Programmatic
Quality Assurance Project Plan

Community Wide Brownfields

New Jersey Economic Development Authority
36 West State Street, P.O. Box 990
Trenton, New Jersey 08625

Prepared by:
BRS, Inc.
P.O. Box 2293
Medford Lakes, NJ 08055

www.brsinc.com

INTRODUCTION

This Programmatic Quality Assurance Project Plan (QAPP) was prepared by Brownfield Redevelopment Solutions, Inc. (BRS) for the New Jersey's Economic Development Authority (NJEDA) as part of the Brownfields Community Wide Assessment Grant(s). The proposed scope of work involves more than one site where ASTM-E1903-97(2019)-compliant Phase II Environmental Site Investigations will be performed.

The United States Environmental Protection Agency (EPA) requires that all environmental monitoring and measurement efforts participate in a centrally managed quality assurance (QA) program. The team generating data under this QA program has the responsibility to implement minimum procedures to ensure that the precision, accuracy, completeness, and representativeness of its data are known and documented.

A programmatic QAPP may be developed when a recipient's Brownfields program involves more than one site and is designed to accommodate technical requirements common to all the sites. A site-specific QAPP addendum supplements the programmatic QAPP and includes specific methods for sampling and analysis to address the unique technical issues of performing a site assessment at that particular site. A QAPP addendum will be submitted once vetted sites are proposed for site assessment activities.

At this time the preferred environmental laboratory that will be used is Hampton-Clark in Fairfield, New Jersey. If a different laboratory is chosen to provide analytical testing services once vetted sites are proposed, the laboratory must be qualified to perform laboratory services in the State of New Jersey and hold all necessary accreditations offered by the State for the project scope. This environmental laboratory will be presented in a QAPP addendum for that vetted site.

BRS will submit a site-specific QAPP addendum and perform the field sampling. All project reporting will be completed by BRS. BRS been selected as a result of a documented competitive process which complies with local, state and federal procurement procedures.

NJEDA Brownfields Quality Assurance Project Plan

TABLE OF CONTENTS

Section 1. NJEDA Brownfields QAPP Title and Approval Page 4
Section 2a. Project Organizational Chart 5
Section 2b. Personnel Responsibilities 6
Section 3a. Problem Definition/Project Description 8
Section 3b. Project Quality Objectives/Systematic Planning Process Statements 10
Section 4. Project Schedule/Timeline 12
Section 5a. Sampling Methods and Locations 13
Section 5b. Analytical Methods and Requirements 14
Section 5c. Reference Limits and Evaluation Table 16
Section 5d. Analytical Laboratory Sensitivity and Project Criteria 22
Section 5e. Secondary Data Criteria and Limitations Table 26
Section 6. Project Specific Method and Standard Operating Procedures (SOPs) Reference Table 27
Section 7. Field Equipment Calibration, Maintenance, Testing, and Inspection 29
Section 8. Analytical Laboratory Instrument and Equipment Maintenance, Testing, and Inspection 30
Section 9a. Sample Handling System 33
Section 9b. Sample Custody Requirements 34
Section 10. Field and Analytical Laboratory Quality Control Summary 35
Section 11a. Data Management and Documentation 42
Section 11b. Project Reports 43
Section 12a. Planned Project Assessments Table 44
Section 12b. Assessment Findings and Corrective Action Responses 45
Section 13a. Project Data Verification Process (Step I) 46
Section 13b. Project Data Validation Process 47
Section 13c. Project Matrix and Analytical Validation 48
Section 13d. Usability Assessment 50

FIGURES

Figure 1 HOLD for Site Plan Showing Project Area

APPENDICES

Appendix A Resumes
Appendix B Hampton-Clark New Jersey State Certification # and Annual Certified Parameter List
Appendix C Hampton-Clark Standard Operating Procedures
Appendix D Field Sampling Standard Operating Procedures
Appendix E Sample Site-Specific QAPP Addendum

Section 1. NJEDA Brownfields QAPP Title and Approval Page

Title: NJEDA Programmatic Quality Assurance Project Plan (QAPP)
Property/Site Location: TO BE DETERMINED
Revision Number: 1
Revision Date: April 1, 2022

Brownfields Cooperative Agreement Number(s): BF –96242421

New Jersey Economic Development Authority
Brownfields Recipient

Alicia Flammia, Project Manager - Brownfield Redevelopment Solutions, Inc.
PO Box 2293, Medford Lakes, NJ 08055
856-964-6456 Ext. 6865 / AFlammia@BRSInc.com
Preparer's Name and Organizational Affiliation
Preparer's Address, Telephone Number, and E-mail Address

February 22, 2022
Preparation Date (Day/Month/Year)

BROWNFIELDS RECIPIENT PROGRAM MANAGER:

Melissa Dulinski
Signature

Melissa A. Dulinski, NJEDA
mdulinski@njeda.com April 21, 2022
Printed Name/Organization/Date

ENVIRONMENTAL CONSULTANT QUALITY ASSURANCE OFFICER: (QAO)

Signature

James Charles, BRS, Inc. April 21, 2022
Printed Name/Organization/Date

EPA REGION 2 BROWNFIELDS PROJECT OFFICER:

