. In addition, when multiple instruments are employed for the analysis of the same method, each individual instrument will maintain a current MDL study. MDLs are based on the results of seven matrix spikes at the estimated MDL, and are statistically calculated in accordance with the Title 40, Code of Federal Regulations Part 136 (40 CFR 136) Appendix B. The standard deviation of the seven replicates is determined and multiplied by 3.14 (i.e., the 99% confidence interval from the one-sided student t-test). If risk-based project objectives are developed, then where practicable, MDLs must be lower than the risk-based criteria determined for the project.

The MDLs to be used are intended to allow that both nondetected and detected target compound results will be usable to the fullest extent possible for the project. An MDL check sample an (interference-free MS with all method target compounds) must be analyzed following the MDL study to determine if reasonable MDL concentrations have been achieved. The MDL check sample should be at a concentration in the range of two to four times the MDL. If any target compound is not recovered, the MDL study must be repeated. In this case, the repeated MDL should be performed with a higher concentration, based on the analyst's judgment, of the target compounds that failed in the MDL check sample. MDLs must be determined annually at a minimum, and verified by analyzing an MDL check sample on each instrument used for the applicable method.

VOCs, SVOCs, PCBs, anions, mercury, and TOC will generally be reported to the RL. Analytical results below the RL will be flagged with the RL concentration followed by a *U* to indicate the data is non-detect. However, if required by a specific analytical statement of work, the laboratory will flag organic analytes (VOCs, SVOCs, PCBs) detected at a level less than the RL but greater than the MDL (or the laboratory's determined minimum reportable concentration) with a *J* to denote an estimated concentration. Similarly, if required by a specific analytical statement of work, inorganic analytes (e.g., Mercury) detected at a level less than the RL but greater than the MDL will be "flagged" as estimated with a *B* to denote an estimated concentration.

Sediments typically contain low percent solids. When results are corrected for dry weight, the reporting limits are then elevated accordingly. To compensate for the low solids, modifications are made either to increase the initial volume extracted/digested or to reduce the final volume of extract/digestate. For this project, if analyte levels and matrix permit, the following modifications will be applied to these samples:

- PCB Aroclors (total PCBs) the final volume of extract will be concentrated to a final volume of 2.0 mL, if appropriate.
- Routine sample mass will be used for all other analyses.

Any free-standing water for samples undergoing pore water analysis will be decanted and combined with the pore water generated through centrifugation of the sediment. The free standing water is essentially porewater that has come to the surface of the sample during transportation of the sample from the field to the lab. As stated in the SAP and associated standard operating procedures surface water will be decanted from the top of the sample prior to packaging and shipment to the laboratory. In all cases, any QC failure or anomalous observation on the part of the analytical laboratory will immediately be reported to the Project Manager and/or,QAO.

For samples that do not meet the project-specified RLs, (taking into consideration elevated RLs due to percent solids or percent moisture and aliquots used for the designated analysis), the laboratory must make available compelling documentation (e.g., screening data) and a justifiable explanation for its inability to meet the specified limits using the project protocols. It must also provide an appropriate, justifiable explanation of the issues and resolution in the analytical report/data package (dilution factor, interference, etc.). Excessive, unnecessary dilutions on any sample for a project are unacceptable. The laboratory will analyze all samples initially undiluted, unless for GC/MS analyses (i.e., SW8260B and SW8270C), a preliminary GC-screen is performed and indicates that GC/MS instrument damage or compromise may occur if the sample is not analyzed initially at dilution. In this instance, the sample will be analyzed at the lowest possible dilution factor. If multiple extractions/ analyses are performed (such as undiluted and diluted analyses), resulting in several data sets for the same sample, the laboratory will report all data and results from each of the multiple analyses in the data package.

Quantitation limits for all definitive data quality level laboratory analytical methods, compounds, and matrices to be addressed for this project are provided in Section B7. Sediment RLs and MDLs listed in Table B7.4 are presented on a wet-weight basis. Individual sediment sample RLs and MDLs will be adjusted accordingly based on moisture and aliquots used for analysis. Individual aqueous sample RLs and MDLs will be adjusted accordingly based on aliquots used for analysis.

TABLE B3.1

SUMMARY OF DQOs FOR ANALYTICAL AND TESTING PARAMETERS FOR SEDIMENT, SURFACE WATER, AND POREWATER SAMPLES[(1)]

PARAMETER	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
Total Mercury				X
CPOI VOCs				X
CPOI SVOCs				X
Total PCBs				X
Total Chlorides				X
Total Ammonia				X
Total Sulfides				X
pH			X	
Major Cations (metals)				X
Major Anions				X
Nitrate/Nitrite Nitrogen				X
Ammonia Nitrogen				X
Salinity		X		
Total Organic Carbon (TOC)				X
Dissolved Organic Carbon (DOC)				X
Turbidity (lab)			X	
Total Suspended Solids (TSS)			X	
Hardness			X	
Grain Size			X	
Atterberg Limits			X	
Specific Gravity			X	
Moisture Content				X
Carbonate Content			X	
Bulk Density			X	
UU Triaxial Strength			X	
CU Triaxial Strength			X	
Consolidation			X	
MIP Test (field)		X		
Cone Penetrometer Test (field)		X		
Standard Penetration Test (field)		X		
Vane Shear Tests (field)		X		

[(1)]Note: suite of analytical parameters will vary by sample type and sample location.

TABLE B3.1a

SUMMARY OF DQOS FOR ANALYTICAL AND TESTING PARAMETERS FOR AIR EMISSION AND ODOR TESTING

PARAMETER	LEVEL I	LEVEL II	LEVEL III
CPOI VOCs			X
CPOI SVOCs			X
Total Organic Carbon (TOC)			X
Total Mercury			X
Hydrogen Sulfide (Gastec tubes)		X	
Ammonia (Gastec tubes)		X	
Temperature	X		
Humidity	X		
Air Flow		X	
Percent Solids	X		
Turbidity (field instrument)	X		

TABLE B3.2
QUALITY CONTROL CRITERIA FOR ACCURACY AND PRECISION OF SEDIMENT AND WATER ANALYSES [(1) (2)]

Method	Analyte	Precision RPD/%D	Accuracy % Rec	Precision RPD/%D	Accuracy %Rec
		Sediment		Water	
SW7471A CVAA	Mercury	20	80-120	20	75-125
EPA 350.1	Ammonia	10	90-110	20	75-125
EPA (Lloyd Kahn)	TOC	30	75-125	20	75-125
SW 9040C	pH	+/-0.1 s.u.	N/A	+/-0.1 s.u.	75-125
EPA SW9030B/9034	Sulfide	20	75-125	20	75-125
SW9056	**Anions**	N/A	N/A	20	90-110
SW6010B	**Metals (Cations)**	N/A	N/A	20	75-125
SW8260B	**VOCs**				
	Benzene	30	74-120	32	80-120
	Toluene	30	75-120	35	80-123
	Chlorobenzene	30	70-120	29	70-120
	Ethylbenzene	30	77-120	33	72-126
	m,p-Xylene	30	75-121	32	73-130
	o-Xylene	30	75-121	32	72-124
	1,2-Dichlorobenzene	30	70-120	30	70-120
	1,3-Dichlorobenzene	30	70-120	30	70-120
	1,4-Dichlorobenzene	30	70-120	30	70-120
	1,2,3-Trichlorobenzene	30	35-140	30	35-140
	1,2,4-Trichlorobenzene	30	35-140	30	35-140
	1,3,5-Trichlorobenzene	30	35-140	30	35-140
	Naphthalene	30	23-153	30	32-127
SW8260B	**TCL VOCs [(3)]**				
	Acetone	79	10-186	N/A	N/A
	Benzene	27	74-120	N/A	N/A
	Bromodichloromethane	29	69-120	N/A	N/A
	Bromoform	37	54-129	N/A	N/A
	Bromomethane	54	30-154	N/A	N/A

TABLE B3.2 (CONTINUED)
QUALITY CONTROL CRITERIA FOR ACCURACY AND PRECISION OF SEDIMENT AND WATER ANALYSES [(1) (2)]

Method	Analyte	Precision RPD/%D	Accuracy % Rec	Precision RPD/%D	Accuracy %Rec
		Sediment		Water	
SW8260B TCL VOCs (continued)	2-Butanone	63	25-154	N/A	N/A
	Carbon disulfide	35	57-127	N/A	N/A
	Carbon tetrachloride	35	68-125	N/A	N/A
	Chlorobenzene	25	77-120	N/A	N/A
	Dibromochloromethane	30	67-121	N/A	N/A
	Chloroethane	55	28-172	N/A	N/A
	Chloroform	36	75-120	N/A	N/A
	Chloromethane	50	36-140	N/A	N/A
	Cyclohexane	50	50-150	N/A	N/A
	1,2-Dibromo-3-chloropropane	72	29-144	N/A	N/A
	1,2-Dibromoethane	20	62-122	N/A	N/A
	1,2-Dichlorobenzene	30	72-120	N/A	N/A
	1,3-Dichlorobenzene	30	75-120	N/A	N/A
	1,4-Dichlorobenzene	30	75-120	N/A	N/A
	Dichlorodifluoromethane	80	10-153	N/A	N/A
	1,1-Dichloroethane	47	71-153	N/A	N/A
	1,2-Dichloroethane	43	66-122	N/A	N/A
	cis-1,2-Dichloroethene	20	72-120	N/A	N/A
	trans-1,2-Dichloroethene	20	67-121	N/A	N/A
	1,1-Dichloroethene	33	63-126	N/A	N/A
	1,2-Dichloropropane	20	73-120	N/A	N/A
	cis-1,3-Dichloropropene	40	71-120	N/A	N/A
	trans-1,3-Dichloropropene	31	67-121	N/A	N/A
	Ethylbenzene	25	77-120	N/A	N/A
	2-Hexanone	31	33-147	N/A	N/A
	Isopropylbenzene	20	71-125	N/A	N/A

TABLE B3.2 (CONTINUED)
QUALITY CONTROL CRITERIA FOR ACCURACY AND PRECISION OF SEDIMENT AND WATER ANALYSES [(1) (2)]

Method	Analyte	Precision RPD/%D	Accuracy % Rec	Precision RPD/%D	Accuracy %Rec
		Sediment		Water	
SW8260B TCL VOCs (continued)	Methyl acetate	50	10-150	N/A	N/A
	Methylcyclohexane	50	50-150	N/A	N/A
	Methylene chloride	20	66-129	N/A	N/A
	4-Methyl-2-pentanone	39	42-139	N/A	N/A
	Methyl tert-butyl ether	45	55-126	N/A	N/A
	Styrene	22	73-121	N/A	N/A
	1,1,2,2-Tetrachloroethane	20	51-130	N/A	N/A
	Tetrachloroethene	25	73-120	N/A	N/A
	Toluene	26	75-120	N/A	N/A
	1,2,4-Trichlorobenzene	30	48-131	N/A	N/A
	1,1,1-Trichloroethane	24	71-121	N/A	N/A
	1,1,2-Trichloroethane	23	64-121	N/A	N/A
	Trichloroethene	26	73-120	N/A	N/A
	Trichlorofluoromethane	20	21-153	N/A	N/A
	1,1,2-Trichloro-1,2,2-trifluoroethane	30	54-129	N/A	N/A
	Vinyl chloride	25	43-139	N/A	N/A
	Xylenes (total)	20	75-121	N/A	N/A
	1,2,3-Trichlorobenzene	40	35-140	N/A	N/A
	1,3,5-Trichlorobenzene	44	35-140	N/A	N/A
SW8270C	SVOCs [(4)]				
	Phenol	50	35-110	35	38-115
	Acenaphthene	23	40-115	30	41-115
	Acenaphthylene	24	40-115	30	50-115
	Anthracene	26	40-115	30	49-115

TABLE B3.2 (CONT.)
QUALITY CONTROL CRITERIA FOR ACCURACY AND PRECISION OF SEDIMENT AND WATER ANALYSES [1]

Method	Analyte	Precision RPD/%D	Accuracy % Rec	Precision RPD/%D	Accuracy %Rec
		Sediment		Water	
SW8270C SVOCs (continued)	Benzo(a)anthracene	23	40-115	23	49-115
	Benzo(a)pyrene	24	40-115	31	44-115
	Benzo(b)fluoranthene	30	40-115	28	37-115
	Benzo(g,h,i)perylene	35	40-115	50	46-115
	Benzo(k)fluoranthene	30	40-115	31	42-115
	Chrysene	26	40-115	31	46-115
	Dibenz(a,h)anthracene	31	40-115	55	43-115
	Fluoranthene	23	40-115	23	44-115
	Fluorene	24	40-115	38	47-115
	Indeno(1,2,3-cd)pyrene	32	40-115	37	45-115
	Phenanthrene	24	40-115	20	50-115
	Pyrene	24	40-115	41	35-127
SW8082 (modified (Total PCBs)	PCB Aroclors (1016 + 1268)	35	45-130	35	60-125

[1] Note: Suite of parameters will vary by sample type and sample location, as specified in PDI SAP Section A.3.

[2] STL provided QC Limits; SW8270C SIM used for PAHs in sediments.

[3] TCL VOCs applicable only for SMU 2 sediments.

[4] Applicable to those analytes used for MS/MSD or LCS.

TABLE B3.3A

QUALITY CONTROL ADVISORY LIMITS FOR ACCURACY AND PRECISION OF AIR EMISSIONS BENCH TESTING ANALYSES OF SEDIMENT SAMPLES [(1)]

Method	Analyte	Precision RPD/%D	Accuracy % Rec
		Sediment	
SW7471A CVAA	Mercury	50	75-125
EPA 350.1	Ammonia	50	75-125
EPA (Lloyd Kahn)	TOC	50	75-125
SW 9040B	pH	50	N/A
EPA SW9034	Sulfide	50	75-125
EPA 310.1	Total alkalinity	50	N/A
SW8260B	**VOCs**	50	
SW8270C	Benzene	50	50-150
	Toluene	50	50-150
	Chlorobenzene	50	50-150
	Ethylbenzene	50	50-150
	m,p-Xylene	50	50-150
	o-Xylene	50	50-150
	1,3-Dichlorobenzene	50	50-150
	1,4-Dichlorobenzene	50	50-150
	1,2-Dichlorobenzene	50	50-150
	1,2,3-Trichlorobenzene	50	50-150
	1,2,4-Trichlorobenzene	50	50-150
	1,3,5-Trichlorobenzene	50	50-150
	Naphthalene	50	50-150
	SVOCs		
	Phenol	50	50-150
	Acenaphthene	50	50-150
	Acenaphthylene	50	50-150
	Anthracene	50	50-150

[(1)]Air and Emission laboratory provided limits.

TABLE B3.3A (CONT.)

QUALITY CONTROL ADVISORY LIMITS FOR ACCURACY AND PRECISION OF AIR EMISSIONS BENCH TESTING ANALYSES OF SEDIMENT SAMPLES

Method	Analyte	Precision RPD/%D	Accuracy % Rec
		Sediment	
	Benzo(a)anthracene	50	50-150
	Benzo(a)pyrene	50	50-150
	Benzo(b)fluoranthene	50	50-150
	Benzo(g,h,i)perylene	50	50-150
	Benzo(k)fluoranthene	50	50-150
	Chrysene	50	50-150
	Dibenz(a,h)anthracene	50	50-150
	Fluoranthene	50	50-150
	Fluorene	50	50-150
	Indeno(1,2,3-cd)pyrene	50	50-150
	Phenanthrene	50	50-150
	Pyrene	50	50-150
SW8082 (modified) (PCBs)	PCB Aroclors + 1268	50	50-150

TABLE B3.3B

QUALITY CONTROL ADVISORY LIMITS FOR ACCURACY AND PRECISION OF AIR EMISSIONS BENCH TESTING ANALYSES OF AIR SAMPLES

Method	Analyte	Precision RPD/%D	Accuracy % Rec
		Air	
OSHA-140	Mercury	30	75-125
NIOSH 6016	Ammonia	30	75-125
	Hydrogen Sulfide	30	75-125
NIOSH 1500/1501-modified (Braun Intertec SOP)	**VOCs**		
	Benzene	30	50-150
	Toluene	30	50-150
	Chlorobenzene	30	50-150
	Ethylbenzene	30	50-150
	m,p-Xylene	30	50-150
	o-Xylene	30	50-150
	1,2,4-Trichlorobenzene	30	50-150
	1,3-Dichlorobenzene	30	50-150
	1,4-Dichlorobenzene	30	50-150
	1,2-Dichlorobenzene	30	50-150
ASTM-D-4861	Hexachlorobenzene	30	50-150
NIOSH 5506	**SVOCS (PAHS)**		
	Fluorene	30	50-150
	Naphthalene	30	50-150
	Phenanthrene	30	50-150
	Pyrene	30	50-150

SECTION B4

DATA ACQUISITION

B4.1 SAMPLING METHODS

The detailed sampling methods, equipment, and procedures for collecting samples of various environmental media are described in the SAP. Any non-disposable sampling equipment used for chemical sampling, as described in Section A3 of the SAP, will be cleaned and decontaminated prior to use to prevent potential cross-contamination between each use. Additionally, this QAPP describes management, handling, and tracking procedures for investigation-derived waste, including solid and liquid materials, and personal protective equipment.

The special precautions described here will be taken to confirm that each sample collected is representative of the conditions at that location and that the sampling and handling procedures neither alter nor contaminate the sample. If failure in the sampling or measurement system occurs, the procedures specified in Section B10.3 of this QAPP will be followed to identify who is responsible for implementing the appropriate corrective action. This section presents sample container preparation procedures, sample preservation procedures, and sample holding times.

For this program, the laboratory will purchase and distribute certified clean sample containers with chemical preservatives. The sample containers used for chemical analysis must be virgin bottleware, I-Chem™ Series 300 (or equivalent). Vendors are required to provide documentation of analysis for each lot of containers, and the documentation will be kept on file at the laboratory. Alternatively, the laboratory may perform testing to certify that the sample containers are not contaminated. Since the containers supplied by the laboratory will be certified clean, the bottles will not be rinsed in the field prior to use.

Laboratory-supplied sample kits (coolers containing field chain-of-custody forms, custody seals, sample containers, preservatives, and packing material) will be prepared by the laboratory's Sample Management Staff and shipped to the Parsons Field Team Leader. Tables B4.1 and B4.2 define the type of containers, required sample volumes, preservation techniques, and holding times for specific analyses as appropriate with the exception of physical parameters (such as unit weight, specific gravity, and Atterberg limits). The laboratory that will perform the geotechnical analysis (not yet selected) will specify requirements for the physical parameters.

Samples requiring preservation (such as aqueous samples for VOCs and mercury) will be collected in sample containers provided by the analytical laboratory that already contain sufficient quantities of the appropriate preservative(s) to ensure that the sample is kept in accordance with the method requirements. The laboratory must provide an adequate amount of pre-preserved bottles with traceable high-purity preservatives, and additional preservative for use

if the added amount is not sufficient, based on request by the Field Team Leader and on an as-needed basis if additional bottleware is needed during the field activities. The field team must verify that the preservative has been added appropriately.

B4.2 SAMPLE HANDLING AND CUSTODY

This section presents sample handling and custody procedures for both the field and laboratory. Implementation of proper handling and custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain of custody and transfer of samples will be trained as to the purpose and procedures prior to implementation. For transfer of samples within the laboratory, an internal chain of custody will be required.

B4.2.1 Sample Handling

For this program, samples will be collected by the Parsons' field team and/or subcontractor following procedures specified in the SAP and PSP. After the samples are collected, they will be split as necessary among preserved containers appropriate to the parameters to be analyzed. Each container will be provided with a sample label that will be filled out at the time of collection. The sampler will print label information, specified below, on each label either before or immediately after collecting the sample with an indelible writing instrument. The label will be protected from water and solvents with clear label packing tape.

The following information, at a minimum, is required on each sample label (note: the location ID and the sample ID as described in the Data Management section below inherently identify some of this information, see below):

- Client
- Project name
- Sampling location
- Sample number
- Date and time of sample collection
- Parameters to be analyzed
- Preservative(s) added, if any
- Initials of the sampler.

Following sample collection, excess soil, water, etc., will be wiped from the outside of the sample containers with a paper towel and the lids will be checked to verify they are tightly closed. Each glass container will be wrapped with bubble wrap to minimize breakage during transport. Bottles containing soil, sediment, and water samples will be placed in separate Ziploc® bags (one bag) and set on ice (ice bath not necessary). Documentation of equipment and methods used in the field for treating the samples will be maintained in the field logbooks, and a

chain of custody will be initiated to document transfer of the samples from the field team to the laboratory. In preparation for shipment to the analytical laboratory, the shipment cooler will be packaged as follows:

- Fill a dry shipment cooler with inert cushioning to a depth of 1 inch to prevent bottle breakage.
- Place the bagged samples and the laboratory-provided temperature blank upright in the sample cooler. The temperature blank should be placed in the center (horizontally and vertically) with the samples surrounding.
- Place additional cushioning material around the sample bottles as necessary.
- Place bags of ice in the remaining void space to keep the samples cooled to 4°C.
- Complete the chain-of-custody form (see Section B4.2.2). Place the chain-of-custody form in a polyethylene, sealable bag (such as a 1-gal Ziploc® bag or equivalent) and tape the bag to the interior of the cooler lid. Field personnel retain a copy of the chain-of-custody form; another copy is transmitted to the QAO and the remedial design consultant Project Manager.
- Prior to sealing for shipment, the list of samples will be checked against the container contents to verify the presence of each sample listed on the chain-of-custody record including the temperature blank.
- Affix a custody seal to the cooler.
- Seal the cooler securely with packing tape, taking care not to cover labels if already present.
- Label the cooler appropriately in accordance with the Department of Transportation (DOT) regulations (49 CFR 171 through 179).
- Ship the samples in accordance with the DOT requirements outlined in 49 CFR 171 through 179. Complete the carrier bill of lading, and retain a copy on file.
- Samples will be delivered to the laboratory by the most expedient means to meet holding times. Whenever practicable, samples will be shipped on the day of collection for delivery to the laboratory the morning of the day after collection. The laboratory will be required to adhere to the holding times as stated in Table B4.1 for sediment and porewater sample analyses. For porewater samples collected in the field (i.e. not generated in laboratory), holding times begin at the date and time that the sample is collected. For sediment cores, the sample collection data and time will be data and time that the sediment core is processed at the on-shore facility. All sediment cores will be processed and shipped to the laboratory within two business days of core collection. Analytical holding times for laboratory-generated porewaters and laboratory-generated dewatered sediments will be established from the date/time of sample generation at the laboratory. Laboratory performance requirements for analysis turnaround time will be established using the validated time of sample receipt (VTSR) in accordance to

NYSDEC requirements. The field team will carefully coordinate sampling activities with the laboratory to see that holding times are met.