Signature

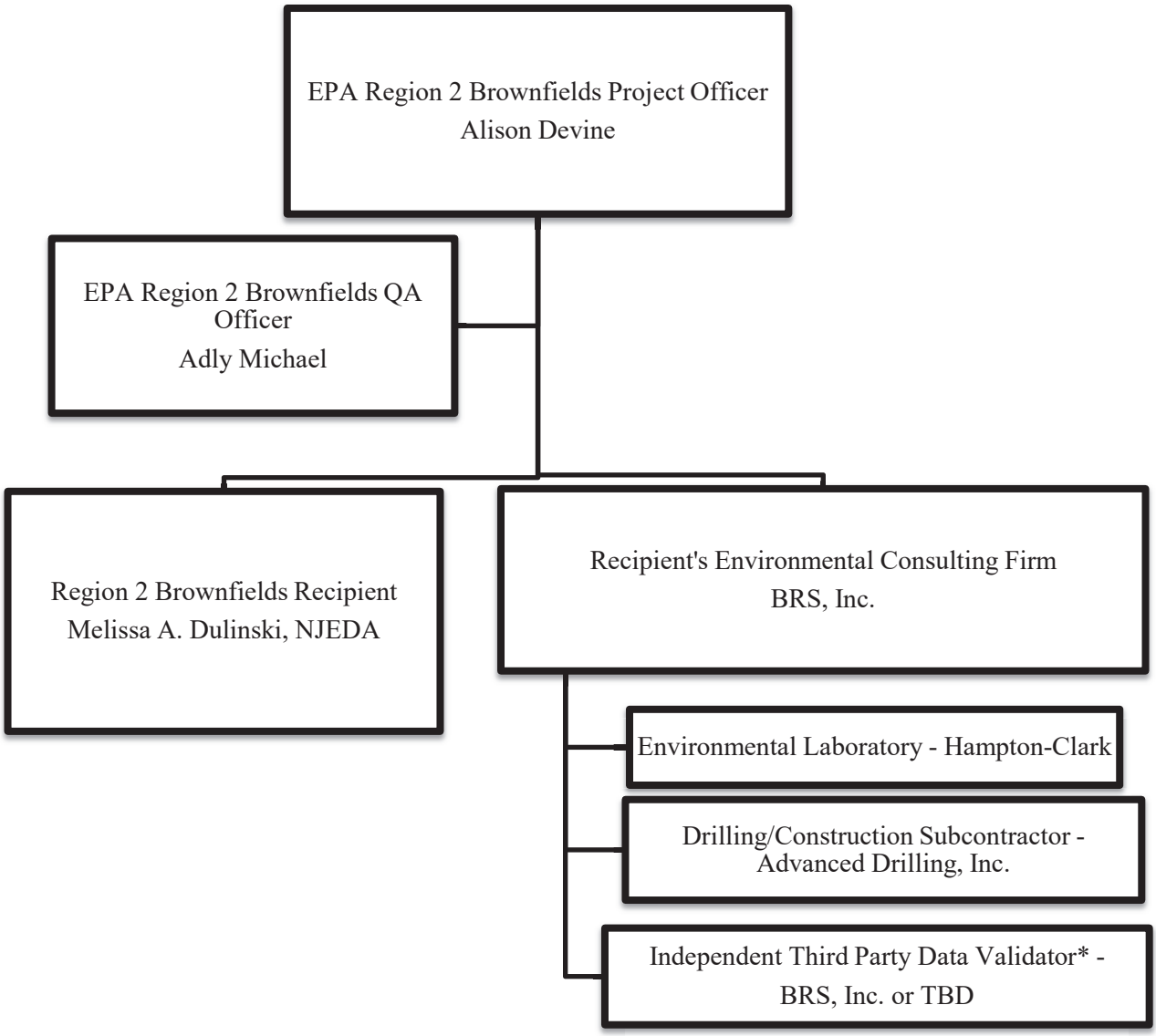
Alison Devine, USEPA Region 2
Printed Name/Organization/Date

EPA REGION 2 BROWNFIELDS QUALITY ASSURANCE OFFICER:

Signature

Adly Michael, USEPA Region 2
Printed Name/Organization/Date

Section 2a. Project Organizational Chart



*Data validation to be performed by third party – independent to project (can be within Environmental Consulting firm or subcontracted to a data validation firm).

Section 2b. Personnel Responsibilities

Name	Title	Telephone Number/Email	Organizational Affiliation	Responsibilities[1]
James Charles, LSRP	Project Scientist	(856) 964-6456 (ext 6854)	BRS, Inc.	Qualified Environmental Professional and the Quality Assurance/ Quality Control manager
Alicia Flammia	Project Manager	(856) 964-6456 (ext 6865)	BRS, Inc.	Collection of environmental media samples, reporting
TBD	Field Technician	TBD	BRS, Inc. or TBD	Collection of environmental media samples
Melissa A. Dulinski	Brownfields Recipient Program Manager (RPM)	(609) 610-4480 MDulinski@njeda.com	NJEDA	Sr. Officer, Brownfields and Sustainable Systems
Adly Michael	EPA Brownfields Quality Assurance Officer (QAO)	732-906-6161	EPA Region 2	Approve QAPP for compliance with EPA Region 2 QA/QC policy
Alison Devine	EPA Brownfields Project Officer (BPO)	(212) 637-4158 devine.alison@epa.gov	EPA Region 2	Ensure investigation is in compliance with QAPP and EPA regulation
TBD	Environmental Laboratory Contact	TBD	Hampton-Clark	Laboratory analysis of environmental media samples
TBD	Third Party Data Validator[2]	TBD	BRS, Inc. or TBD	Data validation of laboratory reports

[1] Include resumes as Appendix A of the site-specific QAPP Addendum once a site has been approved for assessment.

[2] Data validation to be performed by third party – independent to project (can be within Environmental Consulting firm or subcontracted to a data validation firm).

The EPA BPO and the EPA QAO will approve this Programmatic QAPP and the Site Specific QAPP Addendum(s). BRS will perform all sampling, and as may be applicable will oversee collection of all environmental samples by other subcontractors. BRS will be responsible for oversight of investigative tasks including surveying, drilling and disposal of investigation-derived waste, and site restoration performed by others.

This QAPP will govern the operation of the project at all times. Each responsible party listed in the above shall adhere to the procedural requirements of the QAPP and ensure that subordinate personnel do likewise. It is expected that from time to time modifications will need to be made to the project. NJEDA shall be responsible for implementation of changes to the project and shall document the effective date of all changes made. Any significant changes made by the NJEDA need to be approved by the EPA Project Officer before being implemented. In her absence this

function should go to Terry Wesley, Section Chief of the Brownfield Section. His number is 212-637-5027 and his email is Wesley.terry@epa.gov.

The BRS Quality Assurance Manager is responsible for determining that data are of adequate quality to support this project.

Distribution List

1. Melissa A. Dulinski – Sr. Officer, Brownfields and Sustainable Systems, NJEDA (Project Manager)
2. Alison Devine – EPA Region 2 (Project Officer)
3. Jennifer Taylor, PE – Program Manager, BRS, Inc. (Contractor Team Lead)

Section 3a. Problem Definition/Project Description

PROBLEM DEFINITION

Phase I Environmental Site Assessments (ESA) and Preliminary Assessments[a] (PA) will be completed for various priority sites (to be vetted and approved by NJEDA and EPA) by BRS on behalf of NJEDA. As part of the Phase I assessment, it is assumed that recognized environmental conditions (RECs) and potential areas of concern (AOCs) related to historical use of the subject properties will be identified. The intent of the subsequent Phase II Site Investigations[b] is to establish if RECs and/or AOCs have impacted environmental media and, in this case, whether remedial actions may be necessary to advance redevelopment at the sites.