The required holding times must be adhered to for the initial sample preparation/analysis. If subsequent reanalysis or re-extraction becomes necessary because of method requirements or additional requirements stated here, the laboratory will make every effort to perform those re-extractions and/or reanalysis within the primary holding times. Any holding time that is exceeded will be reported immediately to the Parsons Project Manager and the QAO by the laboratory QAM.

B4.2.2 Field Sample Custody

The primary objective of sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the moment of their collection through analysis until their final disposition. A sample (or sample container) will be considered under custody if:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with custody seals placed on the sample cooler so that no one can tamper with it after having been in physical custody
- In a secured area that is restricted to authorized personnel.

The sample custody flowchart is shown in Figure B4.1.

DATA REQUIRED ON CHAIN-OF-CUSTODY*
Project name and client
Signatures of samplers
Sample number, date and time of collection, and grab or composite sample designation
Signatures of individuals involved in sample transfer
If applicable, the air bill or other shipping number
ADDITIONAL ITEMS THAT SHOULD BE INCLUDED:
Sample matrix
Number of sample containers
Analyses to be performed,
Preservative(s)
Name of the analytical laboratory to which the samples are sent
Method of sample shipment
Project number.
*Required by guidance in SW846 Test Methods for Evaluating Solid Waste, Physical and Chemical (USEPA, 1997)

A chain-of-custody record will accompany the samples from the time the samples leave the original sampler's possession through the sample shipments' receipt at the laboratory. Triplicate copies of the chain-of-custody record must be completed for each sample set collected. See chart for data requirements.

If samples are split and sent to different laboratories, a copy of the chain-of-custody record is sent with each sample.

The REMARKS space on the chain-of-custody form is used to indicate if the sample is a matrix spike/matrix spike duplicate (MS/MSD) or matrix spike/matrix duplicate (MS/MD), or any other sample information for the laboratory. Since they are not specific to any one-sample point, blanks are indicated on separate rows. Immediately prior to sealing the sample cooler, the sampler will sign the chain-of-custody form and write the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the chain-of-custody form. Mistakes will be crossed out with a single line in ink and initialed by the author.

Sampling personnel will retain one copy of the chain-of-custody form, and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs his or her name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. Field personnel then relinquish the cooler is then relinquished to personnel responsible for shipment, typically an overnight carrier.

The chain-of-custody seal must be broken to open the sample cooler. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Field Team Leader for direction on whether to proceed with the analyses.

Sampling personnel record the information placed on the chain-of-custody record in the field logbook. They also include in the log book a detailed description of the exact locations from which the samples were collected, any pertinent conditions under which the samples were obtained, and the lot number of the containers used.

B4.2.3 Laboratory Sample Management

The laboratory has a designated Sample Management Staff responsible for receiving samples in the laboratory, opening the coolers, checking the sample integrity and custody seals, logging samples into the laboratory information management system (LIMS), and controlling the handling and storage of samples while in the laboratory. The laboratory is a secure facility and only authorized laboratory personnel are allowed to handle active samples. The laboratory maintains an SOP for sample management.

B4.2.4 Sample Receipt and Logging

Upon receipt at the laboratory, sample-receiving personnel inspect the samples for integrity of the custody seal, check the shipment against the chain-of-custody form, and note any discrepancies. Specifically, the sample-receiving personnel note any damaged or missing sample containers. At this time, the field chain-of-custody record is completed and signed by the Sample Management Staff.

Using the temperature blank in each cooler, the temperature of each incoming sample cooler is measured and recorded during the sample receipt and log-in procedures before samples are placed in laboratory cold storage. Similarly, the laboratory documents that its cold storage facilities are being maintained through daily (at a minimum) documented temperature measurements using a thermometer.

Upon receipt, Sample Management Staff measure and record on the preservation documentation sheet the pH of acid- or base-preserved aqueous samples. Any problems observed during sample receipt must be communicated to the Field Team Leader and/or the QAO verbally and either by fax transmission or email within 24 hr (preferably 3 hr beginning with the normal business day or immediately following for problems noted during second shifts or weekends) after discovery and before samples are released to the laboratory for analysis. Problems may include but are not limited to broken bottles, errors or ambiguities in paper work, insufficient sample volume or weight, inappropriate pH, and elevated temperature.

When the shipment is inspected and the chain-of-custody record agree, the sample receiving personnel enter the sample and analysis information into the LIMS and assign each sample a unique laboratory number. This number is affixed to each sample bottle.

B4.2.5 Sample Storage Security

While in the laboratory, the samples and aliquots that require cold storage will be stored and will be maintained in a secured refrigerator unless they are being used for preparation and/or analysis. All of the refrigerators in the laboratory used for storage of samples have restricted access and are numbered. In addition, dedicated refrigerators are designated for extracts and analytical standards. The sample storage areas are in the laboratory, and access is limited to laboratory personnel. Specific requirements for sample storage are described below:

- Samples will be removed from the shipping container and stored in their original containers unless damaged.
- Damaged samples will be disposed in an appropriate manner, and the disposal will be documented or repacked as necessary and appropriate.
- Samples and extracts will be stored in a secure area designed to comply with the storage method(s) defined in the contract.
- The storage area will be kept secure at all times. The sample custodian or designated personnel will monitor access to the storage area.

- Standards or reagents will not be stored with samples or sample extracts.

The following standard operating procedures for laboratory sample security will be implemented to confirm that the laboratory satisfies sample chain-of-custody requirements:

- Samples will be stored in a secure area.
- Access to the laboratory will be through a monitored area. Other outside access doors to the laboratory will be kept locked.
- Visitors must sign a visitor's log and will be escorted while in the laboratory.
- Refrigerators, freezers, and other sample storage areas will be securely maintained.

Storage blanks will be initiated and analyzed on a weekly basis for each cold storage unit used to hold Honeywell samples submitted for the analysis of VOCs. Field QC samples must be stored in the same cold storage units as the samples that they are associated with (even if the matrices are different). All soil samples must undergo thorough sample homogenization (stirred within the original sample container) using inert utensils and mixing platforms that will not interfere with the target analytes being requested for analysis with the exception of soil samples submitted for the analysis of VOCs. Samples for VOC determinations will be stored in a secure refrigerator separate from other samples, sample extracts, reagents, and standards.

B4.2.6 Retention and Disposal of Samples

The laboratory must retain all excess samples within their original sample bottles for a minimum of 30 days in cold storage (below 4 degrees Celsius) following submission of the validated data report to Honeywell. At that time, the laboratory must contact the Field Team Leader for authorization for responsible disposal or further storage instructions. At the point at which the laboratory is provided authorization to dispose of the samples, the laboratory will be responsible, and will assume all liability for proper characterization and disposal of samples and bottleware in accordance with all local, state, and federal regulations.

FIGURE B4.1

SAMPLE CUSTODY FLOW CHART

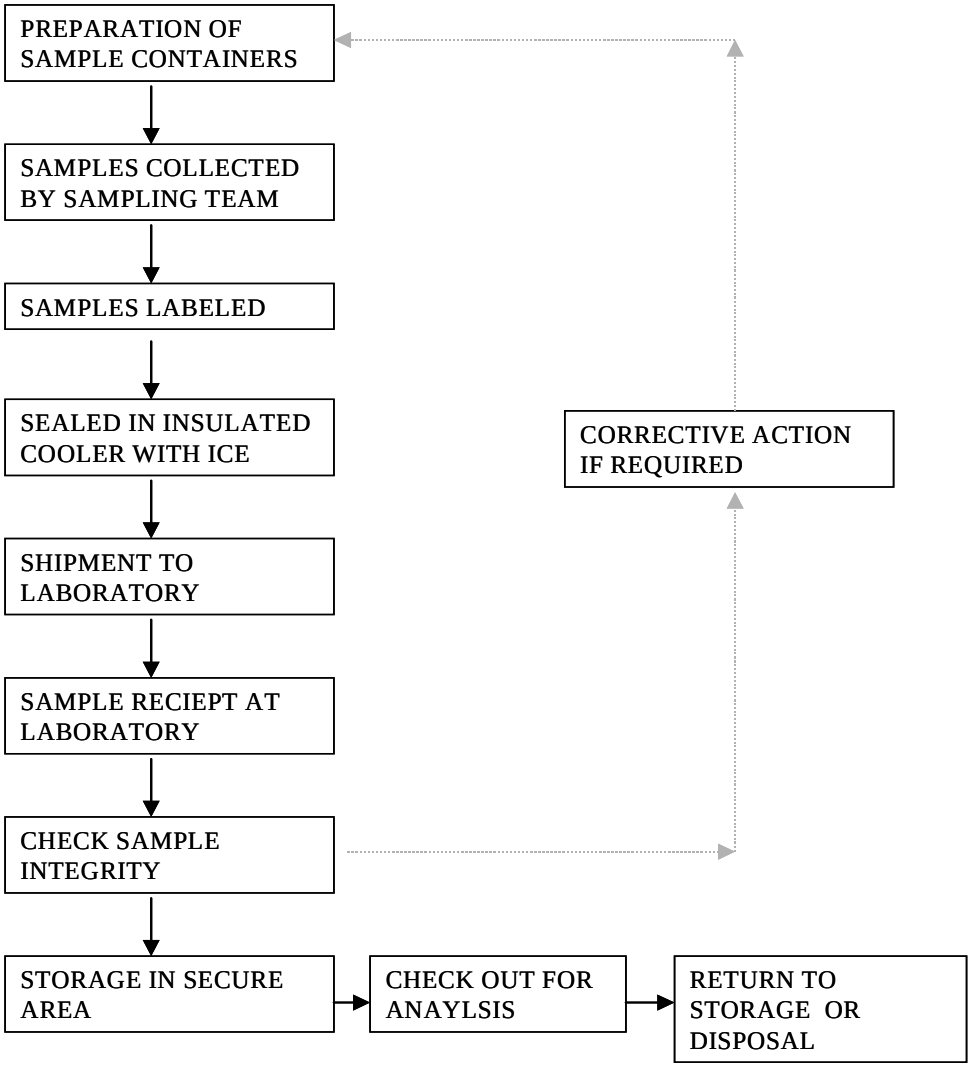

FIGURE B4.2 EXAMPLE CHAIN-OF-CUSTODY RECORD

Chain of Custody / Analysis Request **COC #0675309**

Privileged & Confidential		**Site Name:**	
EDD To:		**Location of Site:**	
Client Contact: (name, co., address)	**Sampler:**		
	P O #		
Honeywell International	**Analysis Turnaround Time:**		
101 Columbia Road	**Standard -**		
Morristown, NJ 07962	Rush Charges Authorized for -		
	2 weeks -		
Hardcopy Report To:	1 week -		
Invoice To:	Next Day -		

	Sample Identification				Sample Date	Sample Time	Sample Type	Sample Matrix	Sample Purpose	# of Cont.	Grab/Composite	Field Filtered Sample ?	Preservative									
	Location ID	Start Depth (ft)	End Depth (ft)	Field Sample ID							Units											
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

Special Instructions:

Relinquished by	Company		Received by	Company		Condition	
	Date/Time			Date/Time		Cooler Temp.	
Relinquished by	Company		Received by	Company		Condition	
	Date/Time			Date/Time		Cooler Temp.	

Preservatives: 0 = None; [1 = HCL]; [2 = HNO3]; [3 = H2SO4]; [4 = NaOH]; [5 = Zn. Acetate]; [6 = MeOH]; [7 = NaHSO4]; 8 = Other (specify):

PARSONS

TABLE B4.1
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR SEDIMENT AND POREWATER SAMPLES[(1)]

Name	Analytical Methods	Container	Preservation	Minimum Sample Container Size[d] (Sediments)	Minimum Sample Container Size[d] (Waters)	Maximum Holding Time
Inorganics						
Metals (Cations) Calcium Magnesium Sodium Potassium	SW6010B	P,G	HNO_3 to pH<2	N/A	500 mL	6 months
Common anions Chloride, Sulfate phosphate nitrate nitrite	SW9056	P, G	None required	4 ounces	500 mL	28 days for Br^-, F^-, Cl^-, and SO_4^{-2}; 48 hours for NO_3^-, NO_2^- and PO_4^{-3}
Dissolved Organic Carbon	SW9060	P, G, T	4°C, HCl or H_2SO_4 to pH < 2	N/A	500 mL	28 days
Total organic carbon	SW9060	P, G, T	4°C, HCl or H_2SO_4 to pH < 2	4 ounces	N/A	28 days
Hydrogen ion (pH) (W, S)	SW9040B/ SW9045C	P, G	None required	4 ounces	100 mL.	Analyze immediately[f]
Nitrogen, nitrate+nitrite	E353.2	P, G	4°C, H_2SO_4 to pH < 2	4 ounces	500 mL	28 days
Mercury	SW7470A SW7471A	P, G, T	HNO_3 to pH < 2, 4°C	8 ounces	500 mL	28 days (water and soil/sediment)
Sulfide	SW9030B/9034B	P,G	NaOH to pH>9, Zinc Acetate, 4°C	4 ounces	500 mL	7 days

TABLE B4.1 (CONT.)
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR SEDIMENT AND POREWATER SAMPLES

Organics						
Polychlorinated biphenyls (PCBs) (Total PCBs as Aroclors)	SW8082	G, Teflon-lined cap, T	4°C	8 ounces	1 liter	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil/sediment)
Semivolatile organics	SW8270C	G, Teflon-lined cap, T	4°C, 0.008% $Na_2S_2O_3$	8 ounces	1 liter	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil/sediment)
Volatile organics	SW8260B	G, Teflon-lined septum, T	4°C, $Na_2S_2O_3$, (HCl to pH < 2 for volatile aromatics)[b]	4 ounces	2 x 40 mL	14 days (water and soil); 7 days for water if unpreserved by acid.
TOC	Lloyd Kahn method	G	H_2SO_4 to pH<2. 4°C	4 ounces	2 x 40 ml vials	28 days (water); 14 days (sediments)
Physical Parameters						
Grain Size, Specific Gravity, Atterberg Limits		P,G	4°C	32 ounces (sediment)	N/A	6 months
Site Water for Effluent Elutriate Test (EET)	EPA/USACE, 1998	G	4°C		5 x 1 gallon (5 gal. total)	None specified[g]
Site Water for Column Settling Test (CST)	EPA/USACE, 1998	PP	4°C		5 x 5 gallon (25 gal. total)	None specified

(1) Analytical holding time for laboratory-generated porewater samples and for laboratory-generated dewatered sediment samples is calculated as date/time from sample generation by laboratory to date/time of sample analysis.

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T), Plastic Pails (PP).
b. No pH adjustment for soil/sediment.
c. Preservation with $Na_2S_2O_3$ is only required when residual chlorine is present.
d. Additional volume will need to be provided for samples designated as MS/MSD/LDs.
e. From the date/time of sample collection.
f. Measurement should be performed on the site.
g. Holding time for elutriate analysis begins once generation is complete and is the same as water holding times: analyses identified in PDI SAP Table A.3.4.

TABLE B.4.2

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR AIR EMISSIONS BENCH TESTING OF AIR SAMPLES

Name	Analytical Methods	Extraction Methods	Preservation	Sample Absorbent Tube	Minimum Sample Container Sized	Maximum Holding Time
Inorganics						
Mercury	OSHA-140	OSHA-140	NA	Anasorb C300	NA	14 days
Organics						
Semivolatile organics	NIOSH 5506	NIOSH 5506	NA	PTFE Filter & XAD-2 tube	NA	14 days
Volatile organics	NIOSH 1500/1501	NIOSH 1500/1501	NA	Charcoal Tube	NA	14 days

SECTION B5

DATA MANAGEMENT

B5.1 INTRODUCTION

Honeywell has selected Locus Technologies' LocusFocus EIM™ (EIM) as its preferred environmental data management system.

EIM will be use to manage the following data types:

- Chain-of-custody data
- Laboratory analytical data for various media such as soil, water, soil vapor, sediment, and sludge
- Field measurement data such as pH, dissolved oxygen, turbidity, and water levels
- Geotechnical data such as surface or subsurface soil, or geologic characterizations and lithology
- Survey data including geographic or location data.

Additional data types may be added to EIM as appropriate. Historical data collected during the RI/FS that is related to the PDI Phase I will be integrated into EIM.

The Syracuse Portfolio Data Management Plan (DMP), prepared by Parsons, will serve as a standard for all data management activities taking place under PDI Phase I, including analytical and field data requiring both storage and project team accessibility. The electronic data management systems will be implemented to process the information effectively without loss or alteration. The approach outlined in the DMP, a summary introduction of which is enclosed as a project procedure in Attachment 2 of this QAPP, is designed to provide an organized method of data management for the large amounts of data that will be generated during the environmental programs. The DMP defines the following:

- The electronic data management system that will be used
- The data management team organization
- The flow path of the data and the data types
- The data management procedures that will be implemented.

B5.2 FIELD DATA MANAGEMENT

The Field Team Leader will manage data generated in the field. He or his designee will be responsible for recording and documenting sampling activities in the field logbook, on sampling records (as appropriate), and on chain-of-custody forms (when samples are collected) as

described in Section B4.2.2. The records may be photocopied and stored in the project file along with the original.

Assignment of Sample Names: A sample nomenclature system has been developed to provide consistency in field sample ID assignment and compatibility with LocusFocus. Unique sample names will be assigned to each sample according to the sample identification protocol described in herein. Each unique sample name will include the following:

- **Location ID:** Site ID – Location Type – Location #. For example, location ID OL-SB-10001 indicates that the sample came from Onondaga Lake, SB is the location type identification for sediment boring, and the remainder of the Location ID is the SMU number (1 through 8) and the sample within the SMU (0001, 0002, 0003, *etc.*). For locations where more than one analysis is required, STA should be used for the location type indicating a sample station.
- **Field Sample ID:** Site ID – chain-of-custody form # - Sample #. For example, field sample ID OL-12345-01 indicates that the sample came from Onondaga Lake, chain-of-custody number 12345, line 1 on the chain-of-custody form. Depth interval will be shown on chain-of-custody form.

The Database Manager will add data to EIM through the input module of the system. Access to the input module will be restricted to the Syracuse Portfolio Database Managers or delegates. Details on use of the input module are provided in Honeywell data management general procedures.

A complete list of data types and the database system used to manage these data types is provided in Appendix C of the DMP.

DATA INPUT TO EIM MAY INCLUDE:
– Sample planning information (e.g., sample depth)
– Chain-of-custody data
– Sediment coring logs
– Geotechnical data
– Location and geographic data
– Field measurements
– Meteorological data
– Waste characterization data
– Groundwater levels
– Radiodating data
– Laboratory analytical data

B5.3 LABORATORY DATA MANAGEMENT

Laboratory data management involves several important stages that include data transformation, review, verification, and validation, as well as data storage, retrieval, and security. The project laboratory will implement a data management system to manage the data from its generation in the laboratory to its final reporting and storage. The data management system will include, but not be limited to, the use of standard record-keeping practices, standard document control systems, and the electronic data management system.

The laboratory data reduction, verification, validation, and reporting procedures and project data management activities, data/information exchange procedures ensure that complete documentation is maintained, transcription and reporting errors are minimized, and data are properly review.

Specific laboratory data management requirements and procedures are discussed in Sections B6 and B9 of this QAPP.

SECTION B6

DOCUMENTS AND RECORDS

B6.1 INTRODUCTION

Records will be maintained to document accurately the data generation process during investigation in the field, sample analysis in the lab, and during data validation. Project documentation will be maintained in general accordance with guidelines in the National Enforcement Investigation Center Policies and Procedures (USEPA, 1986). A project file will be maintained that will contain appropriate project documentation; see components in chart. Some of this documentation may be retained electronically in lieu of paper copies. Table B6.1 summarizes the types of project documents and records.

MINIMUM COMPONENTS OF PROJECT FILE
- Project plans and specifications
- Field logbooks and data records
- Photographs, maps, and drawings
- Sample identification documents
- Chain-of-custody records
- Data review notes
- Report notes and calculations
- Progress and technical reports and
- Correspondence and other pertinent information
- Full analytical data deliverables package provided by the lab, including QC documentation and electronic data deliverable

B6.2 FIELD RECORDS

Field personnel are responsible for documenting sample handling activities, observations, and data in field sampling records including field logbooks, chain-of-custody records, photographs, and pre-design investigation records. The Field Team Leader is responsible for maintaining these documents. Each record is described below.

B6.2.1 Field Logbook

A Field Logbook will be used to document pre-design investigation activities. The field logbook will have consecutively numbered pages, and documentation will be recorded using waterproof ink. Incomplete lines, pages, and changes in the logbook will be lined out with a

single line, dated, and initialed. More detailed procedures for documenting investigation activities (such as field sampling records and boring log forms) and type of information to include in the field logbook may be developed.

MINIMUM REQUIREMENT FOR INFORMATION IN FIELD LOG
- Responsible person's name - Date and time of activity - Equipment and methods used for field preparation of samples - Field measurements of samples (*e.g.*, pH, temperature) - Information coordinating sample handling activities with appropriate field activities and chain-of-custody documentation *Daily calibration activities:* Calibrator's name Instrument name and model Date and time of calibration Standards used and their source Temperature (if appropriate) Results of calibration Corrective actions taken (if any)

B6.2.2 Electronic Field Data Management

As described in the SAP and Section B5 Data Management, the field sampling program will have an electronic data management component. The system will be designed to specify the necessary samples taken at any given location and to provide the ability to be updated and amended in the field. This will provide a management system that efficiently tracks the needs of the sampling scope. As the samples are taken, log entries are put in the database, and sample labels are printed. At any given time a chain-of-custody record can be printed as well.

B6.2.3 Chain-of-Custody Record

The chain of custody record establishes the documentation necessary to trace sample possession from the date and time of sample collection, through sample shipment, to the date and time of arrival at the laboratory designated to perform analysis. The ability to trace the history of a sample is essential to show that the sample collected was, indeed, the sample analyzed and that the sample was not subjected to biasing influences. Evidence of sample traceability and integrity is provided by chain-of-custody procedures. These procedures are necessary to support the validity of the data and will accompany each shipping container.

A copy of the chain-of-custody record will be detached and kept with the field logbook or placed in the project file; the original record will accompany the shipment. A more detailed description of chain-of-custody procedures are included in Section B4.2.2 of this QAPP; an example chain-of-custody record is included in Figure B.4.2.

LAB RECORDS SHOULD CONVEY:
- What was done
- When it was done
- Who did it and
- What was found
REQUIREMENTS FOR LAB RECORDKEEPING
- Data entries must be made in indelible water-resistant ink
- Date of each entry and observer must be clear
- Observer uses his or her full name or initials
- Initial and signature log is maintained so the recorder of every entry can be identified
- Information must be recorded in notebook or on other records when the observations are made
- Recording information on loose pieces of paper not allowed

B6.3 LABORATORY RECORDS

Laboratories providing analytical support for this project must maintain records to ensure that all aspects of the analytical processes are adequately documented to ensure legal defensibility of the data.

When a mistake is made, the wrong entry is crossed out with a single line, initialed, and dated by the person making the entry, and the correct information recorded. Obliteration of an incorrect entry or writing over it is not allowed, nor is the use of correction tape or fluid on any laboratory records.

Overwriting or disposal of any electronic media prior to a 5-yr expiration period is strictly prohibited. All electronic and hardcopy data must be stored in an easily accessible climate-controlled environment. The laboratory will exercise “best practices” in terms of frequent, redundant electronic backup procedures on proper long-term storage media to assure that all electronic data representing Honeywell sample analyses will be maintained for the 5-yr storage period. Electronic data must be stored in a secure, limited-access area with redundant copies stored in fireproof vaults and/ or stored off-site of the laboratory facilities.

Sample preparation in the laboratory must be fully documented and include sample preparation conditions (such as digestion temperatures). In addition, documentation must allow complete traceability to all prepared or purchased reagents, acids and solvents, and reference

solutions. All spike solutions and calibration standards must be used prior to labeled expiration dates and stored in accordance with manufacturers recommended conditions. Complete and unequivocal documentation must exist to enable traceability of all prepared spike solutions, calibration standards, and prepared reagents back to the reference materials utilized. Organic extracts must be stored in the same type of vials (amber or clear) as the associated standards at the appropriate storage temperatures.

The unit conventions set forth in the figures for reported data will be consistent with standard laboratory procedures. Reporting units used are those commonly used for the analyses performed. Concentrations in soil and sediment samples will be expressed in terms of weight per unit dry weight, with moisture content reported for each sample. Sediment and porewater samples will be expressed as shown in Tables B7.4 and B7.5, respectively.

Laboratory records used to document analytical activities in the laboratory will include reagent and titrant preparation records, standard preparation logs, sample preparation logs, bench data sheets, instrument run logs, and strip chart recordings/chromatograms/computer output. Additional records will include calibration records, maintenance records, nonconformance memos, and Corrective Action Request (CAR) forms.

B6.3.1 Operational Calibration Records

Operational calibration records will document the calibration of instruments and equipment that are corrected on an operational basis. Such calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations are maintained in the following documents:

- Standard preparation information, to trace the standards to the original source solution of neat compound, is maintained in LIMS or laboratory standard preparation logs.
- Instrument logbook provides an ongoing record of the calibration for a specific instrument. The logbook should be indexed in the laboratory operations records and should be maintained at the instrument by the chemist. The chemist must sign and date all entries, and the OM or his designee must review them.
- For Level IV data packages, copies of the raw calibration data will be kept with the analytical sample data so the results can readily be processed and verified as one complete data package. If samples from several projects are processed together, the calibration data is copied and included with each group of data. The laboratory will maintain all calibration, analysis, and corrective action documentation (both hard copy and electronic data) for a minimum of 5 yr. The documentation maintained must be sufficient to show all factors used to derive the final (reported) value for each sample. Documentation must include all calculation factors such as dilution factor, sample aliquot size, and dry-weight conversion for solid samples. The individual who performs hand calculations must sign and date them. This documentation must be stored with the raw data. Calculations performed by the data system will be documented and stored as electronic and hard copy data. The instrument printouts will

be kept on file, and the electronic data will be stored by the laboratory for a minimum of 5 yr.

B6.3.2 Maintenance Records

Maintenance records will be used to document maintenance activities, service procedures, and schedules. They must be traceable to each analytical instrument, tool, or gauge. The individual responsible for the instrument must review, maintain, and file these records. These records may be audited by the QAO to verify compliance. Logs must be established to record and control maintenance and service procedures and schedules.

B6.3.3 Nonconformance Memos

Nonconformance Memos (NCM) may be either a hard copy record or an electronic database record. In either case, review and release of the record must be documented by the initiator, the analytical group leader where appropriate, the LPM, and the QAM. All internal laboratory nonconformance documentation will be communicated to the Field Team Leader by the LPM verbally and summarized in the report narrative. A NCM will be used to document equipment that fails calibration and will identify any corrective actions taken.

B6.3.4 Corrective Action Request Forms

The laboratory must use CAR forms to document any incidents requiring corrective action. The CAR form will be issued to the personnel responsible for the affected item or activity. A copy will also be submitted to the LPM. The individual to whom the CAR is addressed will return the requested response promptly to the QA personnel and will affix his or her signature and date to the corrective action block after stating the cause of the conditions and corrective action to be taken. QA personnel will maintain a log for status of CAR forms to confirm the adequacy of the intended corrective action and to verify its implementation. CARs will be retained in the project record file.

B6.3.5 Analytical Data Reports

The following requirements apply to the project laboratories, with the exception of the laboratory performing bench-scale testing and analyses for work associated with the Air Emissions and Odor Work Plan (PDI Phase I WP Appendix D) or for other laboratories performing work under a specific scope of work (SOW) that specifies alternative requirements and procedures. Analytical data will be reported as an Electronic Data Deliverable (EDD) and as an analytical data package (two copies on CD-Rom and one hard copy). The analytical laboratories are required to submit all data, preliminary and final, in EIM formatted EDDs in accordance with Honeywell Data Management Laboratory Reporting Requirements. The laboratory must meet 100% compliance with these requirements. The Parsons Database Manager will submit written requests dictating the requirements and appropriate files to be supplied by the laboratory. The specifications of the EDD are summarized in QAPP Attachment 2.

Analytical data reports will be provided by the laboratory within 28 calendar days following receipt of a complete Sample Delivery Group (SDG) and will include the specifications

identified in Attachment 3. An SDG is considered to include all samples received for the same project or site, to a maximum of twenty investigative samples not to exceed 5 consecutive days of sampling. The data package provided by the laboratory will be Level IV, unless an alternative requirement is specified in a laboratory statement of work (SOW) and will contain all information to support the data validation in accordance with the USEPA Region II Standard Operating Procedures (SOP) as described in Section B9 and Attachment 3. Additionally, the completed copies of the chain-of-custody records, accompanying each sample from the time of initial bottle preparation to completion of analysis, must be attached to the analytical reports.

Specific requirements applicable to the project laboratory performing bench-scale testing and analyses for work associated with the Air Emissions and Odor Work Plan are described in that work plan (PDI Phase I WP Appendix D).

B6.4 DATA VALIDATION AND AUDIT RECORDS

Data validation personnel are responsible for documenting validation procedures and results in the form of a data usability report. The QAO will be responsible for maintaining this report and the QAO will be responsible for its distribution. Additionally, audit reports will be prepared and distributed by the QAO. A brief description of each record is described below.

B6.4.1 Data Usability Reports

Parsons personnel will prepare the data usability report. The report will summarize the impacts of using data that do not achieve overall data quality objectives or that do not meet PARCC and sensitivity criteria identified in Section B3.3 and Attachment 3. Additionally, the report will be used to identify, assess and present issues associated with the overall data.

B6.4.2 Audit Reports

Among other QA audit reports, which may be generated during the conduct of activities, a final audit report for this project may be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified

TABLE B6.1

SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS

REPORT	PERSON RESPONSIBLE FOR MAINTENANCE	DISTRIBUTION	STORAGE
PROJECT FILES AND FIELD SAMPLING RECORDS			
Field Logbook	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Photographs	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Chain-of-Custody	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Field Sampling Records	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
LABORATORY RECORDS			
Reagent and Titrant Preparation Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Standards Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Sample Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Bench Data Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Instrument Run Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Strip Chart Recordings/ Chromatograms/Computer Output	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory

TABLE B6.1

SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS (CONT.)

REPORT	PERSON RESPONSIBLE FOR MAINTENANCE	PERSON RESPONSIBLE FOR DISTRIBUTION	STORAGE
Analytical Data Reports	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Log-in Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Maintenance Records	Quality Assurance Manager	Laboratory Project Manager	Instrument Maintenance Logbook at Laboratory
Periodic Calibration Records	Quality Assurance Manager	Laboratory Project Manager	QA Files at Laboratory
Operational Calibration Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Nonconformance Memos	Quality Assurance Manager	Laboratory Project Manager	Maintained in Datbase File at Laboratory
Corrective Action Request Forms	Quality Assurance Manager	Laboratory Project Manager	Client Correspondence Records at Laboratory
DATA VALIDATION AND AUDIT RECORDS			
Data Validation Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location
Audit Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location

SECTION B7

ANALYTICAL PROCEDURES

B7.1 INTRODUCTION

The programs that rely on this QAPP will involve the analysis of sediment core samples, surficial grab sediment samples, sediment porewater samples, surface water samples and air samples for chemical parameters. To meet program specific regulatory requirements for chemicals of concern, all methods will be followed as stated, with some specific requirements noted below. Chemical parameters of interest (CPOIs) are listed on Tables B7.1 through B7.3. Project analytical methods for CPOIs analyses and for geotechnical parameters are summarized on Tables B7.2 and B7.3, respectively.

Chemical analyses for inorganics, organics, and wet chemistry parameters will be conducted in accordance with the project QAPP and with laboratory's SOPs (maintained "on-file" at the laboratory), and with referenced analytical methods including USEPA SW846 Test Methods for Evaluating Solid Waste, Physical, and Chemical (USEPA, 1997), Methods for Chemical Analysis of Water and Wastes (USEPA, 1983), ASTM Standard Methods (Tables B7.2 and B7.3), NIOSH Manual of Analytical Methods (NIOSH, 1994), and OSHA Index of Sampling and Analysis Methods (OSHA, 2005). Where requirements conflict, the technical and QA/QC requirements in this QAPP, the work plan or the SAP take precedence. Project analytical QA/QC requirements and corrective actions are summarized on Attachment 3 of this QAPP.

The project RLs for sediment and porewater samples are specified in Tables B7.4 and B7.5, respectively. Each project RL has been determined to be less than the applicable Probable Effect Concentration (PEC). The project RLs for the Air Emissions and Odor Work Plan bench testing of air, sediment, and porewater samples are specified in Tables B7.6, B7.7, and B7.8, respectively. Sediments typically contain low percent solids. When results are dry weight corrected, the reporting limits are then elevated accordingly. To compensate for the low solids, modifications are made either to increase the initial volume extracted or digested, or by reducing the final volume of extract or digestate. For this project, if analyte levels and matrix permit the volume of sample digested or extracted may be increased so as to increase the decrease the achievable RL. Routine sample mass will be used for all other analyses. Any freestanding water for samples undergoing pore water analysis will be decanted and combined with the pore water generated through centrifugation of the sediment.

B7.2 ANALYTICAL METHODS

B7.2.1 PCBs (Total PCBs)

Samples will be analyzed for PCBs utilizing USEPA SW846 Method 8082. PCB Aroclors (method-specified Aroclors plus Aroclor 1268) will be identified and quantified with the sample result for Total PCBs reported as the sum of the identified PCB Aroclors, which are also

reported, according to the methodology specified in Table B7.2. Soxtherm using Method 3541 will extract sediment samples. Extracts for these samples may be subjected to a sulfuric acid clean up (Method 3665A) followed by a sulfur cleanup (Method 3660A).

B7.2.2 Mercury

Mercury will be analyzed utilizing USEPA SW846 Method 7471A by Cold Vapor Atomic Absorption (CVAA) as indicated in Table B7.2.

B7.2.3 Volatile Organic Compounds

VOCs will be analyzed utilizing USEPA SW846 Method 8260B by GC/MS according to the methodology specified in Table B7.2 as part of the pre-design sampling program. Xylenes will be reported as both individual xylene parameters (m,p-Xylene and o-Xylene) and as "Xylenes (total)". Samples, with exception of SMU 2 sediment samples, will be analyzed (where applicable) for a project-specific list of VOCs (12 analytes). SMU 2 sediment samples will be analyzed for all TCL VOCs.

B7.2.4 Semivolatile Organic Compounds

SVOCs will be analyzed utilizing USEPA SW846 Method 8270C by GC/MS according to the methodology specified in Table B7.2.

B7.2.5 Wet Chemistry and Inorganic Parameters

Wet chemistry parameters including moisture content, specific gravity, total organic carbon (TOC/DOC), pH, sulfide, ammonia, major anions, and cations (metals) will be measured according to the methodology specified in Table B7.2.

B7.2.6 Geotechnical Analysis

Geotechnical and physical tests to be conducted on sediment samples are specified in Table B.7.3. The specified methods will be used when the analysis is specified on the chain-of-custody form or is requested by the remedial design Project Manager. These methods were selected because they best meet the requirements of the pre-design investigation.

B7.2.7 Column Settling Test and Effluent Elutriate Test Procedures

The CST and EET test will be performed in accordance with the methods given in the SAP. See USEPA/USACE, 1998.

B7.2.8 Standard Operating Procedures

Standard Operating Procedures (SOPs) are a written step-by-step description of laboratory operating procedures exclusive of analytical methods. Laboratories providing analytical support for this project will be required to document all procedures in SOPs. The SOPs must address the following areas:

- Storage containers and sample preservatives
- Sample receipt and logging

- Sample custody
- Sample handling procedures
- Sample transportation
- Glassware cleaning
- Laboratory security
- QC procedures and criteria
- Equipment calibration and maintenance
- Documentation
- Safety
- Data handling procedures
- Document control
- Personnel training and documentation
- Sample and extract storage
- Preventing sample contamination
- Traceability of standards
- Data reduction and validation
- Maintaining instrument records and logbooks
- Nonconformance
- Corrective actions
- Records management

B7.2.9 Air Emissions and Odor Bench Testing

The collection of meteorological data from the site and testing to estimate emission rates from dredging, dredged material discharge and wastewater treatment will be conducted as described in Appendix D to the Work Plan. To ensure the most precise meteorological data is used in the analysis, site-specific data will be collected using sensory instrumentation and data acquisition hardware with software that fully meets the performance and operating specifications in USEPA's guidelines for air quality modeling applications, including "Meteorological Monitoring Program Guidance for Regulatory Modeling Applications." The bench test experiments are consistent with and exceed the recommendations of Tier 3 of the USACE Upland Testing Manual, which is the most vigorous level of analysis.

TABLE B7.1A

CHEMICAL PARAMETERS OF INTEREST (CPOIs) FOR THE PDI SEDIMENT AND POREWATER SAMPLING[1]

Analytical Parameter	Analyte [2]
Metals	Mercury
VOCs	Benzene
	Toluene
	Ethylbenzene
	Xylenes
	Chlorobenzene
	Dichlorobenzenes
	Trichlorobenzenes
SVOCs	Naphthalene
	Phenol
PAHs	Acenaphthene
	Acenaphthalene
	Anthracene
	Benzo(a)anthracene
	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Benzo(g,h,i)perylene
	Benzo(k)fluoranthene
	Chrysene
	Dibenz(a,h)anthracene
	Fluoranthene
	Fluorene
	Indeno(1,2,3-cd)pyrene
	Phenanthrene
	Pyrene
PCBs	Total PCBs (Method SW8082 Aroclors + 1268)

[1] A subset of the analytes will be analyzed in porewater per the SAP and related standard project procedures.

[2] Note: Analyte list varies dependent upon individual SMU investigation activities and sample matrix as identified in SAP Section A3.

TABLE B7.1B

CHEMICAL PARAMETERS OF INTEREST (CPOIs) FOR THE ODOR AND EMISSIONS WORK PLAN*

Analytical Parameter	Analyte
Metal	Mercury
VOCs	Benzene
	Toluene
	Ethylbenzene
	Xylenes
	Chlorobenzene
	Dichlorobenzenes
	Trichlorobenzenes
SVOCs	Hexachlorobenzene
PAHs	Fluorene
	Naphthalene
	Phenanthrene
	Pyrene

* This list was based on the list of chemical parameters of interest (CPOI) developed for the Onondaga Lake Feasibility Study (FS) (Parsons, 2004), and the United States Environmental Protection Agency (USEPA) as Hazardous Air Pollutants (HAPs) (SOURCE – EPA Website). Contaminants appearing on both CPOI and HAP lists have been retained as COIs for the Air Emissions Bench Test.

TABLE B7.2

ANALYTICAL METHODS

ANALYTICAL METHODS				
Parameter	**Method**	**Method #**	**Matrix**	**Reference**
EXTRACTION CLEANUP				
Sulfuric Acid Cleanup	Liquid-liquid Partitioning	3665A	S	EPA, 1997
Sulfur Cleanup	Treatment with Cu or Hg or TBA	3660A/B	S	EPA, 1997
Florisil Cleanup	Adsorption Column Chromatography	3620B	S	EPA, 1997
ORGANIC COMPOUNDS				
Total PCBs (reported as individual Aroclors and calculated "Total PCBs")	Gas Chromatography–ECD	3541(mod/3510C (mod) /8082	S	EPA, 1997
Volatile Organic Compounds (Project-specific VOCs)	Gas Chromatography/Mass Spectrometer (GC/MS)	3541/3510C/ 8260B	S	EPA, 1997
Semivolatile Organic Compounds (Project-specific SVOCs)	Gas Chromatography/Mass Spectrometer (GC/MS)	3541/3510C/ 8270C	S	EPA, 1997
INORGANIC COMPOUNDS				
Mercury	Atomic Absorption - Cold Vapor	7471A	S	EPA, 1997
Anions	Ion Chromatography	SW9056	W	EPA, 1997
Cations (metals)	Inductively coupled plasma/atomic emission spectroscopy	SW6010B	W	EPA, 1997
ADDITIONAL PARAMETERS				
Total Organic Carbon	Combustion Oxidation	Lloyd Kahn	S	EPA, 1988
Dissolved Organic Carbon	Combustion Oxidation	9060	W	EPA, 1997
Sulfide, Total	Distillation/Titrimetric	9030B/9034	S,W	EPA, 1997
Nitrogen, Ammonia	Colorimetric - Automated	350.1	S,W	EPA, 1979
pH	Electrometric	9040C	S,W	EPA, 2004

Matrix codes: S – Sediments, W-Water, E-Elutriate,

TABLE **B7.3**

GEOTECHNICAL METHODS FOR SEDIMENT SAMPLES

GEOTECHNICAL METHODS				
Parameter	**Method**	**Method #**	**Matrix**	**Reference**
Grain Size	Sieve and hydrometer analysis	D422	S	ASTM, 1995
Specific Gravity	----------	D854/C127	S	ASTM, 1995
Atterberg Limits	---------	D4318	S	ASTM, 1995
Moisture Content		ASTM 2216	S	ASTM, 1995
Carbonate Content		ASTM D3042	S	ASTM, 1995
Cone Penetrometer Testing (CPT)	Index, cone, MIP	ASTM D5778	S	ASTM, 1995
Shelby Tubes	Drilling	ASTM D1587	S	ASTM, 1995
Standard Penetration Testing (SPT)	Drilling	ASTM D1586	S	ASTM, 1995
Bulk Density	Shelby tube	E1110-2-1906	S	ASTM, 1995
Unconsolidated Undrained Triaxial	Shelby tube	ASTM D2850	S	ASTM, 1995
Consolidated Undrained Triaxial	Shelby tube	ASTM D4767	S	ASTM, 1995
Consolidation	Shelby tube	ASTM D2435	S	ASTM, 1995
Seepage-induced Consolidation			S	ASTM, 1995
Van shear tests	M-3 vane shear equipment	*In situ*	S	
Column settling w/self-weight consolidation			E	
Consolidation (low vertical stress)	Preformed on Column Setting test material			

TABLE B7.4

PROJECT QUANTITATION LIMITS FOR SEDIMENT SAMPLES

Parameter	Units	Laboratory RL[(1)]
PCB AROCLORS – GC/ECD – (SW846 8082)		
Aroclor 1016	µg/kg	33
Aroclor 1221	µg/kg	33
Aroclor 1232	µg/kg	33
Aroclor 1242	µg/kg	33
Aroclor 1248	µg/kg	33
Aroclor 1254	µg/kg	33
Aroclor 1260	µg/kg	33
Aroclor 1268	µg/kg	33
WET CHEMISTRY PARAMETERS		
TOC (Lloyd Kahn)	mg/kg	500
Nitrogen, ammonia (EPA 350.1)	mg/kg	2.5
Sulfide (SW846 9030B/9034)	mg/kg	13
METALS – COLD VAPOR (SW846 7471A)		
Mercury	mg/kg	0.033
TCL VOCs		
Acetone	ug/kg	20
Benzene	ug/kg	5
Bromodichloromethane	ug/kg	5
Bromoform	ug/kg	5
Bromomethane	ug/kg	5
2-Butanone	ug/kg	5
Carbon disulfide	ug/kg	5
Carbon tetrachloride	ug/kg	5
Chlorobenzene	ug/kg	5
Dibromochloromethane	ug/kg	5
Chloroethane	ug/kg	5
Chloroform	ug/kg	5
Chloromethane	ug/kg	5
Cyclohexane	ug/kg	5
1,2-Dibromo-3-chloropropane	ug/kg	5
1,2-Dibromoethane	ug/kg	5
1,2-Dichlorobenzene	ug/kg	5
1,3-Dichlorobenzene	ug/kg	5
1,4-Dichlorobenzene	ug/kg	5
Dichlorodifluoromethane	ug/kg	5