PROJECT DESCRIPTION

Site Location and Description

Sites will be selected from the priority sites identified by NJEDA throughout the State of New Jersey.

The scope of work may include assessment of underground utilities, tanks and appurtenances and the installation of soil borings, soil vapor probes, temporary and/or permanent monitoring wells at the Site. A site-specific QAPP addendum prepared by BRS will supplement this programmatic QAPP and will include specific methods for sampling and analysis to address the unique technical issues of performing a site assessment at that particular site. Site assessment goals, approaches and technologies can differ significantly for each site based on variability in major site attributes such as contaminant types, depth of groundwater, site geology, overall site conditions and accessibility. The sampling locations will be selected to provide representative areal coverage of the properties, including future sub-slab areas beneath proposed structures, if any have been proposed. A Site Location Map will be provided in the site-specific QAPP Addendum as Figure 1.

As part of Phase II Site Investigation (SI) activities, BRS will collect environmental samples to be analyzed by Hampton-Clark laboratory staff at their NJ facility. For purposes of establishing this programmatic QAPP, it is assumed that no previous environmental assessment has been conducted on the sites. It is anticipated that soil and groundwater samples may be analyzed for Extractable Petroleum Hydrocarbons (EPH), full Target Compound List / Target Analyte List (TCL/TAL) and other site-specific compounds as necessary. Should additional analysis be required for a site-specific Phase II, these will be included in a QAPP Addendum.

[a] Performed in accordance with NJ Technical Requirements for Site Remediation (NJAC 7:26E).
[b] Phase II Site Investigations will also be performed in accordance with NJ Technical Requirements for Site Remediation (NJAC 7:26E) in order to advance remediation of sites per the *Administrative Requirements for the Remediation of Contaminated Sites* at N.J.A.C. 7:26C-1.2.

Field quality control samples will be collected as detailed in Section 10. Samples will be collected using disposable sampling equipment and placed directly into laboratory provided glassware. Samples will be stored on ice and transported to the laboratory under chain of custody. Please refer to Section 6 for Standard Operating Procedures (SOP) information.

Laboratory results will be compared to NJDEP Soil Remediation Standards (NJAC 7:26D) and groundwater contaminant concentrations will be compared to the NJ *Class II-A Ground Water Quality Criteria* (GWQC).

PROJECT DECISION STATEMENTS

Future use of the sites where Phase II Site Investigations are planned is currently unknown. Investigative drilling and completion of soil borings and temporary and/or permanent monitoring wells with concurrent sampling of environmental media will likely be proposed in order to evaluate if contamination has come to be located on or under the property. If sampling results are found to be below the most stringent applicable NJDEP Soil Remediation Standards (SRS) as determined by the targeted site reuse, then it can be concluded that the Site does not pose a risk to public health and the environment and no further action would be recommended.

However, if sampling results are found to be above the NJDEP SRS or GWQC, then remedial investigations will be completed at sites to determine the nature and extent of contamination confirmed to be present during the Phase II SI. Ultimately, the full nature and extent of contamination will be evaluated and once remedial investigations are complete, an Analysis of Brownfields Cleanup Alternatives (ABCA) may also be prepared. The purpose of the ABCA is to memorialize the steps to be taken to select a recommended cleanup alternative for the site.

All environmental media analysis will be performed by a New Jersey State-certified laboratory such as Hampton-Clark. The accreditation certificate and annual certified parameter list for Hampton-Clark is provided in Appendix B; if a different laboratory is chosen, then this information will be updated and provided in Appendix B of the QAPP Addendum.

Section 3b. Project Quality Objectives/Systematic Planning Process Statements

The purpose of the project is to establish if RECs and/or AOCs have impacted environmental media at the site. Samples will be collected and evaluated in accordance with the following (at a minimum):

- NJ Technical Requirements for Site Remediation (NJAC 7:26E)
- NJ Remediation Standards (NJAC 7:26D)
- NJ Ground Water Quality Standards (NJAC 7:9C)
- NJ Department of Environmental Protection (NJDEP) Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil
- NJDEP Ground Water Technical Guidance: Site Investigation, Remedial Investigation, Remedial Action Performance Monitoring
- NJDEP Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria
- NJDEP Data Quality Assessment and Data Usability Evaluation Technical Guidance

Who will use the data?
Data will be used by the EPA Region 2 Brownfields Cooperative Agreement Recipient ("CAR", NJEDA), the property owner, and the owner's LSRP, to determine if additional investigation of the subject AOCs are necessary
What will the data be used for?
Data will be used to determine if additional investigation of the subject RECs and/or AOCs are necessary, as well as to formulate an Analysis of Brownfields Cleanup Alternatives (ABCA) or a Remedial Action Workplan, as necessary.
What types of data are needed?

- Soil and possibly Groundwater Data
    - Data will be evaluated for the presence of regulated compounds above applicable NJDEP standards:
        - Ingestion / Dermal Residential Soil Remediation Standard (IDR SRS);
        - Ingestion / Dermal Non-Residential SRS (IDNR SRS);
        - Inhalation Residential SRS (IHR SRS);
        - Inhalation Non-Residential SRS (IHNR SRS);
        - Migration to Ground Water SRS (MGW SRS); and
        - Class II-A GWQS.
- Field screening
    - Photoionization Detector (PID)
    - Visual observations
- Sampling techniques – per NJDEP *Field Sampling Procedures Manual*
    - En-core or Terra-core samplers for volatiles (per manufacturer instructions)

- Geoprobe direct push with macrocore liners

How "good" do the data need to be in order to support the environmental decision?
The data will be provided in a Reduced Laboratory Data Deliverable meeting all requirements of NJAC 7:26E. Data validation will be performed to ensure that data quality objectives are met and data can reliably be compared to the NJDEP SRS and GWQS. The data must be of sufficient quality to allow for this comparison. The quality of data is determined by establishing criteria for performance measures that include precision, accuracy/bias, sensitivity (quantitation limit), data comparability, representativeness, and completeness. Please refer to **Section #5d**, which will be updated if a different site-specific laboratory has been selected.

How much data are needed?
A site-specific QAPP addendum will supplement this programmatic QAPP and will include a workplan for media sampling and analysis that will address the additional and unique technical issues of performing a site assessment at a particular site. QA samples including blind duplicates, field blanks, and trip blanks analyzed for one or more of TCL and TAL compounds will be collected in accordance with the requirements stated in the site-specific QAPP addendum.

Where, when, and how should the data be collected/generated?
Specific boring installation and sampling collection points will be based on the site-specific QAPP addendum and workplan.

Who will collect and generate the data?
BRS will perform or oversee the collection of the samples. Laboratory analysis and analytical data will be provided by a New Jersey State-accredited laboratory, such as Hampton-Clark.

How will the data be reported?
BRS will summarize and present the data as components of the final reports.

How will the data be archived?
Analytical data will be archived by the laboratory. BRS will archive deliverables in its cloud-based company server for a minimum of three years per the NJEDA Brownfields Assessment Grant Cooperative Agreement.

Section 4. Project Schedule/Timeline

The anticipated start and completion dates are provided below.

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Preparation of QAPP	BRS, Inc. for NJEDA	1/13/22	3/18/22	QAPP	3/18/22
Review of QAPP	EPA Region 2 BPO and Brownfields QA Officer	3/18/22	4/15/22	Approved QAPP by EPA Region BPO	4/15/22
Preparation of Health and Safety Plan	BRS, Inc.	Spring 2022- 2023	TBD	HASP	TBD
Preparation of QAPP Addendums	BRS, Inc.	Spring 2022- 2023	TBD	QAPP Addendums	TBD
Procurement of Equipment	BRS, Inc.	Spring 2022- 2023	TBD	N/A	
Laboratory Request	BRS, Inc.	Spring 2022- 2023	TBD	N/A	
Field Reconnaissance/Access	BRS, Inc.	Spring 2022- 2023	TBD	N/A	
Collection of Field Samples	BRS, Inc., or TBD	2023	TBD	Filed Notes, Boring Logs	TBD
Laboratory Package Received	BRS, Inc.	Spring 2022- 2023	TBD	Lab Report	TBD
Validation of Laboratory Results	BRS, Inc., or TBD	Spring 2022- 2023	TBD	Validated data Packages	TBD
Data Evaluation/ Preparation of Final Report	BRS, Inc.	Spring 2022- 2023	TBD	Final Report	TBD

Section 5a. Sampling Methods and Locations

All site locations that will be sampled will be provided in the site-specific QAPP Addendum. Samples will be collected in accordance with the NJAC 7:26E Technical Guidance for Site Investigation and Remediation.

Matrix	Sampling Location(s)	Depth (*units*)	Analytical Group	No. of Samples (*identify field duplicates*)	Sampling SOP Reference	Rationale for Sampling Location
Soil	TBD	TBD	TCL volatile and semivolatile organics, pesticides, PCBs and TAL metals	TBD	BRS SOPs	TBD
Groundwater	TBD	TBD	TCL volatile and semivolatile organics, pesticides, PCBs and TAL metals	TBD	EPA Low-flow Sampling Guide	

The following procedures will be performed during collection of soil samples:
1. Grab samples will be transferred as soon as possible into the appropriate laboratory supplied containers.
2. Sample jars will be labeled with the following information: project name, project number, location identification, sample depth interval, date and requested analysis. This information will also be recorded in the field logbook.
3. All laboratory samples will be stored in a cooler to maintain samples at 4°C.
4. Duplicate soil and groundwater samples for will be collected at a rate of 5 percent (%) per sample batch or one minimum per day, whichever is larger. Equipment blanks will be collected at a rate of 5% per sample batch or one minimum per day, whichever is smaller. BRS will also provide the laboratory with sufficient aliquots of soil at a rate of 5% per sample batch or one minimum per day (whichever is larger) to serve as laboratory matrix spike/matrix spike duplicate (MS/MSD) samples for site-specific matrix interference assessment. All sample spiking will be performed by the laboratory.

Section 5b. Analytical Methods and Requirements

At this time the preferred environmental laboratory is Hampton-Clark in Fairfield, New Jersey. If a different laboratory is chosen to provide analytical testing services once vetted sites are proposed, the laboratory must be qualified to perform laboratory services in the State of New Jersey and hold all necessary accreditations offered by the State for the project scope. This environmental laboratory will be presented in a QAPP addendum for that vetted site.

The following is widely accepted as the preferred analytical methods and requirements. Laboratory Standard Operating Procedures are provided in Appendix C. Site-specific requirements will be updated in the Site-specific QAPP Addendums.

Matrix	**Analytical Group**	**Concentration Level**	**Analytical & Preparation Method/ SOP Reference**	**Sample Volume**	**Containers (*number, size, type*)**	**Preservation Requirements (*chemical, temperature, light protected)***	**Maximum Holding Time (*preparation/ analysis)***
Groundwater	VOCs	Low-Moderate	SW-846 Method 8260	120 ml	(3) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; protected from light, cool to 4°C	14 days to analysis
Soil	VOCs	Low-Moderate	SW-846 Method 8260	40 ml per 5 gram sample +4 oz per sample	(3) 40 ml glass VOA Vial. 1 additional 8-oz amber glass sample container will be filled and not preserved for percent solids determination	cool 4°, protected from light. Lab may add 15 ml methanol to 15 grams soil as required for medium level analysis	14 days to analysis
Groundwater	Semi-VOCs	Trace-Low	SW-846 8270 SIM	1 L	1-1 L amber glass with Teflon insert in caps	Unpreserved, protected from light, cool to 4℃ ±2℃	extracted within 7 days of sampling/ analyzed within 40 days following extraction
Soil	Semi-VOCs	Low-Moderate	SW-846 8270D	300 mL/8-oz	8-oz wide-mouth amber glass jars	Unpreserved, protected from light, cool to 4℃ ±2℃	extracted within 14 days of sampling/ analyzed within 40 days following extraction

Groundwater	Pesticides	Trace-Low	SW-846 8081LL	1 L + 1 L per day	I L amber glass + 1 L amber glass sample container will be filled and not preserved for quality control requirements	Unpreserved, cool to 4℃ ±2℃	extracted within 7 days of sampling/ analyzed within 40 days following extraction
Soil	Pesticides	Low-Moderate	SW-846 8081B	300 mL/8-oz	8-oz wide-mouth amber glass jars	Unpreserved, cool to 4℃ ±2℃	extracted within 14 days of sampling/ analyzed within 40 days following extraction
Groundwater	PCBs	Low-Moderate	SW-846 8082A	250 mL + 1 L per day	300 mL amber glass + 1 L amber glass sample container will be filled and not preserved for quality control requirements	Unpreserved, cool to 4℃ ±2℃	extracted within 1 year of sampling/ analyzed within 40 days following extraction
Soil	PCBs	Low-Moderate	SW-846 8082A	300 mL/8-oz	8-oz wide-mouth amber glass jars	Unpreserved, protected from light, cool to 4℃ ±2℃	extracted within 1 year of sampling/ analyzed within 40 days following extraction
Groundwater	TAL Metals	Low-Moderate	SW-846 6010C	250 mL	250 mL plastic or glass container	Nitric acid to pH <2, cool 4°	6 months
Soil	TAL Metals	Low-Moderate	SW-846 6010C	300 mL/8-oz	8 oz plastic or glass soil container	Cool 4°	6 months
Groundwater	Mercury	Low-Moderate	SW-846 7470A	250 mL	250 mL plastic or glass container	Nitric acid to pH <2, cool 4°	28 days
Soil	Mercury	Low-Moderate	SW-846 7471B	300 mL/8-oz	8 oz plastic or glass soil container	Cool 4°	28 days