TABLE B7.4 (Continued)

PROJECT QUANTITATION LIMITS FOR SEDIMENT SAMPLES

Parameter	Units	Laboratory RL [(a)]
1,1-Dichloroethane	ug/kg	5
1,2-Dichloroethane	ug/kg	5
cis-1,2-Dichloroethene	ug/kg	5
trans-1,2-Dichloroethene	ug/kg	5
1,1-Dichloroethene	ug/kg	5
1,2-Dichloropropane	ug/kg	5
cis-1,3-Dichloropropene	ug/kg	5
trans-1,3-Dichloropropene	ug/kg	5
Ethylbenzene	ug/kg	5
2-Hexanone	ug/kg	5
Isopropylbenzene	ug/kg	5
Methyl acetate	ug/kg	5
Methylcyclohexane	ug/kg	5
Methylene chloride	ug/kg	5
4-Methyl-2-pentanone	ug/kg	5
Methyl tert-butyl ether	ug/kg	5
Styrene	ug/kg	5
1,1,2,2-Tetrachloroethane	ug/kg	5
Tetrachloroethene	ug/kg	5
Toluene	ug/kg	5
1,2,4-Trichlorobenzene	ug/kg	5
1,1,1-Trichloroethane	ug/kg	5
1,1,2-Trichloroethane	ug/kg	5
Trichloroethene	ug/kg	5
Trichlorofluoromethane	ug/kg	5
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/kg	5
Vinyl chloride	ug/kg	5
Xylenes (total)	ug/kg	15
1,2,3-Trichlorobenzene	ug/kg	5
1,3,5-Trichlorobenzene	ug/L	5
VOCs		
Benzene	µg/kg	5
Toluene	µg/kg	5
Ethylbenzene	µg/kg	5
Xylenes (total)	µg/kg	5
Chlorobenzene	µg/kg	5
1,3-Dichlorobenzene	µg/kg	5
1,4-Dichlrobenzene	µg/kg	5
1,2-Dichlorobenzene	µg/kg	5
1,2,3-Trichlorobenzene	µg/kg	5

TABLE B7.4 (Continued)

PROJECT QUANTITATION LIMITS FOR SEDIMENT SAMPLES

Parameter	Units	Laboratory RL [a]
1,2,4-Trichlorobenzene	µg/kg	5
1,3,5-Trichlorobenzene	ug/kg	5
Naphthalene	µg/kg	5
SVOCs		
Phenol	µg/kg	6.67
SVOCs (PAHs)		
Acenapthene	µg/kg	6.67
Acenapthylene	µg/kg	6.67
Anthracene	µg/kg	6.67
Benzo(a)anthracene	µg/kg	6.67
Benzo(a)pyrene	µg/kg	6.67
Benzo(b)fluoranthene	µg/kg	6.67
Benzo(g,h,i)perylene	µg/kg	6.67
Benzo(k)fluoranthene	µg/kg	6.67
Chrysene	µg/kg	6.67
Dibenz(ah)anthracene	µg/kg	6.67
Indeno(1,2,3-cd)pyrene	µg/kg	6.67
Phenanthrene	µg/kg	6.67
Pyrene	µg/kg	6.67

[1] RL=Quantitation Limit RLs are wet weight basis. Individual sample RLs will be adjusted accordingly based on moisture and aliquots used for analysis. RLs are less than applicable PECs.

[2] TCL VOCs applicable only to SMU 2 sediments.

TABLE B7.5

PROJECT QUANTITATION LIMITS FOR WATER SAMPLES(1)

Parameter	Units	Laboratory RL
PCB AROCLORS – GC/ECD – (SW846 8082)		
Aroclor 1016	µg/L	0.01
Aroclor 1221	µg/L	0.01
Aroclor 1232	µg/L	0.01
Aroclor 1242	µg/L	0.01
Aroclor 1248	µg/L	0.01
Aroclor 1254	µg/L	0.01
Aroclor 1260	µg/L	0.01
Aroclor 1268	µg/L	0.01
WET CHEMISTRY PARAMETERS		
TOC (Lloyd Kahn)	mg/L	500
Nitrogen, ammonia (EPA 350.1)	mg/L	2.5
Sulfide (SW846 9030B/9034)	mg/L	13
METALS – COLD VAPOR (SW846 7471A)		
Mercury	ug/L	0.2
ANIONS		
Chloride	ug/L	1
Fluoride	ug/L	0.05
Nitrate as N	ug/L	0.05
Nitrite as N	ug/L	0.05
Sulfate	ug/L	1
o-Phosphate	ug/L	0.5
TCL VOCs		
Benzene	µg/L	1
Toluene	µg/L	1
Ethylbenzene	µg/L	1
Xylenes (total)	µg/L	3
Chlorobenzene	µg/L	1
1,3-Dichlorobenzene	µg/L	1
1,4-Dichlrobenzene	µg/L	1
1,2-Dichlorobenzene	µg/L	1
1,2,3-Trichlorobenzene	µg/L	1
1,2,4-Trichlorobenzene	µg/L	1
1,3,5-Trichlorobenzene	ug/L	1

TABLE B7.5 (Continued)

PROJECT QUANTITATION LIMITS FOR WATER SAMPLES

Parameter	Units	Laboratory RL
TCL SVOCs		
Phenol	µg/L	10
TCL SVOCs (PAHs)		
Acenapthene	µg/L	10
Acenapthylene	µg/L	10
Anthracene	µg/L	10
Benzo(a)anthracene	µg/L	10
Benzo(a)pyrene	µg/L	10
Benzo(b)fluoranthene	µg/L	10
Benzo(g,h,i)perylene	µg/L	10
Benzo(k)fluoranthene	µg/L	10
Chrysene	µg/L	10
Dibenz(ah)anthracene	µg/L	10
Indeno(1,2,3-cd)pyrene	µg/L	10
Phenanthrene	µg/L	10
Pyrene	µg/L	10

(1) RL=Quantitation Limit RLs are wet weight basis. Individual sample RLs will be adjusted accordingly based on moisture and aliquots used for analysis

(2) Note: suite of analytical parameters will vary by sample location and sample type as identified in SAP Section 3..

TABLE B7.6

PROJECT QUANTITATION LIMITS FOR AIR SAMPLES FROM AIR EMISSIONS BENCH TESTING[(1)]

Parameter	Units	Laboratory RL
METALS – COLD VAPOR (SW846 7471A)		
Mercury	ug	0.01
VOCs		
Benzene	ug	4.0
Toluene	ug	4.0
Ethylbenzene	ug	4.0
Xylenes (total)	ug	4.0
Chlorobenzene	ug	4.0
1,3-Dichlorobenzene	ug	4.0
1,4-Dichlrobenzene	ug	4.0
1,2-Dichlorobenzene	ug	4.0
1,2,3-Trichlorobenzene	ug	4.0
1,2,4-Trichlorobenzene	ug	4.0
SVOCs		
Hexachlorobenzene	ug	10.0
Phenol	ug	20.0
SVOCs (PAHs)		
Fluorene	ug	4.0
Naphthalene	ug	10.0
Phenanthrene	ug	4.0
Pyrene	ug	4.0

[(1)]Air and Emission laboratory provided limits.

TABLE B7.7

PROJECT QUANTITATION LIMITS FOR SEDIMENT SAMPLES FROM SLURRY BENCH TESTING[(1)]

Parameter	Units	Laboratory RL[(a)]
PCB AROCLORS – GC/ECD – (SW846 8082)		
Aroclor 1016	ug/kg	8.3
Aroclor 1221	ug/kg	8.3
Aroclor 1232	ug/kg	8.3
Aroclor 1242	ug/kg	8.3
Aroclor 1248	ug/kg	8.3
Aroclor 1254	ug/kg	8.3
Aroclor 1260	ug/kg	8.3
Aroclor 1268	ug/kg	8.3
WET CHEMISTRY PARAMETERS		
TOC (Lloyd Kahn)	mg/kg	500
Nitrogen, ammonia (EPA 350.1)	mg/kg	0.2
Nitrogen, nitrate/nitrite (EPA 353.2 DI leach)	mg/kg	1.0
Total Kjeldahl Nitrogen (EPA 351.3)	mg/kg	150
Sulfide (SW846 9030B/9034)	mg/kg	4
METALS – COLD VAPOR (SW846 7471A)		
Mercury	mg/kg	0.033
VOCs		
Benzene	ug/kg	10
Toluene	ug/kg	10
Ethylbenzene	ug/kg	10
Xylenes (total)	ug/kg	10
Chlorobenzene	ug/kg	10
1,3-Dichlorobenzene	ug/kg	10
1,4-Dichlorobenzene	ug/kg	10
1,2-Dichlorobenzene	ug/kg	10
1,2,3-Trichlorobenzene	ug/kg	10
1,2,4-Trichlorobenzene	ug/kg	10
SVOCs		
Hexachlorobenzene	ug/kg	330
Phenol	ug/kg	330
SVOCs (PAHs)		
Acenaphthene	ug/kg	330
Acenaphthylene	ug/kg	330

TABLE B7.7 (CONT.)

PROJECT QUANTITATION LIMITS FOR SEDIMENT SAMPLES FROM SLURRY TEST BENCH TESTING

Parameter	Units	Laboratory RL[1,2]
Anthracene	ug/kg	330
Benzo(a)anthracene	ug/kg	330
Benzo(a)pyrene	ug/kg	330
Benzo(b)fluoranthene	ug/kg	330
Benzo(g,h,i)perylene	ug/kg	330
Benzo(k)fluoranthene	ug/kg	330
Chrysene	ug/kg	330
Dibenzo(a,h)anthracene	ug/kg	330
Indeno(1,2,3-cd)pyrene	ug/kg	330
Naphthalene	ug/kg	330
Phenanthrene	ug/kg	330
Pyrene	ug/kg	330
Fluorene	ug/kg	330

[1] RL=Quantitation Limit Individual sample RLs and MDLs will be adjusted accordingly based on moisture and aliquots used for analysis

[2]Air and Emission laboratory provided limits.

TABLE B7.8

QUANTITATION LIMITS FOR POREWATER SAMPLES FROM SLURRY BENCH TESTING[(1)]

Compound	RL, and (MDL); shown in mg/L	Code	RL and (MDL), shown in ug/L	Method
Mercury	0.000770 (0.00020)	B	0.770 (0.20)	SW7470A
Ethylbenzene	0.0170 (0.0010)	A	17.0 (1.0)	SW8260B LW
Xylene	0.0650 (0.0010)	A	6.50 (1.0)	SW8260B LW
Chlorobenzene	0.00500 (0.0010)	A	5.00 (1.0)	SW8260B LW
Dichlorobenzenes	0.00500 (0.0010)	A	5.00 (1.0)	SW8260B LW
Naphthalene	0.0130 (0.0010)	A	13.0 (1.0)	SW8260B LW
Benzene	0.210 (0.0010)	A	210 (1.0)	SW8260B LW
Toluene	0.100 (0.0010)	A	100 (1.0)	SW8260B LW
Hexachlorobenzene	0.00368 (0.0050)	A	3.68 (5.0)	SW8270C
Phenol	0.00500 (0.0100)	A	5.00 (10.0)	SW8270C
Benzo(a)pyrene	0.00000120	B	0.00120	SW8270C
Pyrene	0.00460 (0.0020)	A	4.60 (2.0)	SW8270C
Phenanthrene	0.00500 (0.0020)	B	5.00 (2.0)	SW8270C
Fluorene	0.000540 (0.0020)	A	0.540 (2.0)	SW8270C
PCBs (total)	0.0000140	A	0.0140	SW8082

Code Definitions:

A. NYSDEC Surface Water Standards obtained from water quality criteria for benthic aquatic life chronic toxicity A(C) in fresh water, as provided in Table 1 of the NYSDEC's Technical Guidance for Screening Contaminated Sediments (1999).

B. New York State Ambient Water Quality Standards for Aquatic Acute, or Aquatic Chronic A(C), or Human Consumption of Fish H(FC) in fresh water. Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Limitations NYSDEC 1998.

[(1)]Air and Emission laboratory provided limits.

SECTION B8

QUALITY CONTROL

B8.1 INTRODUCTION

A QC program is a systematic process that controls the validity of analytical results by measuring the accuracy and precision of method and matrix, developing expected control limits, using these to detect anomalous events, and requiring corrective action techniques to prevent or minimize the recurrence of these events. QC measurements for analytical protocols are designed to evaluate laboratory performance, and measurement biases resulting from the sample matrix and field performance. Project-specific criteria and corrective actions for each analytical method are summarized in Attachment 3. Project procedures for field methods (sample collection, field analyses, equipment calibration, etc.) are described in the PDI Phase I SAP.

- **Field performance:** QC samples are used to evaluate the effectiveness of the sampling program to obtain representative samples, eliminating any cross contamination. These samples will include trip blanks, field duplicates and rinse blanks.
- **Sample performance:** Factors associated with sample preparation and analysis influence accuracy and precision. Such factors are monitored by the use of internal QC samples. QC field samples are analyzed to evaluate measurement bias due to the sample matrix based on evaluation of matrix spike (MS), matrix spike duplicate (MSD), and/or matrix duplicate (MD) samples. If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.
- **Laboratory method performance:** All QC criteria for method performance should be met for all target analytes for data to be reported. These criteria generally apply to instrument detector assessment (such as, tunes, ICP interference check sample), calibration, method blanks, and LCS. Variances will be documented and noted in the case narrative of the report.

B8.1.1 Field Quality Control Samples

QC samples will be collected in the field as part of the sampling program to allow evaluation of data quality. Field QA/QC samples will consist of the collection and analysis of rinse blanks, field duplicates, and "extra volume samples", to be used for matrix spike/matrix spike duplicate (MS/MSD) samples, at a frequency of 1:20 for each sample media (sediment, porewater, and soil borings). Temperature blanks will accompany each sample shipment container (cooler) shipped to the laboratory for sample analysis. Since each of the sediment samples will be collected from disposable tubes/liners, the need for equipment blanks (rinse blanks) at every location will be unnecessary. A rinse blank will be collected from the disposable sampling equipment at a frequency of once per lot. Standard sample identifiers will

identify field QA/QC samples and they may provide no indication of their nature as QA/QC samples.

A summary of the type and collection frequency of field QC sample to be collected respective to the sampling programs specified in this QAPP, is included in Table B8.1. A description of each QC sample is included below.

B8.1.1.1 Equipment Rinse Blanks

To assess field sampling and decontamination performance, rinse blanks will be used to evaluate the effectiveness of the decontamination procedures for chemical sampling equipment. Rinse blanks will be collected as part of all chemical sampling programs, except for waste characterization. An equipment rinse blank (rinse blank) is a sample of deionized water provided by the laboratory that is poured over or through the sampling equipment (such as split spoon, wipe template), into the sample container specified in Table B4.1. A rinse blank will be collected at a frequency of 1:20 samples per type of sample collection activity using non-disposable sampling equipment. A rinse blank will be collected from disposable sampling equipment at a frequency of once per lot.

B8.1.1.2 Field Duplicates

Coded (blind) field duplicates will be used to assess the precision of field sampling procedures. Precision of a sample is calculated by quantifying the RPD between two sample measurements (Section B.3.2.2.1). If the RPD of field duplicate results is greater than the precision criterion (Attachment 3), the environmental results for the field duplicate pair will be qualified as estimated. The Field Leader responsible for sample collection and processing should be notified to identify the source of variability (if possible), and corrective action should be taken (Section B10.3).

Coded (blind) field duplicates will be collected to evaluate the representativeness and effectiveness of homogenization and proper mixing for sediment and aqueous samples. The field duplicate will be analyzed for all of the parameters for which the associated samples are being analyzed. The samples will be labeled in such a manner that the laboratory will not be able to identify the sample as a duplicate sample. This will eliminate bias that could arise by laboratory personnel.

B8.1.1.3 Trip Blanks

During field sampling and sample shipping, contamination may be introduced to the samples that could affect the accuracy of analysis results. Trip blanks will be used during sample shipment to detect cross-contamination. Each cooler of porewater samples sent to the laboratory for analysis of VOCs will contain one trip blank. Trip blanks are prepared only when VOCs samples are taken and are analyzed on for VOCs analytes. The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field.

B8.1.1.4 Temperature Blank

The temperature blank is used to indicate the temperature of the sample cooler upon receipt at the laboratory. A temperature blank consists of laboratory reagent in a 40-ml glass vial sealed with a Teflon® septum. Any cooler temperature exceeding the allowable 4 ± 2 degrees Celsius (°C) must be noted and the QAO notified prior to sample analyses.

B8.1.2 Laboratory Quality Control Samples

QC data from the laboratory are necessary to determine precision and accuracy of the analyses and to demonstrate the absence of interferences and contamination of glassware and reagents. The laboratory will analyze QC samples routinely as part of the laboratory QC procedures. Laboratory QC results will consist of analysis of MS/MSD or MS/MD, LCS, method/preparation blanks, and surrogate spikes (Table B8.2). Surrogates will be added to samples (Table B8.2). QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. These laboratory QC sample analyses will be run independently of the field QC samples. Results of these analyses will be reported with the sample data and kept in the project QC data file. The QC checks, their frequency, acceptance criteria, and corrective actions for noncompliance are summarized in the methods and in Attachment 3 for each analytical method.

QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. Re-preparation and/or reanalysis of the laboratory QC samples due to a failing recovery and/or precision failure without the re-preparation and reanalysis of the associated samples is prohibited. In all events, QC failures, holding time exceedances, or any other non-standard occurrence must be communicated immediately to the QAO and prior to reporting and then, with approval to report the data, summarized in the case narrative. QC sample results will be evaluated against the criteria in Attachment 3. If the criteria are not met, appropriate corrective action must be taken as specified in Section B9.1 and Section B10.

B8.1.2.1 Matrix Spike/Matrix Spike Duplicate/ Matrix Duplicates

MS/MSD, or matrix duplicates (MD) for methods not requiring MS/MSD, samples for organics, metals, and wet chemistry parameters will be taken at a frequency of 1 per 20 field samples (per SDG) per matrix per method. MD samples will be analyzed by the laboratory at frequency required by the analytical method. A “batch” is considered up to twenty samples from the same matrix, of the same extraction/digestion type, prepared and/or analyzed by a given analyst, within12-hr, within an extraction/digestion event, whichever is more frequent. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes by spiking a normal field sample with a known concentration of the analyte of interest. Samples identified as rinse blanks will not be used for the MS/MSD or MS/MD preparation or analysis.

Spiked samples will be analyzed, and the percent recovery will be calculated. Results of the analysis will be used to evaluate accuracy and precision of the actual sample matrix. For MS/MSD or MD, the result will be compared and used to evaluate the precision of the actual sample matrix. The percent recovery for each analyte in the MS and MSD should fall within the

limits established by laboratory QC protocol. The percent recovery and RPD control limits between the MS and MSD and the sample and the duplicate concentrations (Table B3.2).

The original sample, MS/MSD, and MD sample aliquots will be treated exactly the same throughout the sample preparation and analysis and will not be homogenized more than any other project sample (either in the field or at the laboratory). The spike samples will be analyzed for the same parameters as the sample. Field personnel must indicate on the chain-of-custody form which sample(s) are designated as MS/MSD (or MS/MD). If samples are not designated for these QC purposes and/or insufficient sample is available the Project Manager and/or QAO will be notified for resolution. Corrective actions applicable to MS/MSD or MS/MD analyses are described in Attachment 3.

B8.1.2.2 Laboratory Control Samples

Laboratory Control Samples (LCS) are designed to check the accuracy of the analytical procedure by measuring a known concentration of an analyte of interest. An LCS will be analyzed for each analytical batch requested for sample preparation and analysis. LCSs must be prepared at a frequency of one per batch for all analytical methods. If high LCS recoveries are observed and the associated samples are reported as "not detected" for the requested target analytes, no action is necessary other than to note the issue in the case narrative of the final analytical report. LCS recoveries must meet the criteria specified in Table B3.2. If these criteria are not met, corrective actions applicable to LCS samples will be described in Attachment 3.

B8.1.2.3 Method and Preparation Blanks

Laboratory blank samples (also referred to as method or preparation blanks) are designed to detect contamination resulting from the laboratory environment or sample preparation procedure. Method blanks verify that method interferences caused by contaminants in solvents, reagents, glassware, or in other sample processing hardware, are known. Method blanks will be analyzed for each analytical batch using similar preparation techniques (separatory funnel and liquid/liquid extraction) to assess possible contamination and evaluate which corrective measures may be taken, if necessary.

Method blanks associated with field samples must undergo all of the processes performed on investigative samples, including but not limited to pre-filtration and sample cleanups. The blank will be deionized water for water samples or a purified solid matrix such as sodium sulfate for extractable soil samples. For sediment analysis, where the use of sodium sulfate blank is not appropriate, the blank must include all reagents that are normally used for the associated sample analysis. Where all the field samples in a batch do not require an additional cleanup procedure, an additional blank may be prepared to check the performance of the additional cleanup and will be associated with the field samples getting the specific additional cleanup. Where this is done, both blanks will be reported, and the procedure described in the case narrative. Method blanks must be prepared at a frequency of one per analytical batch. Corrective actions applicable to method blanks are described in Attachment 3.

B8.1.2.4 Surrogate Spike Analyses

Surrogate spikes (applicable to organic analysis only) are used to determine the efficiency of analyte recovery in sample preparation and analysis. Calculated percent recovery of the spikes is used to measure the accuracy of the analytical method. A surrogate spike is prepared by adding a known amount of a compound similar in type to the analytes of interest. Surrogate compounds will be added to all samples analyzed by USEPA Methods, including method blanks, MS/MSDs, project environmental samples, and duplicate samples in accordance with the method. Surrogate spike recoveries should fall within the limits established by laboratory QC protocol. If the recovery is not with the specified limits, the applicable corrective actions described in Attachment 3 should be followed.