Section 5c. Reference Limits and Evaluation Table

At this time the preferred environmental laboratory that will be used is Hampton-Clark in Fairfield, New Jersey. If a different laboratory is chosen to provide analytical testing services once vetted sites are proposed, the laboratory must be qualified to perform laboratory services in the State of New Jersey and hold all necessary accreditations offered by the State for the project scope. Once a New Jersey State-accredited laboratory has been selected, the reporting limit and method detection limit tables will be updated in the site-specific QAPP Addendum to ensure analytical methods can achieve the required limits for comparison to the applicable standards. A sample of these tables using the NJ SRS and NJDEP GWQS (VOCs only) is presented below.

Abbreviations used in the tables below:
NJDEP– NJ Department of Environmental Protection
IDNR- Ingestion Dermal Non Residential
IDR- Ingestion Dermal Residential
IHNR- Inhalation Non Residential
IHR- Inhalation Residential
MGW- Migration to Ground Water
mg/L - milligrams per liter
µg/L – micrograms per liter

NS – No Standard
All soil units are in mg/kg – milligrams per kilogram

Matrix: Soil
Analytical Group: VOC
Concentration Level: Low
Analytical Method: SW-846 8260B

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
1,1-Dichloroethane	75-34-3	640	120	NA	NA	0.24	0.24	0.002	0.00087
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	180	11	240	52	0.0069	0.0069	0.002	0.00115
1,1,1-Trichloroethane	71-55-6	NA	160000	NA	NA	0.2	0.2	0.002	0.00092
1,1,2-Trichloroethane	79-00-5	64	12	NA	NA	0.017	0.017	0.002	0.00139
1,1,2,2-Tetrachloroethane	79-34-5	18	3.5	NA	NA	0.0069	0.0069	0.002	0.00045
1,2-Dibromo-3- chloropropane	96-12-8	4.5	0.87	0.12	0.026	0.005	0.005	0.002	0.00055
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	1.8	0.35	0.41	0.085	0.005	0.005	0.001	0.00049
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	110000	6700	NA	NA	11	11	0.002	0.00051
1,2-Dichloroethane	107-06-2	30	5.8	320	71	0.0095	0.0095	0.002	0.00041
1,2-Dichloroethene (cis) (c-1,2-Dichloroethylene)	156-59-2	13000	780	NA	NA	0.35	0.35	0.002	0.00081
1,2-Dichloroethene (trans) (t-1,2-Dichloroethylene)	156-60-5	22000	1300	NA	NA	0.56	0.56	0.002	0.0012
1,2-Dichloropropane	78-87-5	98	19	27	5.7	0.0058	0.0058	0.002	0.00082
1,2,4-Trichlorobenzene	120-82-1	13000	780	NA	94	0.52	0.52	0.002	0.00063
1,2,4-Trimethylbenzene	95-63-6	13000	780	NA	NA	NA	780	0.001	0.0006
1,3-Dichlorobenzene (m-Dichlorobenzene)	541-73-1	110000	6700	NA	NA	11	11	0.002	0.00055
1,3-Dichloropropene (total)	542-75-6	36	7	23	4.8	0.0063	0.0063	0.002	0.00045
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	13000	780	NA	NA	1.4	1.4	0.002	0.00053
1,4-Dioxane	123-91-1	36	7	210	45	0.067	0.067	0.1	0.04858
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	780000	47000	NA	NA	0.98	0.98	0.002	0.0012
Acetone (2-Propanone)	67-64-1	NA	70000	NA	NA	19	19	0.01	0.00677
Benzene	71-43-2	16	3	11	2.2	0.0094	0.0094	0.001	0.00073
Bromodichloromethane (Dichlorobromomethane)	75-27-4	59	11	NA	NA	0.005	0.005	0.002	0.00047
Bromoform	75-25-2	460	88	NA	NA	0.018	0.018	0.002	0.00033
Bromomethane (Methyl bromide)	74-83-9	1800	110	82	18	0.043	0.043	0.002	0.00157
Carbon disulfide	75-15-0	NA	NA	NA	NA	3.7	3.7	0.005	0.0034
Carbon tetrachloride	56-23-5	40	7.6	6.9	1.4	0.0075	0.0075	0.002	0.00097
Chlorobenzene	108-90-7	8400	510	NA	NA	0.64	0.64	0.002	0.00062
Chloroform	67-66-3	13000	780	NA	590	0.33	0.33	0.002	0.00136
Chloromethane (Methyl chloride)	74-87-3	NA	NA	1200	270	NA	270	0.002	0.00123
Dibromochloromethane (Chlorodibromomethane)	124-48-1	43	8.3	NA	NA	0.005	0.005	0.002	0.00043
Dichlorodifluoromethane (Freon 12)	75-71-8	260000	16000	NA	NA	38	38	0.002	0.00141
Ethylbenzene	100-41-4	130000	7800	48	10	15	10	0.001	0.00069
Isopropylbenzene	98-82-8	130000	7800	NA	NA	22	22	0.001	0.00083
2-Hexanone	591-78-6	6500	390	NA	1000	0.15	0.15	0.002	0.00085
Methyl acetate	79-20-9	NA	78000	NA	NA	22	22	0.002	0.00096
Methyl tert-butyl ether (MTBE)	1634-04-4	13000	780	650	140	0.25	0.25	0.001	0.00054
Methylene chloride (Dichloromethane)	75-09-2	260	50	NA	1400	0.013	0.013	0.002	0.00075
n-Hexane	110-54-3	NA	NA	NA	NA	5.5	5.5	0.002	0.0012
Tertiary butyl alcohol (TBA)	75-65-0	23000	1400	NA	NA	0.32	0.32	0.01	0.00645
Tetrachloroethene (PCE)	127-18-4	1700	330	NA	47	0.0086	0.0086	0.002	0.00098
Toluene	108-88-3	1.00E+05	6300	NA	NA	7.8	7.8	0.001	0.00066
Trichloroethene (TCE) (Trichloroethylene)	79-01-6	79	15	14	3	0.0065	0.0065	0.002	0.00082
Trichlorofluoromethane (Freon 11)	75-69-4	390000	23000	NA	NA	29	29	0.002	0.00118
Vinyl chloride	75-01-4	5	0.97	6.4	1.4	0.0067	0.0067	0.002	0.00122
Xylenes (total)	1330-20-7	190000	12000	NA	NA	19	19	0.0012	0.0012

Matrix: Soil
Analytical Group: SVOC
Concentration Level: Low
Analytical Method: SW-846 8270D

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
1,2,4,5-Tetrachlorobenzene	95-94-3	390	23	NA	NA	NA	23	0.033	0.01116
2-Chloronaphthalene	91-58-7	67000	4800	NA	NA	NA	4800	0.033	0.01483
2,3,4,6-Tetrachlorophenol	58-90-2	27000	1900	NA	NA	26	26	0.033	0.01253
2,4-Dinitrotoluene/2,6-Dinitrotoluene (mixture)	25321-14-6	3.8	0.8	NA	NA	0.27	0.27	0.033	0.01035
2,4,5-Trichlorophenol	95-95-4	91000	6300	NA	NA	68	68	0.033	0.00948
2,4,6-Trichlorophenol	88-06-2	230	49	NA	NA	0.86	0.86	0.033	0.02589
3,3'-Dichlorobenzidine	91-94-1	5.7	1.2	NA	NA	3.9	1.2	0.033	0.02689
4-Chloroaniline	106-47-8	13	2.7	NA	NA	0.23	0.23	0.033	0.01463
4-Methylphenol (p-cresol)	106-44-5	9100	630	NA	NA	0.75	0.75	0.02	0.01317
4-Nitroaniline	100-01-6	130	27	NA	NA	NA	27	0.033	0.01274
Acenaphthene	83-32-9	50000	3600	NA	NA	NA	3600	0.033	0.00949
Anthracene	120-12-7	250000	18000	NA	NA	NA	18000	0.033	0.00918
Atrazine	1912-24-9	3200	220	NA	NA	0.33	0.33	0.033333	0.01338
Benzo(a)anthracene (1,2-Benzanthracene)	56-55-3	23	5.1	370000	78000	0.71	0.71	0.033	0.01110
Benzo(a)pyrene	50-32-8	2.3	0.51	16000	3500	NA	0.51	0.033	0.01137
Benzo(b)fluoranthene (3,4-Benzofluoranthene)	205-99-2	23	5.1	370000	78000	NA	5.1	0.033	0.01197
Benzo(k)fluoranthene	207-08-9	230	51	NA	780000	NA	51	0.033	0.01225
Butylbenzyl phthalate	85-68-7	1300	290	NA	NA	29	29	0.033	0.02557
Caprolactam	105-60-2	460000	32000	1300	290	16	16	0.033	0.02669
Bis(2-chloroethoxy)methane	111-91-1	2700	190	NA	NA	NA	190	0.033	0.00944
Bis(2-chloroethyl)ether	111-44-4	3.3	0.63	NA	NA	0.33	0.33	0.0083	0.00809
Bis(2-ethylhexyl)phthalate	117-81-7	180	39	NA	NA	14	14	0.033	0.02934
Chrysene	218-01-9	2300	510	NA	NA	NA	510	0.033	0.01128
Di-n-butyl phthalate	84-74-2	91000	6300	NA	NA	NA	6300	0.167	0.03822
Di-n-octyl phthalate	117-84-0	9100	630	NA	NA	NA	630	0.033	0.02207
Dibenz(a,h)anthracene	53-70-3	2.3	0.51	37000	7800	NA	0.51	0.033	0.01219
Diethylphthalate	84-66-2	730000	51000	NA	NA	44	44	0.033	0.02147
Fluoranthene	206-44-0	33000	2400	NA	NA	NA	2400	0.033	0.01283
Fluorene	86-73-7	33000	2400	NA	NA	NA	2400	0.033	0.00907
Hexachloro-1,3-butadiene	87-68-3	47	8.9	NA	NA	0.17	0.17	0.033	0.01486
Hexachlorobenzene	118-74-1	2.3	0.43	NA	NA	0.17	0.17	0.033	0.01392
Hexachlorocyclopentadiene	77-47-4	7800	470	NA	2.7	2.5	2.5	0.17	0.10825
Hexachloroethane	67-72-1	91	17	NA	NA	0.17	0.17	0.033	0.01471
Indeno(1,2,3-cd)pyrene	193-39-5	23	5.1	370000	78000	NA	5.1	0.033	0.01509
Isophorone	78-59-1	2700	570	NA	NA	0.23	0.23	0.033	0.01078
N-Nitrosodi-n-propylamine	621-64-7	0.36	0.17	NA	NA	0.17	0.17	0.167	0.01254
N-Nitrosodiphenylamine	86-30-6	520	110	NA	NA	1.1	1.1	0.167	0.11290
Naphthalene	91-20-3	34000	2500	27	5.7	19	5.7	0.033	0.00962
2-Chlorophenol (o-Chlorophenol)	95-57-8	6500	390	NA	NA	0.76	0.76	0.033	0.01093
2-Methylnaphthalene	91-57-6	3300	240	NA	NA	3.1	3.1	0.033	0.01029
2-Methylphenol (o-cresol)	95-48-7	4600	320	NA	NA	0.77	0.77	0.033	0.00957
2,4-Dichlorophenol	120-83-2	2700	190	NA	NA	0.19	0.19	0.033	0.01252
2,4-Dimethylphenol	105-67-9	18000	1300	NA	NA	2.3	2.3	0.033	0.01619
2,4-Dinitrophenol	51-28-5	1800	130	NA	NA	0.33	0.33	0.17	0.14453
1,1'-Biphenyl	92-52-4	450	87	NA	NA	NA	87	0.033	0.00958
Nitrobenzene	98-95-3	2600	160	36	7.5	0.17	0.17	2	0.6874
Pyrene	129-00-0	25000	1800	NA	NA	NA	1800	0.033	0.01136
Pentachlorophenol	87-86-5	4.4	1	NA	NA	0.33	0.33	0.17	0.16013
Phenol	108-95-2	270000	19000	NA	39000	21	21	0.033	0.00924

Matrix: Soil
Analytical Group: PCBs
Concentration Level: Low
Analytical Method: SW-846 8082A

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
Polychlorinated biphenyls (PCBs)	1336-36-3	1.1	0.25	NA	NA	1.6	0.25	0.025	0.02447

Standards and reporting limits are shown for Total PCBs rather than individual aroclors.