B8.2 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

B8.2.1 Field Equipment

Equipment failure will be minimized by routinely inspecting all field equipment to ensure that it is operational and by performing preventative maintenance procedures. Field sampling equipment will be inspected prior to sample collection activities, and repairs will be made prior to decontamination and reuse of the sampling equipment. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure, based on the manufacturer's instructions or recommendations. Maintenance will be performed in accordance with the schedule specified by the manufacturer to minimize the downtime of the measurement system. Qualified personnel must perform maintenance work.

MINIMUM ROUTINE PREVENTIVE MAINTENANCE
Removal of foreign debris from exposed surfaces
Storage in a cool dry place protected from the elements
Daily inspections
Verification of instrument calibrations (Section B8.3.1)

A list of critical spare parts will be developed prior to the initiation of fieldwork. Field personnel will have ready access to critical spare parts to minimize downtime while fieldwork is in progress. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

Non-routine maintenance procedures require field equipment to be inspected prior to initiation of fieldwork to determine whether or not it is operational. If it is not operational, it will be serviced or replaced. Batteries will be fully charged or fresh, as applicable.

B8.2.2 Laboratory Instrumentation

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting section of factory manuals may be used in assisting personnel in performing maintenance tasks.

Major instruments in the laboratory are covered by annual service contracts with manufacturers or other qualified personnel (internal or external). Under these agreements, trained service personnel make regular preventive maintenance visits. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument.

The OM is responsible for preparation, documentation, and implementation of the program. The QAM reviews implementation to verify compliance during scheduled internal audits.

Written procedures will establish the schedule for servicing critical items to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule and arrange any necessary and prompt service. Qualified personnel will perform required service.

B8.3 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Instruments (field and laboratory) used to perform chemical measurements will be properly calibrated prior to use to obtain valid and usable results. The requirement to properly calibrate instruments prior to use applies equally to field instruments as it does to fixed laboratory instruments to generate appropriate data to meet DQOs.

B8.3.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures of field instruments (such as PID, pH, temperature), will conform to manufacturer's standard instructions to ensure that the equipment functions within the allowable tolerances established by the manufacturer and required by the project. Personnel performing instrument calibrations must be trained in its proper operation and calibration. Records of all instrument calibration will be maintained by the Field Team Leader in the field logbook (Section B6.2) and will be subject to audit by the QAO or authorized personnel. The Field Team Leader will maintain copies of all the instrument manuals on the site.

B8.3.2 Laboratory Instruments

A formal calibration program will control instruments and equipment used in the laboratory. The program will verify that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity or whose performance is expected at a stated level will be subject to calibration. Laboratory personnel or external calibration agencies or equipment manufacturers will calibrate the instruments using reference standards. Upon request, the laboratory will provide all data and information to demonstrate that the analytical system was properly calibrated at the time of

analysis including calibration method, frequency, source of standards, concentration of standards, response factors, linear range, check standards, and all control limits. This data will be documented in a calibration record (Section B6.3.1). Calibration records will be prepared and maintained for each piece of equipment subject to calibration.

This section provides an overview of the practices used by the laboratory to implement a calibration program. Detailed calibration procedures, calibration frequencies, and acceptance criteria are specified in the laboratory's analytical method SOPs. The requirements for the calibration of instruments and equipment depend on the type and expected performance of individual instruments and equipment. Therefore, the laboratory will use the guidelines provided here to develop a calibration program.

Two types of calibration are described in this section: periodic calibration and operational calibration. The results of the calibration activities will be documented in the analytical data package and the calibration records (Section B6.3.1).

- **Periodic calibration:** Performed at prescribed intervals for equipment, such as balances and thermometers. In general, equipment which can be calibrated periodically is a distinct, singular purpose unit and is relatively stable in performance.
- **Operational calibration:** routinely performed as part of an analytical procedure or test method, such as the development of a standard curve for use with an atomic absorption spectrophotometer. Operational calibration is generally performed for instrument systems.

Equipment that cannot be calibrated or becomes inoperable will be removed from service. Such equipment must be repaired and satisfactorily recalibrated before reuse. For equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken, and the analyst achieves an acceptable calibration. This type of failure will be documented in an NCM (Section B10).

B8.3.3 Calibration System

The calibration system includes calibration procedures, equipment identification, calibration frequency, calibration reference standards, calibration failure, and calibration records. These elements are described next.

B8.3.3.1 Calibration Procedures

Written procedures will be used by the laboratory for all instruments and equipment subject to calibration. Whenever possible, recognized procedures, such as those published by ASTM or USEPA, will be adopted. If established procedures are not available, a procedure will be developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured. Calibration procedure established by the laboratory must, at a minimum, meet the calibration requirements of the method on which the SOP is based.

MINIMUM CALIBRATION PROCEDURES
Equipment to be calibrated
Reference standards used for calibration
Calibration technique and sequential actions
Acceptable performance tolerances
Frequency of calibration
Calibration documentation format

B8.3.3.2 Equipment Identification

Equipment that is subject to calibration is identified by a unique number assigned by the laboratory. Calibration records reference the specific instrument identification.

B8.3.3.3 Calibration Frequency

Instruments and equipment will be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Calibration frequency will be based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

B8.3.3.4 Calibration Reference Standards

Two types of reference standards will be used by the laboratory for calibration:

- **Physical standards**, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration. Physical reference standards that have known relationships to nationally recognized standards (such as NIST) or accepted values of natural physical constants will be used whenever possible. If national standards do not exist, the basis for the reference will be documented. Physical reference standards will be used only for calibration and will be stored separately from equipment used in analyses. In general, physical standards will be recalibrated annually by a certified external agency, and documentation will be maintained. Balances will be calibrated against class "S" weights by an outside source annually. Physical standards such as the laboratory's class "S" weights will be recertified annually.
- **Chemical standards,** such as vendor certified stock solutions and neat compounds, will generally be used for operational calibration. The laboratory, to provide traceability for all standards used for calibration and QC samples, will document standard preparation activities.

B8.3.4 Operational Calibration

Operational calibration will generally be performed as part of the analytical procedure and will refer to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Formulas used for calibration are listed in Table B8.3.

B8.3.4.1 Preparation of a Calibration Curve

Preparation of a standard calibration curve will be accomplished by analyzing calibration standards that are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards will be chosen to cover the working range of the instrument or method. All sample measurements will be made within this working range. Average response factors will be used or a calibration curve will be prepared by plotting or regressing the instrument responses versus the analyte concentrations. Where appropriate a best-fit curve may be used for nonlinear curves and the concentrations of the analyzed samples will be back-calculated from the calibration curve.

B8.3.4.2 Instrument Calibration Procedures

The QC requirements and corrective actions for the applicable instrument calibration procedures are described in Attachment 3.

B8.3.4.3 Periodic Calibration

Periodic calibrations are performed for equipment (such as balances and thermometers), that is required in the analytical method, but that is not routinely calibrated as part of the analytical procedure. Table B8.4 lists the periodic calibration requirements used by the laboratories.

B8.4 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

In the laboratory, personnel qualifying reagents and standards must be trained to perform the associated instrumental analysis, including instrument calibration, calculations, and data interpretation. Laboratory personnel must document the purchase, receipt, handling, storage, and tracking of supplies and consumables used during analysis. For example, analytical standards, source materials, and reference materials used for instrumental calibration/tunes/checks must be certified and traceable to the USEPA or NIST through reference numbers documented directly in each analytical sequence. Calibration for all requested analyses must be verified by an independent second source reference. Adhering to these procedures precludes the use of expired supplies and consumables or supplies and consumables that do not meet standard acceptance criteria.

Records must be maintained on reagent and standard preparation in the LIMS reagent system or laboratory standard preparation logs. The records should indicate traceability of the standards to their original source solution or neat compound, the name of the material, concentration, the method and date of preparation, the expiration date, storage conditions, and the preparer's initials. Each prepared reagent or standard should be labeled with a unique identifier that links the solution to the preparation documentation that specifies an expiration and/or re-evaluation date for the solution.

TABLE B8.1

SUMMARY OF FIELD QC SAMPLE TYPES AND COLLECTION FREQUENCY

Field QC Sample Type	Sample Type	Collection Frequency
Rinse Blank	Pore Water	Once per week for non-disposable sampling equipment. Once per lot for disposable sampling equipment.
	Surface Water	Once per week for non-disposable sampling equipment. Once per lot for disposable sampling equipment.
	Sediment	Once per week for non-disposable sampling equipment. Once per lot for disposable sampling equipment.
	Soil Boring	Once per week for non-disposable sampling equipment. Once per lot for disposable sampling equipment.
Field Duplicates	Pore Water	1:20 Samples
	Surface Water	1:20 Samples
	Sediment	1:20 Samples
	Soil Boring	1:20 Samples
Extra Volume Sample (collected for MS/MSD)	Pore Water	1:20 Samples
	Surface Water	1:20 Samples
	Sediment	1:20 Samples
	Soil Boring	1:20 Samples

Field QA/QC samples will be identified by using standard sample identifiers that will provide no indication of their nature as QA/QC samples.

TABLE B8.2

LABORATORY QUALITY CONTROL SAMPLE FREQUENCY

QC Sample	Frequency
Method/prep Blanks	1 per analytical batch of 1-20 samples, per preparation event
Porewater/Effluent Elutriate Test (EET) Prep Blank	1 per 10 samples
Laboratory Control Sample	1 per analytical batch of 1-20 samples, per preparation event
Surrogates	Spiked into all field and QC samples (Organic Analyses)
Matrix Spike/Matrix Spike Duplicate or Matrix (Laboratory) Duplicate	1 per batch of 1-20 samples

TABLE B8.3

OPERATIONAL CALIBRATION FORMULAS

Application	Formula	Symbols
Linear calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$CF = A_x / C$	C = concentration (µg/L) CF = calibration factor Ax = peak size of target compound in sample extract
Response factors [2]	$RF = C_{is} A_x / C A_{is}$	C = concentration (µg/L) RF = internal standard response factor Cis = concentration of the internal standard (µg/L) Ax = area of the characteristic ion for the target compound Ais = area of the characteristic ion for the internal standard

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique

Note: For organic analysis, the laboratory will make efforts to use the best curve technique for each analyte. This practice is described in detail in the laboratory calibration criteria documents for GC analysis. This may require the use of a quadratic curve for some compounds.

TABLE B8.4

PERIODIC CALIBRATION REQUIREMENTS

Instrument	Calibration Frequency		Corrective Actions
Analytical Balances	Daily:	Sensitivity (with a Class S-verified weight)	Adjust sensitivity
	Annually:	Calibrated by outside vendor against certified Class S weights	Service balance
Thermometers	Annually:	Calibrated against certified NIST thermometers	Tag and remove from service
Automatic Pipettors	Quarterly:	Gravimetric check	Service or replacement

TABLE B8.5

SAMPLE CONCENTRATION CALCULATION FORMULAS

Application	Formula	Symbols
Linear regression calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$C = A_x V_f / CF V_i$	C = concentration (µg/L) CF = calibration factor A_x = peak size of target compound in sample extract V_f = final volume of extracted sample (mL) V_i = initial volume of sample extracted (mL)
Response factors [2]	$C = C_{is} A_x V_f / RF A_{is} V_I$	C = concentration (µg/L) RF = internal standard response factor C_{is} = concentration of the internal standard (µg/L) A_x = area of the characteristic ion for the target compound V_f = final volume of extracted sample (mL) A_{is} = area of the characteristic ion for the internal standard V_i = initial volume of sample extracted (mL)
Residues [3]	R = (W – T)/V x 1,000,000	R[6] = residue concentration (mg/L) W = weight of dried residue + container (g) T = tare weight of container (g) V = volume of sample used (mL)
Solid samples [4]	K = C V D / W (%S/100)	K = dry-weight concentration (mg/kg) C = analytical concentration (mg/L) V = final volume (mL) of processed sample solution D = dilution factor W = wet weight (g) of as-received sample taken for analysis %S = percent solids of as-received sample

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique
3. Used for total, filterable, nonfilterable, and volatile residues as well as gravimetric oil and grease
4. Used to calculate the dry-weight concentration of a solid sample from the analytical concentration of the processed sample.
5. Conversion factor to convert g/mL to mg/L:

$$\frac{mg}{L} = \frac{g}{mL} \times \frac{10^3 mL}{L} \times \frac{10^3 mg}{g}$$

SECTION B9

DATA VALIDATION AND USABILITY ELEMENTS

B9.1 DATA REVIEW, VERIFICATION, AND VALIDATION

The data collected during this project will undergo a systematic review for compliance with the DQOs and performance objectives as stated in Section B3 and Attachment 3. In particular, field, laboratory, and data management activities will be reviewed to confirm compliance with the method QC criteria for performance and accuracy and to show that data were collected in a manner that is appropriate for accomplishing the project objectives. These data will be evaluated as to their usability during data verification. In particular, data outside QC criteria, but not rejected, will be reviewed for the magnitude of possible positive and negative bias. All data will be validated following verification and reduction.

Parsons data validation personnel will assess and verify data; they will review the data against QC criteria and DQOs (Sections B3 and B9.2.2 and Attachment 3) to identify outliers or errors and to flag or delete suspect values. Field and laboratory activities that should be reviewed include, at a minimum, sample collection, handling, and processing techniques; field documentation records; verification of proper analytical methods; analytical results of QC samples; and calibration records for laboratory instruments and field equipment. A review of such elements is necessary to demonstrate whether the DQOs outlined in B3 were met. Samples that deviate from the experimental design and affect the project objectives must be reported to the QAO and Parsons' data validation personnel.

Departures from standard procedures (in the SAP, this QAPP, or the laboratory SOPs, may lead to exclusion of that data from the project database or validation process, based on discussions with and approval of the NYSDEC. However, routine field audits involving thorough reviews of sample collection procedures and sample documentation should preclude such deviations from occurring. Additionally, routine laboratory audits will be used to document proper sample receipt, storage, and analysis; instrument calibration; use of the proper analytical methods; and use of QC samples specified in Section B8 to assist in appropriately qualifying the data.

The laboratory's analytical report for each sample delivery group (SDG) will be assembled by collecting and incorporating all the data for each analysis associated with the reported samples; the analytical narratives; and other report-related information such as copies of chain-of-custody forms, communication records, and nonconformance forms. The information included in the analytical data report is summarized in Attachment 1.

Before the laboratory submits data to Parsons, the laboratory's data review process will include a full first level "technical" review by the laboratory's analyst during sample analysis and data generation. The review must include a check of all QC data for errors in transcription,

calculations, and dilution factors and for compliance with QC requirements. Failure to meet method performance QC criteria may result in the reanalysis of the sample or analytical batch. After the initial review is completed, the data will be collected from summary sheets, workbooks, or computer files and assembled into a data package.

The laboratory's first review will be followed by a second-level technical review of the data package. The second level review may be performed by a peer trained in the procedures being reviewed, by the QAM, or by the appropriate analytical group supervisor. The reviewer will check the data packages for completeness and compliancy with the project requirements and will certify that the report meets the DQOs for PARCC specifications. The report narrative will be generated at this stage of the data review. Any problems discovered during the review and the corrective actions necessary to resolve them will be communicated to the responsible individual, who will discuss the findings with the QAM for resolution.

The first and second review will be conducted throughout sample analysis and data generation to validate data integrity during collection and reporting of analytical data. Data review checklists will be used to document the performance and review of the QC and analytical data.

Before the laboratory's final release to the client, the data will undergo a final review by the QAM or his/her designee. This third level review is to confirm that the report is complete and meets project requirements for performance and documentation. The QAM must review reports involving non-conforming data issues. A summary of all non-conformances will be included in the case narrative. The report will then be released to the client for data validation, and a copy will be archived by the laboratory for a period of 5 yrs.

Parsons will validate laboratory analytical data using project-specific data validation procedures to confirm that data meet the applicable data quality objectives. Depending on the type of data and the intended data uses, the data validation process for a given SDG (or a specific percentage of sample analyses) or analytical method may be performed following an EPA Level IV protocol (full validation), or an EPA Level III protocol (sample plus QC summary data only, no raw data review). The project-specific Level III data validation protocol will provide a level of review resulting in the generation of a data usability summary report (DUSR), as defined by NYSDEC. Level III validation will be performed on all DQO Level III and all DQO Level IV data. Ten percent (10%) of the DQO Level IV Data for each analytical method will undergo a Level IV validation. It is anticipated that DQO Level II data and that the data using to support the odor and emissions treatability study will be reviewed and evaluated, but not validated. Certain geotechnical and field screening data will be evaluated in a manner suitable for the intended data uses.

A data validation report will be issued and reviewed by the QAO before finalization. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCC criteria for each analytical method. The validation criteria are objective and are not sample dependent, except for consideration of sample matrix effects. The

criteria specify performance requirements that should be under the control of the field-sampling contractor or analytical laboratory. This QAPP will be the primary reference for evaluating the data.

After data validation, the data will be evaluated for consistency with site conditions and developed conceptual models. Parsons data validation personnel will prepare a project DUSR that summarizes the implications of the use of any data out of criteria. In addition, the data usability report will include the percentage of sample completeness for critical and non-critical samples and a discussion of any issues in representativeness of the data that may develop as a result of validation. The data usability report will address overall data quality and achievement of PARCC criteria and assess issues associated with the overall data and data quality for all validated Level III and Level IV data.

B9.2 VERIFICATION AND VALIDATION METHODS

B9.2.1 Laboratory

The laboratory will verify and assess analytical data against the stated requirements on the chain-of-custody record, the sample handling procedures (Section B4), and the QC parameters (Attachment 3). The laboratory data reviewers will also check that transcriptions of raw or final data and calculations were performed correctly and are verified.

Following data verification, analytical data generated by the laboratory will be reduced and managed based on the procedures specified in this QAPP and USEPA SW846 methodologies. Data reduction includes all processes that change either the values or numbers of data items. The data reduction processes used in the laboratory includes establishment of calibration curves, calculation of sample concentrations from instrument responses, and computation of QC parameters. Table B8.5 lists the formulas used to calculate sample concentrations.

The reduction of instrument responses to sample concentrations takes different forms for different types of methods. For most analyses, the sample concentrations are calculated from the measured instrument responses using a calibration curve. The sample concentrations can be back-calculated from a regression equation fitted to calibration data. For gravimetric and titrimetric analyses, the calculations are performed according to equations given in the method. For chromatographic analyses, the unknown concentrations are determined using either calibration factors (external standard procedure) or relative response factors (internal standard procedure). GC analyses are generally quantitated using the external standard technique; GC/MS analyses are quantitated using the internal standard technique. These calculations are generally performed by the associated computerized data systems.

Validated analytical data will be loaded into a database and reported in tabular format. Database fields will include the field sample identification, laboratory sample identification, blinded sample number, analytical results, detection limits, and validation qualifiers. The usability of the data will be evaluated by the QAM or designee.

B9.2.2 Analytical Data Validation

The Parsons (contractor) data review process is performed in two phases:

1. **Initial phase, contract compliance screening (CCS)**: Review of sample data deliverables for completeness. Completeness is evaluated by ensuring that all required data deliverables are received in a legible format with all required information. The CCS process also includes a review of the chain-of-custody forms, case narratives, and RLs. Sample resubmission requests, documentation of nonconformances with respect to data deliverable completeness, and corrective actions often are initiated during the CCS review. The results of the CCS process are incorporated into the data validation process.
2. **Second phase, data validation:** A project-specific data validation procedure based on a "Level III" or the "Level IV" validation protocol will be performed on the analytical results from the fixed-base laboratory or laboratories, with the exception of the bench-scale testing data. The EPA Level III validation protocol, which be applied to Level III data packages and Level IV data packages not receiving "full" Level IV validation, includes a review of summary information to determine adherence to analytical holding times; results from analysis of field duplicates, method blanks, field blanks, surrogate spikes, MS/MSDs, LCSs, and sample temperatures during shipping and storage. Data qualifiers are applied to analytical results during the data validation process based on adherence to method protocols and laboratory-specific QA/QC limits. The EPA Level IV validation protocol incorporates the Level III validation protocol and adds calculation checks from the raw data of reported and summarized sample data and QC results

The laboratory will send Parsons the required analytical data package deliverables, consisting of CD-ROM and hardcopy versions and the EDD, following completion of the laboratory's validation process (Section B9.2.2). Parsons will perform data validation in accordance with the USEPA Region 2 RCRA and CERCLA Data Validation SOPs for organic and inorganic data review. In addition, Parsons will refer to this QAPP to verify that project and DQOs were met. If problems are identified during data validation, the QAO and the QAM will be alerted, and corrective actions will be requested. The LPM and Parsons data validation chemists will maintain close contact with the QAO to ensure all nonconformance issues are acted upon prior to data manipulation and assessment routines.

USEPA Region II SOPs also used as guidance for data validation	
Organics	Organics Data Review and Preliminary Review (SOP HW-6, Rev. 12, Mar 2001)
PCBs	Validating PCB Compounds by SW-846 Method 8082 (HW-23B, Rev. 1.0, May 2002)
Mercury	Evaluation of Metals Data for the CLP Program SOP (HW-2, Rev. 11, Jan 1992)
VOCs	Validating Volatile Organic Compounds by SW-846 Method 8260B (HW-24, Rev. 1, Jun 1999)
SVOCs	Validating Semivolatile Organic Compounds by SW-846 Method 8270 (HW-22, Rev. 2, Jun 2001)

Data validation will be conducted using the USEPA guidelines (USEPA, 1999a/2005 and USEPA, 2004) as supplementary guidelines. Where CLP guidelines and SW-846 disagree, this QAPP and Parsons' data validation professional judgment will prevail.

Trained and experienced Parsons data validation chemists will perform the data validation work (see parameters below). The QAO will review the data validation report before it is finalized. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCC criteria for each analytical method. A detailed assessment of each SDG will follow. Based on the results of data validation, the validated analytical results reported will be assigned a usability flag (see chart at right).