Matrix: Soil
Analytical Group: Pesticides
Concentration Level: Low
Analytical Method: SW-846 8081B

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
Aldrin	309-00-2	0.21	0.041	NA	NA	0.13	0.041	0.005	0.0014
alpha-HCH (alpha-BHC)	319-84-6	0.41	0.086	NA	NA	0.0023	0.0023	0.001	0.001
4,4'-DDD (p,p'-TDE)	72-54-8	11	2.3	NA	NA	0.47	0.47	0.0025	0.00136
4,4'-DDE (p,p'-DDX)	72-55-9	11	2	NA	NA	0.47	0.47	0.0025	0.00113
4,4'-DDT	50-29-3	9.5	1.9	NA	NA	0.67	0.67	0.0025	0.00162
beta-HCH (beta-BHC)	319-85-7	1.4	0.3	NA	NA	0.0046	0.0046	0.00174	0.00174
Lindane (gamma-HCH) (gamma-BHC)	58-89-9	2.8	0.57	NA	NA	0.0035	0.0035	0.00109	0.00109
Dieldrin	60-57-1	0.16	0.034	NA	NA	0.024	0.024	0.001	0.00077
Diethylphthalate	84-66-2	730000	51000	NA	NA	44	44	0.033	0.02147
Endosulfan I and Endosulfan II (alpha and beta) (summed)	115-29-7	7800	470	NA	NA	NA	470	0.01	0.00349
Endrin	72-20-8	270	19	NA	NA	1.6	1.6	0.005	0.00173
Heptachlor	76-44-8	0.81	0.15	NA	NA	0.083	0.083	0.005	0.00316
Heptachlor epoxide	1024-57-3	0.4	0.076	NA	NA	0.081	0.076	0.005	0.00271
Methoxychlor	72-43-5	4600	320	NA	NA	NA	320	0.005	0.00328
Toxaphene	8001-35-2	2.3	0.49	NA	NA	6.2	0.49	0.025	0.02493

Matrix: Soil
Analytical Group: EPH
Concentration Level: Low
Analytical Method: NJDEP EPH Rev. 3

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
Extractable Petroleum Hydrocarbons (Category 1)	various	75000	5300	NA	NA	NA	5300	60	9.14681

Matrix: Soil
Analytical Group: Metals
Concentration Level: Low
Analytical Method: SW-846 6010D/6020B (Mercury 7471B)

Compound	CAS	IDNR	IDR	IHNR	IHR	MGW	LOW	HC RL	HC MDL
Aluminum (total)	7429-90-5	NA	78000	NA	NA	NA	78000	200	14.3746
Antimony (total)	7440-36-0	520	31	NA	NA	5.4	5.4	4	1.357422
Arsenic (total)	7440-38-2	19	19	5200	1100	19	19	4	1.538313
Barium (total)	7440-39-3	260000	16000	NA	870000	2100	2100	10	0.727
Beryllium	7440-41-7	2600	160	9300	2000	0.7	0.7	0.2	0.0157
Cadmium	7440-43-9	1100	71	12000	2600	1.9	1.9	1.2	0.776855
Cobalt (total)	7440-48-4	390	23	2500	520	90	23	2.5	1.135119
Copper (total)	7440-50-8	52000	3100	NA	NA	910	910	5	1.20704
Lead (total)	7439-92-1	800	400	NA	NA	90	90	5	1.677835
Manganese (total)	7439-96-5	31000	1900	4.00E+05	87000	NA	1900	500	75.2848
Mercury (total)	7439-97-6	390	23	NA	520000	0.1	0.1	0.5*	0.162714
Nickel (total)	7440-02-0	26000	1600	93000	20000	48	48	5	1.356308
Selenium (total)	7782-49-2	6500	390	NA	NA	11	11	3	1.981444
Silver (total)	7440-22-4	6500	390	NA	NA	0.5	0.5	0.2	0.0261
Vanadium (total)	7440-62-2	6500	390	8.00E+05	170000	NA	390	10	0.8688
Zinc (total)	7440-66-6	390000	23000	NA	NA	930	930	10	2.48973

Matrix: Groundwater
Analytical Group: VOC
Concentration Level: Low
Analytical Method: SW-846 8260B

Compound	NJDEP GWQS	CAS No.	RL	MDL	Units
Acetone	6000	67-64-1	5	4.57679	µg/L
Benzene	1	71-43-2	0.5	0.29569	µg/L
Bromochloromethane	NS	74-97-5	1	0.78578	µg/L
Bromodichloromethane	1	75-27-4	1	0.34522	µg/L
Bromoform	4	75-25-2	1	0.54071	µg/L
Bromomethane	10	74-83-9	1	0.50255	µg/L
2-Butanone (MEK)	300	78-93-3	1	0.74804	µg/L
Carbon disulfide	700	75-15-0	1	0.42352	µg/L
Carbon tetrachloride	1	56-23-5	1	0.32282	µg/L
Chlorobenzene	50	108-90-7	1	0.33055	µg/L
Chloroethane	5	75-00-3	1	0.57964	µg/L
Chloroform	70	67-66-3	1	1.9632	µg/L
Chloromethane	NS	74-87-3	1	0.51583	µg/L
Cyclohexane	NS	110-82-7	1	0.48652	µg/L
Dibromochloromethane	1	124-48-1	1	0.23913	µg/L
1,2-Dichlorobenzene	600	95-50-1	1	0.32392	µg/L
1,3-Dichlorobenzene	600	541-73-1	1	0.3766	µg/L
1,4-Dichlorobenzene	75	106-46-7	1	0.36533	µg/L
Dichlorodifluoromethane	1,000	75-71-8	1	0.61927	µg/L
1,1-Dichloroethane	50	75-34-3	1	0.42759	µg/L
1,2-Dichloroethane	2	107-06-2	1	0.63824	µg/L
1,1-Dichloroethene	NS	75-35-4	1	0.53248	µg/L
cis-1,2-Dichloroethene	70	156-59-2	1	0.63544	µg/L
trans-1,2-Dichloroethene	100	156-60-5	1	0.30957	µg/L
1,2-Dichloropropane	1	78-87-5	1	0.29962	µg/L
cis-1,3-Dichloropropene	1	10061-01-5	1	0.32051	µg/L
trans-1,3-Dichloropropene	1	10061-02-6	1	0.30687	µg/L
Ethylbenzene	700	100-41-4	1	0.46747	µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	20,000	76-13-1	1	0.72743	µg/L
2-Hexanone	40	591-78-6	1	0.60048	µg/L
Isopropylbenzene	700	98-82-8	1	0.49214	µg/L
Methyl Acetate	7000	79-20-9	1	0.70285	µg/L
Methylcyclohexane	NS	108-87-2	1	0.61435	µg/L