USABILITY FLAGS FOR VALIDATED RESULTS	
U	Not detected at given value
UJ	Analyte not detected; associated quantitation limit is an approximate (estimated) values.
J	Estimated value
N	Presumptive evidence at the value given
NJ	Analysis indicates presence of analyte tentatively identified; the associated numerical value is its approximate concentration
R	Result not useable and
No flag	Result accepted without qualification

FULL VALIDATION (USEPA LEVEL IV EQUIVALENT)	
Organic Analytical Methods	**Inorganic Constituents, Wet Chemistry Parameters**
Percentage of solids	Percentage of solids
Sample preservation and holding times	Sample preservation and holding times
Instrument tuning	Calibrations
Instrument calibrations	Blank results
Blank results	Interference check samples (inorganics only)
System monitoring compounds or surrogate recovery compounds (as applicable)	LCSs
Internal standard recovery results	Project Required Reporting Limit (PRRL) standard check samples
MS and MSD (or MD) results	Duplicates
LCS results	MSs (pre-digestions and post-digestions for inorganics only)
Target compound identification	ICP serial dilutions and
Chromatogram quality	Results verification and reported detection limits
Duplicate results	
Compound quantitation and reported RLs	
System performance and	
Results verification	

B9.3 RECONCILIATION WITH USER REQUIREMENTS

Following data validation by Parsons personnel, the data will be evaluated by the QAO and the project manager as to consistency with site conditions and developed conceptual models to determine whether field and analytical data meet the requirements for decision making. Specifically, the results of the measurements will be compared to the DQOs (Section B3 and PDI Phase I SAP Section 3).

The DQOs will be considered complete and satisfied if the data are identified as usable and if no major data gaps are identified. For example, the objective for data collected under the characterization program is to further refine the limits of dredging and/or capping. If the collected data sufficiently characterizes these limits in a manner that is acceptable for remedial action, then the DQO is satisfied. In cases where data may be considered not usable (for example, rejected during data validation), resampling may be required at a specific location. If resampling is not possible, the data will be identified and noted in the project database to make data users aware of its limitations.

The Level III analytical data resulting from the bench-scale testing (treatability testing) of the Air Emissions and Odor Work Plan (PDI Phase I WP Appendix D) will not undergo formal

data validation. However, the data will be evaluated and assessed by the laboratory in relation to the established laboratory (and project) control limits for accuracy and precision with factors impacting data quality being identified in the laboratory analytical report. The data will be evaluated by the project manager as to consistency with site conditions and developed conceptual models, to determine whether field and analytical data meet the requirements for decision making. Specifically, the results of the measurements will be compared to the DQOs described in Section B3 of this QAPP and PDI Phase I Work Plan Appendix D. The DQOs will be considered complete and satisfied if the data are identified as usable for the intended purposes and if no major data gaps are identified.

SECTION B10

ASSESSMENT AND OVERSIGHT

B10.1 ASSESSMENTS AND RESPONSE ACTIONS

Performance and system audits of both field and laboratory activities may be performed. Any such audits will be performed at a frequency to be determined to ensure that sampling and analysis activities are completed in accordance with the procedures specified in the SAP and this QAPP.

Quality assurance audits will be carried out under the direction of the QAO on field activities, including sampling and field measurements. They will be implemented to verify that established procedures are being followed and to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s).

The QAO will plan, schedule, and approve system and performance audits based on procedures customized to the project requirements. Additional field sample collection audits may be performed by the QAO at the direction of Honeywell. If required, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. Quality auditing personnel will not have responsibility for field or laboratory project work.

B10.2 PROJECT-SPECIFIC AUDITS

Project-specific audits include system and performance audits of sampling and analysis procedures, and of associated recordkeeping and data management procedures. Project-specific audits will be performed on a discretionary basis at a frequency determined by the project manager.

B10.2.1 System Audits

The QAO may perform system audits. Such audits will encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be system-audited including the field logbook, field sampling records, laboratory analytical records, sample handling, processing, and packaging in compliance with the established procedures, maintenance of QA procedures, and chain-of-custody procedures. These audits may be carried out during execution of the project to confirm that sampling crews employ consistent procedures. However, if conditions adverse to quality are detected or if Honeywell or its designee requests, additional audits may occur.

Findings from the audit will be summarized and provided to the PM and/or designated personnel so that necessary corrective action can be monitored from initiation to closure.

B10.2.2 Performance Audits

The laboratory may be required to conduct an analysis of PE samples or provide proof that PE samples were submitted by an approved USEPA performance testing provider within the past 12 months. If necessary, proof that applicable PE samples have been analyzed at the laboratory within the past 12 months will be included in the laboratory procurement package.

B10.2.3 Formal Audits

Formal audits are any system or performance audit that the QAO documents and implements. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklist to verify objectively that QA requirements have been developed, documented, and instituted in accordance with contractual and project criteria. At the discretion of the project manager, the QAO or designated personnel may conduct formal audits on project and subcontractor work during the course of the project.

Auditors who have performed the site audit after gathering and evaluating all data will write audit reports. Items, activities, and documents determined by lead auditors to be in noncompliance must be identified at exit interviews conducted with the involved management. Noncompliance will be logged and documented through audit findings. These findings will be attached to and become part of the integral audit report. These audit-finding forms are directed to management to resolve satisfactorily the noncompliance in a specified and timely manner.

The QAO has overall responsibility to see that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports will be submitted to the PM after completion of the audit. Serious deficiencies will be reported to the PM on an expedited basis. Audit checklists, audit reports, audit findings, and acceptable resolutions will be approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

B10.2.4 Laboratory Audits

Internal laboratory audits will be performed routinely to review and evaluate the adequacy and effectiveness of the laboratory's performance and QA program, to ascertain if the QAPP is being completely and uniformly implemented, to identify nonconformances, and to verify that identified deficiencies are corrected. The laboratory QAM is responsible for such audits and will perform them according to a schedule planned to coincide with appropriate activities on the project schedule and sampling plans. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QAPP
- When necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit

- When requested by the LPM or QAM.

B10.2.4.1 Laboratory Performance Audits

Performance audits are independent sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process. Performance audits are conducted by introducing control samples, in addition to those used routinely, into the data production process. These control samples include PE samples of known concentrations. The results of performance audits will be evaluated against acceptance criteria. The results will be summarized and maintained by the QAM and distributed to the supervisors who must investigate and respond to any results that are outside control limits.

B10.2.4.2 Laboratory Internal Audits

The QAM conducts routine internal audits of each laboratory section for completeness, accuracy, and adherence to SOPs. The laboratory audit team will verify that the laboratory's measurement systems are operated within specified acceptable control criteria and that a system is in place to confirm that out-of-control conditions are efficiently identified and corrected.

B10.2.4.3 Laboratory Data Audits

The laboratory will maintain raw instrument data for sample analyses on magnetic tape media or optical media in a secured fireproof safe. During routine audits, the audit team will verify the processing of the raw data file by reviewing randomly selected electronic data files and comparing the results with the hardcopy report. Tapes will be archived for a period of 5 yr. Tapes will be also available for audit by the QAO upon request.

B10.2.4.4 Laboratory Audit Procedures

Prior to an audit, the designated lead auditor will prepare an audit checklist. During an audit and upon its completion, the auditor will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will prepare and submit an audit report to the designated responsible individual of the audited group, the PM, and the QAO. Minor administrative findings that can be resolved to the satisfaction of the auditor during an audit need not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project will be included in the audit report.

The designated responsible individual of the audited group will prepare and submit to the QAO a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the audit report, the reply to the audit, and any supporting documents. It is the responsibility of the designated responsible individual of the audited group to conform to the established procedures, particularly as to development and implementation of such corrective action.

B10.2.4.5 Laboratory Documentation

To confirm that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures, a checklist will be completed during each audit. The checklist will detail the activities to be executed and ensure that the auditing plan is accurate. Audit checklists will be prepared in advance and will be available for review.

AUDIT CHECKLIST (AT MINIMUM)
Date and type of audit
Name and title of auditor
Description of group, task, or facility being audited
Names of lead technical personnel present at audit
Checklist of audit items according to scope of audit
Deficiencies or non-conformances

Following each system, performance, and data audit, the QAO or his designee will prepare a report to document the findings of the specific audit. The report will be submitted to the designated individual of the audited group to ensure that objectives of the QA program are met.

MINIMUM CONTENT OF AUDIT REPORT
Description and date of audit
Name of auditor
Copies of completed, signed, and dated audit form and/or checklist
Summary of findings including any nonconformance or deficiencies
Date of report and appropriate signatures
Description of corrective actions

The QAO will maintain a copy of the signed and dated report for each audit. If necessary, a second copy will be placed in project files.

B10.3 CORRECTIVE ACTIONS

Corrective action procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated,

documented, evaluated, and corrected. Corrective action enables significant conditions adverse to quality to be noted promptly at the site, laboratory, or subcontractor location. Additionally, it allows for the cause of the condition to be identified and corrective action to be taken to rectify the problem and to minimize the effect on the data set. Further, corrective action is intended to minimize the possibility of repetition.

Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, PM, FTL, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The designated responsible individual of the audited group will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Events that trigger corrective actions
When predetermined acceptance standards are not attained
When a deviation from SOP is required or observed
When procedure or data compiled are determined to be deficient
When equipment or instrumentation is found to be faulty
When samples and analytical test results are not clearly traceable
When QA requirements have been violated
When designated approvals have been circumvented
As a result of system and performance audits
As a result of a management assessment
As a result of laboratory/field comparison studies
As required by analytical method

All project personnel have the responsibility, as part of normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Specifically, the laboratory must designate the assigned individual to act as the primary laboratory contact responsible for timely identification and resolution of any and all issues including contract and administrative issues. Any phone calls initiated by Parsons' personnel, Honeywell personnel, or designated representatives to the laboratory with respect to corrective actions must be returned in a timely manner on a normal business day if the designate individual (or alternate) is not available at the initiation of the phone call.

Project management and related staff, including field investigation teams, remedial design planning personnel, and laboratory groups will monitor on-going work performance as part of daily responsibilities. Work may be audited at the Parsons office, the site, the laboratories, or subcontractor locations. Activities or documents ascertained to be noncompliant with QA

requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the QAO, PM, or designated personnel.

Personnel assigned to QA functions will have the responsibility to issue and control CAR forms (Figure B10.1). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered.

Similar to the CAR, the laboratory will record and report nonconformances internally using the laboratory's nonconformance documentation tracking system in the form of an NCM. Each NCM is traceable so that it can be cross-referenced with its resolution to the associated project records. The QAM summarizes critical nonconformances, such as reissued reports and client complaints, in a monthly report to the laboratory management staff. Management of the NCM is described in Section B6.3. Corrective action procedures applicable to QC requirements that do not meet the criteria specified in Attachment 3 of this QAPP are described in the following sections. Consistent, frequent contacts between laboratory personnel, the QAO, or designated personnel are required.

TYPICALLY CONTENT OF NCM FORMS
Problem description and root cause
Corrective action
Client notification summary
QA verification
Approval history action

B10.3.1 Laboratory Analytical Corrective Actions

Corrective actions to be taken by the analytical laboratory on the basis of analytical method QA/QC requirements, procedures, and criteria are summarized on Attachment 3 of this QAPP.

B10.3.1.1 Field Blanks

If analysis of a field blank (equipment blank) reveals the presence of one or more requested target analytes at or above the RL, the project QAO will be immediately notified. If the same analyte(s) (detected in the field blanks) is/are detected in the associated samples, re-preparation and/or reanalysis of the field blank only without the re-preparation/reanalysis of the associated field samples in which the target analyte(s) was/were detected will not be permitted.

FIGURE B10.1

CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST

Number _____ Date:_____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (a) to resolve the noted conditions and (b) to prevent it from recurring. Your written response is to be returned to the Project quality assurance manager by _____.

Condition:

Reference Documents:

_____ _____ _____ _____ _____ ___
Originator Date Approval Date Approval Date

Response

Cause of Condition:

Corrective Action

Resolution:

(B) Prevention

(B2) Affected Documents

Signature_____ Date_____

CA Follow-up

Corrective Action verified by:_____ Date _____

SECTION B11

REPORTS TO MANAGEMENT

B11.1 QA REPORTS

Parsons management personnel receive QA reports appropriate to their level of responsibility. The PM receives copies of all QA documentation. QC documentation is retained within the department that generated the product or service except where this documentation is a deliverable for a specific contract. QC documentation is also submitted to the project QAO for review and approval. Previous sections detailed the QA activities and the reports, which they generate. Among other QA audit reports that may be generated during the conduct of activities, a final audit report for this project will be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified.

Additionally, any incidents requiring corrective action will be fully documented.

SECTION B12

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ATTACHMENT 1

SUMMARY OF ANALYTICAL DATA PACKAGE (DQO LEVEL IV)

1.0 INTRODUCTION

In order for data to be used for decision-making purposes it is essential that it be of known and documented quality. Verification and validation of data requires that appropriate quality assurance and quality control (QA/QC) procedures be followed, and that adequate documentation be included for all data generated both in the laboratory and in the field.

The QA/QC documentation provided by any laboratory, in conjunction with sample results, allows for evaluation of the following indicators of data quality:

- Integrity and stability of samples;
- Instrument performance during sample analysis;
- Possibility of sample contamination;
- Identification and quantitation of analytes;
- Analytical precision; and
- Analytical accuracy.

General laboratory documentation requirements discussed in this document are formatted into two sections, organic and inorganic analyses. These specifications are intended to establish general, analytical documentation requirements that laboratories should meet when generating data for this project.

2.0 GENERAL DOCUMENTATION REQUIREMENTS

2.1 Data Package Format

Each data package for Level IV data submitted to Parsons will consist of five sections:

- Case narrative;
- Chain-of-custody documentation
- Summary of results for environmental samples;
- Summary of QA/QC results; and
- Raw data.

Level II data packages will not contain the raw data.

Data packages will be consistent with, and will supply the data and documentation required for NYSDEC ASP-defined deliverables (i.e. Category B and Category A). Summaries of data and results may be presented in a Contract Laboratory Program (CLP) type format or an equivalent format that supplies the required information as stated below. All laboratory data qualifiers shall be defined in the deliverable.

In cases where the laboratory has varied from established methodologies, they will be required to include the Standard Operating Procedures (SOPs) for those methods as an attachment to this QAPP. Inclusion of these SOPs in the QAPP will aid in final review of the data by data reviewers and users.

2.2 Case Narrative

The case narrative will be written on laboratory letterhead and the release of data will be authorized by the laboratory manager or their designee. The Case Narrative will consist of the following information:

- Client's sample identification and the corresponding laboratory identification;
- Parameters analyzed for each sample and the methodology used. EPA method numbers should be cited when applicable;
- Whether the holding times were met or exceeded;
- Detailed description of all analytical and/or sample receipt problems encountered;
- Discussion of reasons for any QA/QC sample result exceedances; and
- Observations regarding any occurrences which may adversely impact sample integrity or data quality.

2.3 Chain-of-Custody

Legible copies of all Chain-of-Custody forms for each sample shall be submitted in the data package. Copies of any internal laboratory tracking documents should also be included. It is anticipated that Chain-of-Custody forms and/or internal laboratory tracking documents will include the following information:

- Date and time of sampling and shipping;
- Sampler and shipper names and signatures;
- Type of sample (grab or composite);
- Analyses requested;
- Project, site, and sampling station names;
- Date and time of sample receipt;
- Laboratory sample receiver name and signature;
- Observed sample condition at time of receipt;
- Sample and/or cooler temperatures at time of receipt;
- Air bill numbers;

- Custody seal; and
- Sample numbers.

3.0 ORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

These requirements are applicable to Methods SW8260B, SW8270C, SW8082.

3.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample.

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample extraction and/or analysis;
- Weights or volumes of sample used for extraction and/or analysis;
- Identification of instruments used for analysis;
- Gas Chromatography (GC) column and detector specifications;
- Dilution or concentration factor for the sample;
- Percent Difference between columns, if applicable;
- Percent Moisture or Percent Solids for soil samples;
- Method Detection Limits (MDLs) or sample Quantitation Limits (RLs);
- Analytical results and associated units;
- Discussion of any manual integrations; and
- Definitions for any laboratory data qualifiers used.

3.2 Summary of QA/QC Sample Results (as applicable)

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms should, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and

- Sample Matrix.

3.2.1 Instrument Calibration (for each instrument used)

- **GC/MS Tuning**, Methods SW8260B and SW8270C). Report mass listings, ion abundance criteria, and percent relative abundances. List the instrument identification (ID) and the date and time of analysis. Ensure that all ion abundances have been appropriately normalized.
- **Initial Calibration**. Report analyte concentrations of initial calibration standards and the date and time of analysis. List the instrument identification (ID), response factors (RF), relative response factors (RRF), or calibration factors (CF), percent relative standard deviation (%RSD), and retention time (RT) for each analyte. The initial calibration (IC) report must also include a sample identifier (ID), associated injection volume or quantity of sample analyzed, the acceptance criteria, such as minimum RF values, and associated maximum %RSD values.
- **Continuing Calibration**. Report the concentration of the calibration standard used for the continuing calibration and for the mid-level standard, and the date and time of analysis. List the ID, RF, RRF, CF, percent difference (%D), and RT for each analyte.
- **Quantitation Limit** or Project Required Reporting Limit (PRRL) Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each analyte analyzed. The date and time of analysis must also be reported.

3.2.2 Method Blank Analysis

List environmental samples and QC analyses associated with each method blank. Report concentrations of any analytes found in method blanks above the instrument detection limit.

3.2.3 Surrogate Standard Recovery

Report the name and concentration of each surrogate compound added. List percent recoveries of all surrogates in the samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Also include acceptance ranges that the laboratory used for the analysis.

3.2.4 Internal Standard Summary

Applicable to methods SW8260B and SW8270C. Report internal standard area counts of the associated calibration standard and retention times, include upper and lower acceptance limits. List internal standard area counts and retention times for all samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Include the ID and the date and time of analysis.

3.2.5 Compound Confirmation

Applicable to method SW8082. Report retention times of each compound on both columns as well as retention time windows of the associated standard. In addition, report determined concentrations from each column and percent differences between results. List the ID and the date and time of analysis. A summary should be generated for each sample, including dilutions and reanalyses, blanks, MSs, and MSDs.

3.2.6 Peak Resolution Summary

Applicable to method SW8082. For primary and secondary columns report retention times of any target compounds and/or surrogates that coelute in the standards (ie. the Performance Evaluation Mixture for Contract Laboratory Program pesticides). Calculate and report the percent resolution between each pair of compounds which coelute. Include the ID, column ID, and the date and time of analysis.

3.2.7 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analysis

Report the name and concentration of each spiking compound. Samples are to be spiked with specified compounds of potential concern. List sample results, spiked sample results, duplicate spiked sample results, percent recovery (%R) and the relative percent difference (RPD) between the MS and MSD (if applicable). Acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.8 Laboratory Duplicate Analysis

When performed, report the RPD between duplicate analyses, along with the associated acceptance criteria.

3.2.9 Laboratory QC Check Sample Analysis

Also known as the Laboratory Control Sample (LCS). Report the name and concentration of each spiking compound. List the QC check sample and duplicate (if applicable) results, %R, and RPD, if performed in duplicate. The acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.10 Other QC Criteria

- **Retention time windows determination**. Report the retention time window for each analyte, for both primary and confirmation analyses.
- **Compound identification**. Report retention times and concentrations of each analyte detected in samples.
- **MDL determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Additional method suggested QC parameters, if required**.

- **Any Performance Evaluation (PE) samples** (if identified) associated with the environmental samples.

3.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Raw data for compound identification and quantitation must be sufficient to verify each result.

3.3.1 Gas Chromatographic (GC) Analyses

Applicable to method SW8082. This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for both primary and confirmation analyses are to be included. Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Area print-outs or quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Percent Moisture or Percent Solids for soil samples; and
- GC/MS confirmation, as applicable.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

3.3.2 Gas Chromatographic / Mass Spectrometric (GC/MS) Analyses

Applicable to methods SW8260B and SW8270C. This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Mass spectrometer tuning and mass calibration (BFB, DFTPP);
- Initial and continuing instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Ion scans and enhanced spectra of target analytes and tentatively identified compounds (TICs), with the associated best-match spectra;
- Area print-outs and quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Moisture Content (Percent Moisture) for sediment samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.0 INORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

4.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample:

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample digestion and/or analysis;
- Weights or volumes of sample used for digestion and/or analysis;

- Identification of instruments and analytical techniques used for analysis;
- Instrument specifications;
- Dilution or concentration factor for the sample;
- Percent Moisture or Percent Solids for soil samples;
- Detection Limits: MDLs, RLs;
- Analytical results and associated units; and
- Definitions for any laboratory data qualifiers used.

4.2 Summary of QA/QC Results

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms shall, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

4.2.1 Instrument Calibration Verification (if applicable)

The order for reporting of calibration verifications for each analyte must follow the chronological order in which the standards were analyzed.

- **Initial Calibration Verification.** Report the source for the calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Continuing Calibration Verification**. Report the source for calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Quantitation Limit** or PRRL Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.

4.2.2 Blank Analysis

Report analyte concentrations above the instrument detection limits found in the initial calibration blanks (ICBs), continuing calibration blanks (CCBs), and in method/ preparation blanks. The date and time of analysis must also be reported. The order for reporting ICB and CCB results for each analyte must follow the chronological order in which the blanks were analyzed.

4.2.3 Matrix Spike (MS) Analysis

Report concentrations of the unspiked sample result, the spiked sample result and the concentration of the spiking solution added to the pre-digestion spike for each analyte. Calculate and report the %R and list control limits. If performed in duplicate, provide the %R for the MSD and the RPD.

4.2.4 Post Digestion Spike Analysis (if applicable)

In addition to matrix spikes, post-digestion spikes are often required by the method. Report concentrations of the unspiked sample results, spiked sample results, and the concentration of the spiking solution added. Calculate and report the %R and list control limits.

4.2.5 Laboratory Duplicate Analysis

Report concentrations of original and duplicate sample results. Calculate and report the RPD and list control limits.

4.2.6 Laboratory Control Sample

Identify the source for the LCS. Report the found concentration of the laboratory control sample and the true concentration for all analytes. Calculate and report the %R and list control limits.

4.2.7 Other QC Criteria (if applicable)

- **Method of Standard Additions (MSA)**. This summary must be included if MSA analyses are performed. Report absorbance values with corresponding concentration values. Report the final analyte concentration and list the associated correlation coefficient and control limits.
- **ICP-AES Serial Dilution**. Report initial and serial dilution results, associated %D, and control limits.
- **ICP-AES Linear Dynamic Ranges.** For each instrument and wavelength used, report the date on which linear ranges were established, the integration time, and the upper limit concentration.

- **MDL Determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Any Performance Evaluation (PE) Samples** (if identified) associated with the environmental samples.

4.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Data should be organized sequentially by method and analysis date. Raw data for compound identification and quantitation must be sufficient to verify each result.

4.3.1 Atomic Absorption (AA) and Atomic Emission (AE) Spectrometric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).
- Measurement print-outs for all instruments used or copies of logbook pages for analyses that do not provide instrument print-outs;
- Absorbance units, emission intensities, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, etc.;
- Instrument analysis logs for each instrument used or summary of sample analyses;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Wavelengths used for the analyses; and
- Percent Moisture or Percent Solids for soil samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.2 Titrimetric and Colorimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Titrant volumes, titration end-points, absorbance units, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, sample volumes, solution normalities, etc.;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Wavelengths used for the analyses.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.3 Gravimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Weights, sample volumes, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, drying times, drying temperatures, etc.; and
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards maintained in "job file" in laboratory, unless otherwise requested.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

SUMMARY OF REQUIRED LABORATORY DELIVERABLES FOR LEVEL IV DQO DATA PACKAGE (REQUIREMENTS WILL VARY BY METHOD)

Method Requirements	Laboratory Deliverables
Requirements for all methods:	
Parsons project identification number	Case narrative
Discussion of unusual circumstances or problems	Case narrative
Analytical method description and reference citation	Case narrative
Field sample identification	Signed chain-of-custody forms and sample results form
Laboratory assigned sample number	Signed chain-of-custody forms and sample results form
Sample matrix description	Signed chain-of-custody forms and sample results form
Date of sample collection	Signed chain-of-custody forms and sample results form
Date of sample receipt at laboratory	Signed chain-of-custody forms
Analytical method description and reference citation	Signed chain-of-custody forms and case narrative
Sample analysis results	USEPA CLP form or equivalent sample analysis results summary form (e.g., ASP Form I-VOA)
Dates of sample preparation and analysis (including first run and any subsequent runs)	Specific deliverable depends on type of analysis
Laboratory analytical QC batch info and sample analysis associations	Specific deliverable depends on type of analysis
Instrument analysis sequence log	Specific deliverable depends on type of analysis
Analytical holding times compliance	USEPA CLP form or equivalent holding time summary form
Method detection limit (MDL) determination	USEPA CLP form or equivalent MDL summary form
Method reporting limits (RLs) achieved	Specific deliverable depends on type of analysis (see below)
Dilution or concentration factors	Specific deliverable depends on type of analysis
Discussion of unusual circumstances or problems	Case narrative
Laboratory Control Sample (LCS) results	USEPA CLP form or equivalent LCS results summary form
"Raw" analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
Matrix spike / matrix spike duplicate	USEPA CLP form or equivalent MS/MSD summary form (e.g., NYSDEC ASP Form III-SV
Method blank analysis	USEPA CLP form or equivalent method blank summary form (e.g., NYSDEC ASP Form IV-SV)
GC/MS instrument performance check. Tuning and mass calibration (abundance) using 4-bromofluorobenzene (BFB) for method SW8260B and decafluoro-triphenyphosphine (DFTPP) for method SW8270C	USEPA CLP form or equivalent instrument tuning/performance check summary form
Internal Standard Area Counts and Retention Time, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form VIII-SV)
GC/MS initial calibration data	USEPA CLP form or equivalent initial calibration summary form (e.g., NYSDEC ASP Form VI-SV)
GC/MS continuing calibration data.	USEPA CLP form or equivalent continuing calibration summary form (e.g., NYSDEC ASP Form VII-SV)
GC/MS calibration verification (initial and continuing)/2nd source calibration verification (ICV/CCV)	USEPA CLP form or equivalent calibration verification summary form
GC continuing calibration data for volatile and semivolatile analyses. If calibration factors are used, calibration factors and their percent differences from the initial calibration must be reported. Retention time windows and analyte retention times must be included in this form	USEPA CLP form or equivalent calibration verification summary form
GC/MS internal standard area and retention time summary data	USEPA CLP form or equivalent internal standard summary form
GC second column confirmation, as applicable. To be done for all compounds that are detected above method detection limits	Chromatograms of all confirmations of all samples and the standard laboratory form for all positive results
Surrogate Compound percent recovery summary	USEPA form or equipment percent recovery summary form (e.g., NYSDEC ASP Form II-SV)
"Raw" analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index
Requirements for inorganic analytical methods:	
Initial and Continuing Calibration Verification	USEPA CLP form or equivalent calibration verification summary form(s) (e.g., NYSDEC ASP Form II-IN)

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
ICP Interference Check Sample (ICS), as applicable	USEPA CLP form or equivalent ICS standard summary form (e.g., NYSDEC ASP Form IV-IN)
ICP Interelement Correction Factors, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form XII-IN
IDL or MDL determination	USEPA CLP form or equivalent IDL or MDL summary form(s)
Post-digestion spike, as applicable	USEPA CLP form or equivalent post-digestion spike summary form(s) (e.g., NYSDEC ASP Form V-IN)
ICP linear range	USEPA CLP form or equivalent linear range summary form(s) (e.g., NYSDEC ASP Form XII-IN)
ICP serial dilution, as applicable	USEPA CLP form or equivalent serial dilution summary form(s) (e.g., NYSDEC ASP Form IX-IN)
Method of standard addition (MSA), as applicable	USEPA CLP form or equivalent MSA summary form(s)
Laboratory duplicate results, as applicable	USEPA CLP form or equivalent duplicate analysis summary form(s) (e.g., NYSDEC ASP Form VI-IN)
Requirements for other methods:	
Preparation and analysis logs	No format
Sample results	No format
MS/MSD results	No format
Lab duplicate sample results	No format
Laboratory control sample	Control limits
Method blank results	No format
Initial calibration results	No format
Continuing calibration check (calibration verification)	No format. Report percent relative standard deviation or percent difference from initial calibration

ATTACHMENT 2

SOP FOR DATA MANAGEMENT

SOP FOR DATA MANAGEMENT

1.0 INTRODUCTION

This Data Management Plan (DMP) has been prepared to support the investigation and sampling program for the Syracuse Portfolio, which consists of various sites located in and around Onondaga Lake. This document is intended to serve as a standard for all data management activities taking place for the environmental programs of the Syracuse Portfolio.

The environmental programs of the Syracuse Portfolio will generate analytical and field data, which will require both storage and project team accessibility. Electronic data management systems will be implemented to effectively process the information without loss or alteration. The approach outlined in this DMP is designed to provide an organized method of data management for the large amounts of data that will be generated during the environmental programs.

The objectives of this DMP are to define:

- The electronic data management system that will be used;
- The data management team organization;
- The flow path of the data and the data types; and
- The data management procedures that will be implemented.

2.0 DATA MANAGEMENT SYSTEMS

2.1 EIM

Honeywell has selected Locus Technologies' LocusFocus EIM™ (EIM) as its preferred environmental data management system. EIM was developed by Locus Technologies, who have an extensive background in environmental remediation projects and the associated data collection and processing requirements. Locus Technologies will provide technical support associated with the use of EIM for the Syracuse Portfolio.

EIM is designed to manage the following data types:

- Chain-of-custody data
- Laboratory Analytical Data for various media such as soil, water, soil vapor, sediment, and sludge;
- Field Measurement data such as pH, dissolved oxygen, turbidity, water levels, etc.;

- Geotechnical data such as Surface or subsurface soil, or geologic characterizations/lithology; and
- Survey Data: Geographic or location data.

Additional data types may be added to EIM as appropriate. Historical data related to the Syracuse sites, including all chemical analytical data from previous investigations, has been integrated into the EIM database. Procedures for data management using EIM are available in EIM under Reference/Client-Specific procedures or on-line at: https://www.myresinfo.com/DataMgmt/datamgmtrfp.asp

The remaining sections of this DMP will indicate the applicable procedures

2.1.1 EIM Database Setup

Database settings control how information is stored in EIM and determine the structure of the database. Configuration of the settings for the Syracuse Portfolio database will be limited to the Database Manager or delegate. Changes to the Syracuse database settings will be reviewed by members of the project management team before implementation.

In order to use EIM efficiently, the project must be properly set up before field activities begin. Database settings that will be established in Locus include:

- Valid Values List;
- Location Groups;
- Parameter and Field Parameter Groups;
- Project Analytical Groups; and
- Site Groups.

Once these setup tasks have been accomplished, the database will be ready for data input by the Parsons DBM.

2.1.2 Database User Access

The next step in preparing the EIM database for use is to assign access rights to the end users. Access to EIM is restricted and a username and password will be required. To request access to the Syracuse Portfolio, users will contact the Database Manager. In general, "Guest" (read-only) privileges will be granted to team members. Members of the data management team will be granted privileges to add and edit data in EIM.

2.1.3 Data Input

Data will be added to EIM through the input module of the system by the Database Manager. Access to the input module will be restricted to the Syracuse Portfolio Database Managers or delegates. Details on use of the input module are provided in Honeywell data management general procedures.

Data input to EIM will include:

- Sample planning information;
- Chain-of-custody data
- Soil boring logs;
- Geotechnical data;
- Location and geographic data;
- Field measurements;
- Meteorological data;
- Waste characterization data;
- Groundwater levels;
- Radiodating data; and
- Laboratory analytical data.

A complete list of data types and the database system used to manage these data types is provided in Appendix C of the DMP.

Required QC for Laboratory Analytical Data

All EDDs are required to contain the applicable QC that are necessary for EIM™ to validate the electronic dataset. Table 1 contains the list of QC valid values that EIM™ uses to validate uploaded analytical data files. Table 2 contains the list of required fields that are to be included in Honeywell EDDs. Table 2 outlines the different field names and requirements for Level 1, 2, and 3 EDDs. Level 1 EDDs must contain all fields with a "1" in the level column. Level 2 EDDs must contain all fields identified with a "1" and "2" in the level column. Level 3 EDDs must contain all fields in Table 2 (and valid values identified in Table 3).

With respect to QC data, please note the following requirements:

- Honeywell requires analytical laboratories to report every QC parameter both electronically and in hardcopy.

- The hardcopy QC and hardcopy analytical result must be identical with the EDD in every respect for Level 1 - 3 deliverables. We are defining a Level 4 deliverable as that level requiring calibration data, MDL studies, raw data such as lab notebooks evidencing standard validity and GC/GCMS chromatograms. EIM™ does not incorporate level 4 items but may in the future.
- Any fields left blank in the EDD, are assumed not to be required of the laboratory and shall not be included in the hardcopy.
- Data are to be batched for analytical preparation in groups of, at most, 20 field samples. Honeywell is requiring the laboratory to have, at a minimum, all of the project-required QC for each batch – even if the batch consists of one sample. The only permitted exception is the MS and MSD. However, if sufficient sample is available, this must also be included. If sufficient sample is available, the Honeywell Laboratory Services Contract requires analyses of the MS/MSD at no additional charge to Honeywell.

EDD Format Requirements

To facilitate data loading, the following electronic file formats must be observed:

- The file format must be ASCII with no header or footer, and with each record alike with respect to format.
- Every analytical result is to be a single record.
- No field will be enclosed in quotation marks.
- Every field must be separated by a semi-colon or a tab delimiter (a comma must not be used – owing to its frequent appearance in chemical names). The tab delimiter is particularly useful because an Excel file (an application used to construct numerous wet chemistry data files in laboratories) can be saved as a tab delimited text file and imported directly into EIM™.
- Each record must be terminated with a carriage return.

Example Acceptable ASCII Files

The example below shows an excerpt from an acceptable ASCII file in semicolon-delimited form. Note that this example has 42 fields – each separated by the semicolon - that directly corresponds to those fields identified in Table 2. Also note that there is no semicolon after the 42nd field as the record is ended with a carriage return. This represents one record or one sample from the ASCII file (EIM_Example_EDD.txt) supplied along with this memo.

Example 42 field ASCII file

1298901;CTBERK;EPA 8260B;11-NOV-2002;67-64-1;TRG;10;µg/l;10;WATER;161723-001;22:37;U;;1;EPA 5030B;11-NOV-2002;76742;161723;QC195469;;Acetone;INIT;N;N;;;;;;;;;REG;;;;;;; <carriage return>

In instances where a CAS number does not exist, Honeywell has defined the nomenclature that must be used. The remaining parameters have CAS numbers.

A Suggestion on putting the Data in ASCII Format for EIM

- The laboratory can prepare an Excel spreadsheet with 42 columns and put one record per row. Headers can be used here. These data can be imported into Access and converted using the Access "Import" function to import the data. Using the "Export" function and the "Advanced" icon, any quotes can be removed, semicolon delimiters can be inserted, the titles can be removed and the first row can be made blank. This can be exported to an ASCII file suitable for upload to EIM™.
- Another alternative is to save an Excel file as a tab-delimited, text file. This will upload to EIM™, directly. However, the 42 fields must be in the exact order shown in the example above and the attached electronic files.

Assignment of Sample Names: A sample nomenclature system has been developed to ensure consistency in field sample ID assignment and compatibility with LocusFocus. Unique sample names will be assigned to each sample according to the sample identification protocol described in this QAPP. Each unique sample name will include the following:

- **Location ID:** Site ID – Location Type – Location #. For example, location ID OL-SB-10001 indicates that the sample came from Onondaga Lake, SB is the location type identification for sediment boring, and the remainder of the Location ID is the SMU number (1 through 8) and the sample within the SMU (0001, 0002, 0003, *etc.*). For locations where more than one analysis is required, STA should be used for the location type indicating a sample station.
- **Field Sample ID:** Site ID – chain-of-custody form # - Sample #. For example, field sample ID OL-12345-01 indicates that the sample came from Onondaga Lake, chain-of-custody number 12345, line 1 on the chain-of-custody form. Depth interval will be shown on chain-of-custody form.

2.1.4 Data Output

In general, the Database Manager will provide a single point of contact for team members to obtain data outputs on an as needed basis. Requests for data from EIM will be made using the data request form provided in Appendix D.

Secondly, Individuals may also access EIM directly. Any team member with access to EIM may retrieve data in EIM through the output module. A detailed user guide to the output module is provided in Honeywell data management Reporting Retrieval Output Options. The EIM database, unlike other data management systems, represents a dynamic data set. Therefore, users that output data sets from EIM for the purposes of an engineering or design calculation must provide a copy of the calculation to the Database Manager along with the parameters used to query the database and the date of the query for access by the project team.

Each EDD will be loaded to the temporary holding table in EIM where the validator can login, view the data and conduct their validation. EIM displays the Edit/View Validated Records form. You can use this form to view, or more importantly, edit any of the following fields: Lab Result, Validation Qualifier, Useable (Yes or No), Detect Flag, Reason Codes, and Validation Status.

Once the validation is complete and the results have been entered, the dataset is saved and inserted into the final permanent tables of the database

TABLE 1

SUMMARY OF QC CATEGORIES

EIM Valid Value	Definition
IS	Internal Standard.
SPK	Spiked compounds.
SURR	Surrogate.
TIC	Tentatively Identified Compound.
TRG	Target Analyte.
BS	Blank Spike.
BSD	Blank Spike Duplicate.
LCS	Laboratory Control Spike.
LCSD	Laboratory Control Spike Duplicate.
MB	Method Blank.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
LR	Lab Replicate..
PS	Post-Digestion Spike.

Please note that not all QC categories are applicable to all analytes. For example the IS and surrogates are not applicable to Cr(VI) nor to metals by 6010. If they are not supplied by the laboratory, the EDD must be left blank for that field as Honeywell will assume that it is not required by the laboratory.

TABLE 2

HONEYWELL EDD REQUIRED FIELDS (BOLD) AND OTHER FIELDS

Field	Field Name	When (A = Ahead); S = with data)	Who (L = lab; C = consul-tant)	Level	Length	Field Contents
1	FIELD_SAMPLE_ID	A	C	1	C20	Field Sample number or identifier. Can be left blank for lab-originated samples.
2	LAB_ID	A	C	1	C10	Code or identifier for a lab. Lab tells consultant the ID it will be using.
3	ANALYTICAL_METHOD	A	C	1	C30	Analytical method used. Lab tells consultant the method name it will be using to report the data.
4	ANALYSIS_DATE	S	L	1	Date	Date of analysis, MM/DD/YYYY
5	PARAMETER_CODE	A	C	1	C12	Analyte CAS Number. Lab tells consultant that it will be using CAS numbers or the code for analyses having no CAS numbers (i.e., alkalinity, pH).
6	RESULT_TYPE_CODE	A	C	1	C5	Code identifying the result. See Table 3. Lab tells consultant which fields it will be providing.
7	LAB_RESULT	S	L	1	C10	Analytical Result. If nondetect, enter the lab detection limit here.
8	LAB_UNITS	A	L	1	C10	Unit of measure of the result. Lab tells consultant the units it will be using to report the data.
9	LAB_REPORTING_LIMIT	S	L	1	C10	Actual Reporting Limit realized by the lab.
10	LAB_MATRIX	S	C	1	C10	Matrix of Sample. See Table 3. Lab and consultant communicate and reach agreement or consultant dictates to lab.

Field	Field Name	When (A = Ahead); S = with data)	Who (L = lab; C = consul-tant)	Level	Length	Field Contents
11	LAB_SAMPLE_ID	S	L	1	C20	Internal ID assigned by lab to track a sample within the lab.
12	ANALYSIS_TIME	S	L	1	C5	Time of analysis.
13	LAB_QUALIFIER	S	L	2	C10	Laboratory Qualifier. Multiple qualifiers should be separated by a space.
14	RETENTION_TIME	S	L	3	C10	Retention time for TICS only. For others enter NA or leave blank, HH:MM:SS
15	DILUTION_FACTOR*	S	L	1	C7	Dilution factor if the sample was diluted.
16	PREP_METHOD	S	L	3	C20	Preparation method (if applicable)
17	PREP_DATE*	S	L	1	Date	Date of preparation MM/DD/YYYY (if applicable)
18	ANALYSIS_LOT_ID	S	L	1	C20	Laboratory analysis batch number or ID.
19	SAMPLE_DELIVERY_GROUP	S	L	1	C20	Laboratory sample delivery group
20	LAB_BLANK_SAMPLE_ID	S	L	2	C20	ID of laboratory blank associated with the sample identified in the FIELD_SAMPLE_ID and/or LAB_SAMPLE_ID fields.
21	ERROR	S	L	2	C10	+/- 2-sigma error (pertains to radiological results only)
22	PARAMETER_NAME	S	L	1	C60	Name of parameter.
23	ANALYSIS_TYPE_CODE	A	C	1	C5	Type of analysis. See Table 3. Lab and consultant reach agreement.
24	FILTERED_FLAG	S	L	1	C1	Flag to identify whether sample was filtered or not. Values: see table below. The only valid values are

Field	Field Name	When (A = Ahead); S = with data)	Who (L = lab; C = consul-tant)	Level	Length	Field Contents
						Y, N.
25	LEACHED_FLAG	S	L	1	C1	Flag to identify whether sample was leached prior to being analyzed. See Table 3. The only valid values are Y, N.
26	LEACHATE_METHOD	S	L	1	C20	Method used to leach a sample (if applicable)
27	LEACHATE_DATE	S	L	3	Date	Sample leachate date MM/DD/YYYY (if applicable)
28	LEACHATE_TIME	S	L	3	C5	Sample leachate time (if applicable)
29	SAMPLE_PREP_LOT_ID*	S	L	1	C20	Laboratory prep lot number or ID (if applicable)
30	LEACHATE_LOT_ID	S	L	2	C20	Laboratory leachate lot number or ID (if applicable)
31	PREP_TIME	S	L	3	C5	Time of preparation HH:MM (if applicable).
32	METHOD_DETECTION_LIMIT	S	L	3	C10	Method detection limit.
33	SAMPLE_DATE*	S	L	1	Date	Date Sample was created in the lab: MM/DD/YYYY
34	*SAMPLE_PURPOSE**	A	C	1	C5	The purpose of the sample. Should be left blank for field-originated samples (i.e. regular, trip blank, field blank, field duplicate, and rinsate blanks). Should be populated for matrix spikes and duplicates, method blanks, blank spikes and duplicates, lab duplicates, and any other lab originated or transformed samples. See Table 3. Consultant dictates to the lab for aforementioned QC samples, that is valid values must be in EIM.

Field	Field Name	When (A = Ahead); S = with data)	Who (L = lab; C = consul-tant)	Level	Length	Field Contents
35	*ORIGINAL_LAB_RESULT*	S	L	2	C10	The concentration of the analyte in the original (unspiked) sample. If this proves too difficult for the lab to report, we can populate it ourselves afterward.
36	*SPIKE_ADDED*	S	L	2	C10	Amount of spike added to sample
37	*SPIKED_RESULT*	S	L	2	C10	Concentration of the analyte in the spiked sample
38	SPIKE_RECOVERY*	S	L	2	C10	Percent recovery
39	*RPD**	S	L	2	C10	Calculation of relative percent difference (for duplicates only)
40	RPD_LIMIT*	S	L	2	C10	Upper limit for RPD (for duplicates only)
41	*UPPER_LIMIT**	S	L	2	C10	Upper control limit for spike recovery (for spikes and spike duplicates, surrogates, laboratory control samples, and any spiked samples only)
42	*LOWER_LIMIT**	S	L	2	C10	Lower control limit for spike recovery (for spikes and spike duplicates, surrogates, laboratory control samples, and any spiked samples only)

a. Fields in Bold Regular font are required (e.g., LAB_ID). Two of these fields, DILUTION_FACTOR and SAMPLE_PREP_LOT_ID have an asterisk following them. This signifies that the field can be left blank if it is not applicable. In the case of Sample Prep Lot ID in particular, a value needs to be provided for this field only if it is different than the ANALYSIS_LOT_ID.

b. Fields in Regular font are optional (e.g., LAB_QUALIFIER).

c. Fields In *Bold Italics font* are required for laboratory QC samples (e.g., SAMPLE_PURPOSE). Several of these fields have an asterisk following them. This indicates the field is required only if it is applicable. For example, RPD and *RPD_LIMIT can be left blank for all but laboratory control, blank spike, and matrix spike duplicates.*

d. Fields in Italics are optional for laboratory QC samples (e.g., SPIKE_ADDED)

TABLE 3

LIST OF VALID VALUES REFFERED TO IN TABLE 2

Field (# out of 42 in parentheses)	Valid Values	Values Description
ANALYSIS_TYPE_CODE (23)	INIT	Initial analysis.
	REANL	Reanalysis.
	REEXT	Reextraction.
	DIL	Dilution
FILTERED_FLAG (24)	Y	Yes, the sample was filtered.
	N	No, the sample was not filtered.
LAB_MATRIX (10)	AIR	Air sample.
	WASTE	Waste sample: covers remaining non-aqueous samples.
	SOIL	Soil sample.
	WATER	Water sample.
	DNAPL	Dense non-aqueous phase liquid.
	LNAPL	Light non-aqueous phase liquid.
	BIOTA	Biological samples.
LAB_QUALIFIER (13)	B	Analyte was detected in the associated method blank.
	N	There is presumptive evidence that the compound is present, but it has not been confirmed. The analyte is tentatively identified. All quality control criteria necessary for identification were not met.
	E	Concentration exceeds the calibration range and therefore result is semi-quantitative.
	H	Sample analysis performed past method-specified holding time.
LAB_QUALIFIER (13)	J	Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is of unknown quality.

Field (# out of 42 in parentheses)	Valid Values	Values Description
	MS-NR	There was no MS/MSD analyzed with this batch due to insufficient sample volume (NR = not reported). See Blank Spike/Blank Spike Duplicate.
	DIL-MX	The sample required a dilution due to matrix interference. Because of this dilution, the matrix spike concentrations in the sample were reduced to a level where the recovery calculation does not provide useful information. See Blank Spike (LCS).
	MS-FR	Matrix Spike recovery was outside the method control limits (FR = recovery failure).
	S	Analyzed by standard addition.
	U	Analyte is undetected
	SURR-FR	Surrogate recovery outside method criteria or lab statistical criteria (FR = recovery failure).
LEACHED_FLAG (25)	Y	Yes, the sample was leached prior to being analyzed.
	N	No, the sample was not leached prior to being analyzed.
RESULT_TYPE_CODE (6)	IS	Internal Standard.
	SPK	Spiked compounds.
	SURR	Surrogate.
	TIC	Tentatively Identified Compound.
	TRG	Target Analyte.
SAMPLE_PURPOSE (34)	BS	Blank Spike.
	BSD	Blank Spike Duplicate.
	LCS	Laboratory Control Spike.
	LCSD	Laboratory Control Spike Duplicate.
	MB	Method Blank.
	MS	Matrix Spike.
	MSD	Matrix Spike Duplicate.
	LR	Lab Replicate.
	QCS	Quality Control Sample.

Field (# out of 42 in parentheses)	Valid Values	Values Description
	AS	Analytical Spike

1. The actual valid values used must match those listed. This must be communicated between the site or project and the lab.

2. For any spiked compound where the percent recovery is the data point that we are most interested in (this includes surrogates), the lab should attempt to report, as available, the values for the SPIKE_RECOVERY, UPPER_LIMIT, and LOWER_LIMIT fields. Values for SPIKE_ADDED and SPIKED_RESULT are desired but can be left blank. LAB_RESULT can be left blank as well for these samples.

3. For Matrix Spike/Matrix Spike Duplicates or Lab Replicates, the lab should include, as applicable, the ID of the original field sample in the FIELD_SAMPLE_ID column.

4. A given Lab Sample ID must have a unique purpose. As such, reporting the same ID for the original sample, and the Matrix Spike, Matrix Spike Duplicate, and/or Lab Replicate of this sample is not acceptable. If necessary, append the sample purpose code to these IDs (original sample excluded) to make them unique.

5. The sample date of a lab-originated sample is the date it came into existence in the lab. Many labs use the prep date for this field. A given lab sample should not have multiple sample dates.

6. Labs should provide consultants with the Lab ID they intend to use, and with the specific methods names/numbers that they will be reporting so that this information can be entered into the database ahead of time.

ATTACHMENT 3

ANALYTICAL QC CRITERIA AND CORRECTIVE ACTIONS

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW8260B	**Volatile Organics**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1) Contact QAO. 2) Document situation in case narrative.
		Check of mass spectral ion intensities using BFB.	Once per 12-hour shift.	Ion abundance criteria as described in Method SW8260B.	1) Reanalyze BFB. 2) Adjust MS tune until analysis of BFB passes specification.
		Multi-point initial calibration (minimum six points) with blank and at least five standards covering the linear range of the instrument.	Biannually or when calibration verification fails.	1) SPCC average RF $\geq$0.10 for chloromethane, 1,1-dichloroethane, and bromoform; and $\geq$0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane. 2) RSD $\leq$30 for CCC RFs. 3) The RSDs for all other analytes must be $\leq$15, with no single analyte RSD >30. 4) Low level standard $\leq$RL.	Repeat concentrations not meeting acceptance criteria.
		CCV.	Every 12 hours, prior to sample analysis. Must be a second source or independently prepared standard.	1) Same criteria for SPCCs as for initial calibration. 2) CCC percent difference $\leq$20% from average RFs calculated following initial calibration; non-CCC percent difference $\leq$30%.	1. Repeat CCV. 2. If still out, identify and correct problem and repeat CCV. 3. If still out, repeat initial calibration. 4. All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5. Document actions taken.

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ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW8260B (Continued)	**Volatile Organics (Continued)**	Method blank.	1 per analytical batch or one per 20 samples, whichever is more frequent.	All analytes <RL.	1) Reanalyze method blank. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If noncompliant and sample analyte concentration is <RL or >10 times blank concentration, report results. 5) If noncompliant and sample analyte concentration is between RL and 10 times blank concentration, repurge and reanalyze all samples processed with contaminated blank at no cost.
		LCS (prepared with second source standard).	1 LCS per preparation blank or per 20 samples, whichever is more frequent.	Recovery within project limits. (1)	1) Reanalyze LCS. 2) Identify and correct source of problem. 3) If still out, reanalyze affected samples.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		Surrogate spike.	Every sample, spike, standard, and method blank.	Recovery within project limits. (1)	1) Recalculate result; if still out: 2) Check instrument performance; if necessary, 3) Reanalyze unless obvious matrix interference or high sample concentration.
SW8260B (Continued)	**Volatile Organics (Continued)**	MS/MSD.	One set per 20 project-specific samples	%R values within project limits. (1) RPD values within project limits. (1)	1) Check calculations. 2) Include explanation in anomaly report.
		IS and RT and responses check from calibration check standard.	Every sample, spike, standard, and method blank.	1) RT: Must be <30 second change from daily CCV. 2) IS: Extracted ion area counts must be within a factor of 2 from the daily CCV.	1) Inspect mass spectroscopy or GC for malfunctions. 2) Reanalyze samples analyzed while system was malfunctioning.
		MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.
SW8270C	**SVOCs**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1) Contact QAO. 2) Document situation in case narrative.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		Check of mass spectral ion intensities using DFTPP (4,4'-DDT, pentachlorophenol, and benzidine will be included in tuning standard to verify injection port inertness and GC column performance).	Initially, prior to calibration, again prior to sample analyses, and once per every 10-hour shift.	Ion abundance criteria as described in Method SW8270C. Column performance and injection port inertness: -Degradation of DDT≤20%. -Benzidine and pentachlorophenol must each exceed tailing factor ≤ 3 at 10% peak height.	1) Reanalyze DFTPP. 2) Adjust MS and tune until DFTPP analysis passes specifications. 1) Break off 6-12 inches of column, if necessary. 2) Clean or replace injection port liner and/or glass wool. 3) Do not proceed until acceptance criteria are met.
SW8270C (continued)	**SVOCs (Continued)**	Multi-point initial calibration (minimum six points) with blank and at least five standards covering the linear range of the instrument.	Biannually or when daily calibration check fails.	1) SPCC average RF ≥0.50. 2) RSD ≤30 for each individual CCC. 3) The RSD for all other analytes shall be ≤15 or the average across all analytes shall be ≤15 with no single analyte RSD >30. 4) Low level standard ≤ RL.	Repeat concentrations not meeting acceptance criteria.
		CCV	Every 12 hours, prior to sample analysis. Must be a second source or independently prepared standard	1) SPCCs average RF ≥050. 2) CCC %D ≤20 from average RF: non-CCC %D ≤30. 3) RT must be ≤30 second change from last CCV. 4) IS: Extracted ion area count must be within factor of 2 from last CCV.	1) Repeat CCV. 2) If still out, identify and correct problem and repeat CCV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5) Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW8270C (continued)	**SVOCs (Continued)**	Method blank.	1 per analytical batch or one per 20 samples, whichever is more frequent.	All analytes <RL.	1) Reanalyze method blank. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If noncompliant and sample analyte concentration is <RL or >10 times blank concentration, report results. 5) If noncompliant and sample analyte concentration is between RL and 10 times blank concentration, repurge and reanalyze all samples processed with contaminated blank at no cost.
		LCS.	1 LCS per preparation blank or per 20 samples, whichever is more frequent.	Recovery within project limits. (1)	1) Reanalyze LCS. 2) Identify and correct source of problem. 3) If still out, reanalyze affected samples.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		Surrogate spike.	Every sample, spike, standard, and method blank.	Recovery within project limits. (1)	1) Recalculate result; if still out: 2) Check instrument performance; if necessary, 3) Reanalyze unless obvious matrix interference or high sample concentration.
SW8270C (continued)	**SVOCs (Continued)**	Internal standards RT.	All samples, standards, and blanks.	1) RT: Must be <30 second change from daily CC. 2) IS: Extracted area counts must be within factor of 2 from daily CV.	1) Reanalyze sample. 2) If still out, identify or correct problem. 3) Reanalyze affected samples.
		MS/MSD.	One set per 20 project-specific samples	%R values within project limits. (1) RPD values within project limits. (1)	3) Check calculations. 4) Include explanation in anomaly report.
		MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.
SW8082	**Total PCBs (Aroclors) GC-ECD**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1. Contact QAO. 2. Document situation in case narrative.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		Multi-point initial calibration (minimum six points) with blank and at least five standards covering the linear range of the instrument.	Prior to sample analysis, or when calibration verification fails.	1. RDS for average response factor (RF) ≤20% for each compound; or, 2. The average RF across all compounds shall be ≤20% with no single compound >30%; or, 3. Calibration curve correlation coefficient (r)>0.995 for linear regression. 4. Low standard ≤ RL.	1. Correct the problem. 2. Repeat the initial calibration.
SW8082 (Continued)	**Total PCBs (Aroclors): GC-ECD (Continued)**	Initial calibration verification (ICV).	Immediately following initial calibration using "second source" or independently prepared standard.	All analytes within ±15% of expected value.	1) Repeat ICV. 2) If still out, identify and correct problem and repeat ICV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable ICV must be reanalyzed after recalibration. 5) Document actions taken.
		Continuing calibration verification (CCV).	At the start of each analytical sequence, after every 12 hours or 10 samples, whichever is more frequent, and at the end of the sequence.	All analytes within ±15% of expected value.	1) Repeat CCV. 2) If still out, identify and correct problem and repeat CCV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5) Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		Method Blank.	At least one per analytical batch.	No analytes detected at or above the project RL.	1) Correct the problem. 2) Re-prep and reanalyze all associated samples.
		Surrogate spike.	Every standard, sample, method blank, MS/MSD, and LCS.	Recovery for all analytes must be within project limits. (1)	1) Correct the problem. 2) Reanalyze (re-prep if necessary).
SW8082 (Continued)	**Total PCBs (Aroclors): GC-ECD (Continued)**	MS/MSD.	One set per 20 project-specific samples	%R values within project limits. (1) RPD values within project limits. (1)	5) Check calculations. 6) Include explanation in anomaly report.
		LCS.	At least one per analytical batch.	%R values within project limits. (1)	1) Reanalyze LCS. 2) Identify and correct problem. 3) If still out, redigest and reanalyze affected samples.
		Second-column Confirmation.	100% for all positive results above the RL.	Quantitative confirmation by a second GC column of dissimilar phase and retention characteristics within specified holding times is required.	1) Reanalyze. 2) Document non-compliance in case narrative.
		MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		RT Windows calculated for each analyte.	1 72-hr. study performed on each GC column whenever a new column is installed.	None.	None.
SW6010B	**Total Metals: ICP-AES**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1. Contact QAO. 2. Document situation in case narrative.
SW6010B (Continued)	**Total Metals: ICP-AES (Continued)**	Initial 2-point calibration (including blank)	Daily, prior to sample analysis.	None.	1) Adjust instrument according to instrument manufacturer's recommendations. 2) Repeat calibration.
		ICV.	Daily, immediately following initial calibration. ICV must be a second source or independently prepared standard.	90-110% of expected value for all metals.	1. Repeat ICV. 2. If still out, identify and correct problem and repeat ICV. 3. If still out, repeat initial calibration. 4. All sample analyses bracketed by an unacceptable ICV must be reanalyzed after recalibration. 5. Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		CCV.	After every 10 samples and at the end of each batch.	90-110% of expected value for all metals.	1. Repeat CCV. 2. If still out, identify and correct problem and repeat CCV. 3. If still out, repeat initial calibration. 4. All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5. Document actions taken.
SW6010B (Continued)	**Total Metals: ICP-AES (Continued)**	Low-level Calibration Check (PRRL).	Beginning of each analytical run and at the end of the analytical sequence.	%R = 50-150%.	1. If the applicable criterion is not met, terminate the analysis, correct the problem, recalibrate the instrument. 2. All the sample analyses bracked by unacceptable PRRL must be reanalyzed after recalibration. 3. Document actions taken.
		Calibration Blank (ICB/CCB).	Prior to sample analyses, and after every 10 samples, and at the end of each batch.	Measured concentrations must be <RL.	1. Repeat ICB/CCB. 2. If still out, identify and correct problem and repeat ICB/CCB. 3. If still out, repeat initial calibration. 4. All sample analyses bracketed by an unacceptable ICB/CCB must be reanalyzed after recalibration. 5. Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW6010B (Continued)	**Total Metals: ICP-AES (Continued)**	Method blank.	1 per 20 samples or per preparation batch, whichever is more frequent.	All analytes <RL, or sample concentrations must be >10 times the blank concentration.	1) Investigate contamination source. 2) Take and document appropriate corrective action. 3) Reanalyze method blank. 4) If noncompliant and sample analyte concentration <RL or >10 times the blank concentration, report results. 5) If noncompliant and sample analyte concentration is between RL and 10 times blank concentration, flag sample results associated with method blank contamination.
		LCS.	1 LCS per preparation and/or analytical batch or per 20 samples, whichever is more frequent.	Recovery for all analytes within project limits. (1)	1) Reanalyze LCS. 2) Identify and correct problem. 3) If still out, redigest and reanalyze affected samples.

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ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW6010B (Continued)	**Total Metals: ICP-AES (Continued)**	Interelement Interference Check Standard (ICS).	ICSA/ICSB at the start and end of each analytical sequence or once during an 8-hour period, which ever is more frequent.	All analytes subject to potential spectral interference is within ± 20% of expected value. No non-ICSB analytes detected in the ICSA at the absolute value of the RL or greater than the RL. Where the RL for an element is ≤10 ug/L or <1 mg/kg, the non-ICSB analytes detected in the ICSA must be ≤2x the RL.	1. Correct the problem, recalibrate, reanalyze ICS and all affected samples (i.e. all samples bracketed by an unacceptable ICSA and ICSB).
		Serial dilution.	1 per 20 samples per matrix if at least one sample concentration >10 times the MDL.	Within 90-110% of original concentration if >50 times the RL.	Evaluate data for interference.
		MS/MSD.	One set per 20 project-specific samples per matrix.	%R values within project limits. (1) RPD values within project limits. (1) Criteria apply only if spike concentration is ≥25% of the unspiked sample concentration.	1. Check calculations. 2. Include explanation in anomaly report. 3.

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ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW6010B (Continued)	**Total Metals: ICP-AES (Continued)**	LCS.	At least one per analytical batch.	%R values within project limits. (1)	1. If applicable criterion is not met, reanalyze LCS. Check the instrument parameters, sensitivity, and linearity. Correct any problems. If LCS is acceptable continue with analysis. 2. If samples cannot be reanalyzed or reprepared, contact the QAO. 3. Document actions taken.
		MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.
SW9056	**Anions**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1. Contact QAO. 2. Document situation in case narrative.
		Multi-point initial calibration (one blank and five standards) covering linear range of the instrument.	Before initial sample analysis, every 24 hours, whenever modifications are made to the analytical system, or when continuing calibration verification fails.	Correlation coefficient (r) of linear regression is ≥ 0.995.	1. Validate the standards. If standard still exceeds acceptance criteria, obtain fresh, certified standards. 2. Repeat the initial calibration to meet criteria.

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ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW9056 (Conitinued)	**Anions (Continued)**	Initial calibration verification (ICV); must be from second source.	Immediately following each initial calibration.	All analytes within ±10% of expected value.	1) Repeat ICV. 2) If still out, identify and correct problem and repeat ICV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable ICV must be reanalyzed after recalibration. 5) Document actions taken.
		Continuing calibration verification (CCV).	After every 10 samples and at the end of the analysis sequence.	All analytes within ±10% of expected value.	1) Repeat CCV. 2) If still out, identify and correct problem and repeat CCV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5) Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW9056 (Conitinued)	**Anions (Continued)**	Method Blank.	At least one per analytical batch.	All analytes <RL, or sample concentrations must be >10 times the blank concentration.	1. If applicable criterion is not met, reanalyze the blank. 2. If reanalysis does not meet criteria, the analytical batch must be reprepared and reanalyzed. 3. If samples cannot be reprepared and reanalyzed, the laboratory Project Manager must contact the QAO. 4. Document actions taken in a NCM, and in the report narrative.
		LCS.	1 LCS per preparation and/or analytical batch or per 20 samples, whichever is more frequent.	Recovery within project limits. (1)	1. If applicable criterion is not met, reanalyze LCS. Check the instrument parameters, sensitivity, and linearity. Correct any problems. If LCS is acceptable continue with analysis. 2. If samples cannot be reanalyzed or reprepared, contact the QAO. 3. Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW9056 (Conitinued)	**Anions (Continued)**	MS/MSD.	One set per 20 project-specific samples per matrix.	%R values within project limits. (1) RPD values within project limits. (1) Criteria apply only if spike concentration is $\leq$500% of the unspiked sample concentration.	1. Check calculations. 2. Include explanation in anomaly report. 3.
		MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.
SW7471A/SW7470A	**Total Mercury: CVAA**	Holding Time.	Per Sample.	Preparation/Digestion/Extraction/Analysis is completed within holding time.	1) Contact QAO. 2) Document situation in case narrative.
		Multi-point initial calibration (one blank and five standards) covering linear range of the instrument.	Before initial sample analysis, every 24 hours, whenever modifications are made to the analytical system, or when continuing calibration verification fails.	Correlation coefficient of linear regression (r)is $\geq$ 0.995.	1. Validate the standards. If standard still exceeds acceptance criteria, obtain fresh, certified standards. 2. Repeat the initial calibration to meet criteria.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW7471A/SW7470A (Continued)	**Total Mercury: CVAA (Continued)**	Initial calibration verification (ICV); must be from second source.	Immediately following each initial calibration.	All analytes within ±10% of expected value.	1) Repeat ICV. 2) If still out, identify and correct problem and repeat ICV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable ICV must be reanalyzed after recalibration. 5) Document actions taken.
		Continuing calibration verification (CCV).	After every 10 samples and at the end of the analysis sequence.	All analytes within ±10% of expected value.	1) Repeat CCV. 2) If still out, identify and correct problem and repeat CCV. 3) If still out, repeat initial calibration. 4) All sample analyses bracketed by an unacceptable CCV must be reanalyzed after recalibration. 5) Document actions taken.

Attachment 3 - Summary of Laboratory Quality Control Requirements and Corrective Action Procedures

ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
SW7471A/SW7470A (Continued)	**Total Mercury: CVAA (Continued)**	Calibration Blank (ICB/CCB).	After initial calibration and after every calibration verification (ICV and CCV).	No analytes detected at or above the project MDLs.	1. Repeat ICB/CCCB. 2. If still out, identify and correct problem and repeat ICB/CCB. 3. If still out, repeat initial calibration. 4. All sample analyses bracketed by an unacceptable ICB/CCB must be reanalyzed after recalibration. 5. Document actions taken.
SW7471A/SW7470A (Continued)	**Total Mercury: CVAA (Continued)**	Method Blank.	At least one per analytical batch.	All analytes <RL, or sample concentrations must be >10 times the blank concentration.	1. If applicable criterion is not met, reanalyze the blank. 2. If reanalysis does not meet criteria, the analytical batch must be reprepared and reanalyzed. 3. If samples cannot be reprepared and reanalyzed, the laboratory Project Manager must contact the QAO. 4. Document actions taken in a NCM, and in the report narrative.
		MS/MSD.	One set per 20 project-specific samples.	%R values within project limits. (1) RPD values within project limits. (1)	1. Check calculations. 2. Include explanation in anomaly report. 3.

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ANALYTICAL METHOD	APPLICABLE PARAMETER	QUALITY CONTROL CHECK	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION *
		LCS.	At least one per analytical batch.	%R values within project limits. (1)	1. If applicable criterion is not met, reanalyze LCS. Check the instrument parameters, sensitivity, and linearity. Correct any problems. If LCS is acceptable continue with analysis. 2. If samples cannot be reanalyzed or reprepared, contact the QAO. 3. Document actions taken.
SW7471A/SW7470A (Continued)	**Total Mercury: CVAA (Continued)**	MDL study.	Annually and after major repair or changes on the instrument.	MDLs established shall not exceed project RLs.	MDLs that exceed established criteria shall be submitted for approval prior to any project sample analyses.

*All corrective actions must be documented and maintained in project files.

(1)Project QC limits for accuracy (%R) and precision (RPD or D) specified in PDI QAPP Table 3.2 and Table 3.3A, as applicable to sediments/water analyses and to air and emissions testing, respectively.