Methyl Tert Butyl Ether	70	1634-04-4	0.5	0.312	µg/L
4-Methyl-2-pentanone (MIBK)	NS	108-10-1	1	0.4859	µg/L
Methylene chloride	3	75-09-2	1	0.29407	µg/L
Naphthalene	300	91-20-3	1	0.826	µg/L
Styrene	100	100-42-5	1	0.54364	µg/L
Tertiary butyl alcohol	100	75-65-0	5	2.49983	µg/L
1,1,2,2-Tetrachloroethane	1	79-34-5	1	0.44794	µg/L
Tetrachloroethene	1	127-18-4	1	0.35708	µg/L
Toluene	600	108-88-3	1	0.32565	µg/L
1,2,3-Trichlorobenzene	NS	87-61-6	1	0.78675	µg/L
1,2,4-Trichlorobenzene	9	120-82-1	1	0.72779	µg/L
1,1,1-Trichloroethane	30	71-55-6	1	0.35782	µg/L
1,1,2-Trichloroethane	3	79-00-5	1	0.31904	µg/L
Trichloroethene	1	79-01-6	1	0.34521	µg/L
Trichlorofluoromethane	2000	75-69-4	1	0.30704	µg/L
Vinyl chloride	1	75-01-4	1	0.5739	µg/L
m,p-Xylene	1,000 total xylene	179601-23-1	1	0.84941	µg/L
o-Xylene	1,000 total xylene	95-47-6	1	0.68308	µg/L

All other groundwater analyses will be addressed as required in each site specific QAPP Addendum.

Section 5d. Analytical Laboratory Sensitivity and Project Criteria

The information in the following tables has been adapted from NJDEP, Appendix 2B Guidance for Data Deliverables and the Development of Data Usability Summary Reports. Laboratory Standard Operating Procedures are provided in Appendix C.

Matrix *Soil and Water*
Analytical Group *Volatile Organics*
Concentration Level *Low/Medium*

Analytical Method/SOP	Data Quality Indicators	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
EPA Method 8260C/Laboratory SOP 5001A, 5004A	Precision	RPD ≤20% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)
	Precision	RPD ≤30% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤30% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Generally, 70-130%R (analyte specific)	LCS	(A)
	Accuracy/Precision	Generally, 40-140%R (analyte specific)	MS	(A), (S)
	Accuracy/Extraction Efficiency	70-130%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >RL	Trip Blank, Method Blank & Field Equipment Blank	(A), (S)
	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Matrix *Soil and Water*
Analytical Group *Semi-Volatile Organics*
Concentration Level *Low/Medium*

Analytical Method/SOP	Data Quality Indicators	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
EPA Method 8270D/Laboratory SOP 5002A-C	Precision	RPD ≤50% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)

	Precision	RPD ≤50% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤50% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Generally, 40-140%R for Base Neutrals; 30-130% for Acids (analyte specific)	LCS	(A)
	Accuracy/Precision	Generally, 40-140%R for Base Neutrals; 30-130% for Acids (analyte specific)	MS	(A), (S)
	Accuracy/Extraction Efficiency	30-130%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >Reporting Limit (RL)	Method Blank & Field Equipment Blank	(A), (S)
	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Matrix *Soil and Water*
Analytical Group *Pesticides*
Concentration Level *Low/Medium*

Analytical Method/SOP	**Data Quality Indicators**	**Performance Criteria (related to analytical method)**	**QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
EPA Method 8081B/Laboratory SOP 6001A, 6002A	Precision	RPD ≤30% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)
	Precision	RPD ≤30% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤30% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Generally, 40-140%R	LCS	(A)
	Accuracy/Precision	Generally, 40-140%R	MS	(A), (S)
	Accuracy/Extraction Efficiency	30-150%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >Reporting Limit (RL)	Method Blank & Field Equipment Blank	(A), (S)

	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Matrix *Soil and Water*
Analytical Group *PCBs*
Concentration Level *Low/Medium*

Analytical Method/SOP	Data Quality Indicators	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
EPA Method 8082A/Laboratory SOP 6002A, 6003A	Precision	RPD ≤30% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)
	Precision	RPD ≤30% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤30% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Generally, 40-140%R	LCS	(A)
	Accuracy/Precision	Generally, 40-140%R	MS	(A), (S)
	Accuracy/Extraction Efficiency	30-150%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >Reporting Limit (RL)	Method Blank & Field Equipment Blank	(A), (S)
	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Matrix *Soil and Water*
Analytical Group *Metals*
Concentration Level *Low/Medium*

Analytical Method/SOP	Data Quality Indicators	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
EPA Method 6010C /Laboratory SOP 4216B AND 4223	Precision	RPD ≤20% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)
	Precision	RPD ≤20% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤20% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Generally, 80-120%R	LCS	(A)

	Accuracy/Precision	Generally, 75-125%R	MS	(A), (S)
	Accuracy/Extraction Efficiency	80-120%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >Reporting Limit (RL)	Method Blank & Field Equipment Blank	(A), (S)
	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Matrix *Soil and Water*
Analytical Group *Mercury*
Concentration Level *Low/Medium*

Analytical Method/SOP	**Data Quality Indicators**	**Performance Criteria (related to analytical method)**	**QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
EPA Method 7470A and 7471B/ Laboratory SOP 4206 and 4207A	Precision	RPD ≤20% (analyte specific)	Laboratory Control Sample (LCS) Duplicate	(A)
	Precision	RPD ≤20% (analyte specific)	Matrix Spike (MS) Duplicate	(A), (S)
	Precision	RPD ≤20% (analyte specific)	Field Duplicates	(A), (S)
	Accuracy/Bias	Vendor Limits	LCS	(A)
	Accuracy/Precision	Generally, 70-130%R	MS	(A), (S)
	Accuracy/Extraction Efficiency	80-120%R	Surrogates	(A)
	Accuracy/Bias (Contamination)	No Target Compounds >Reporting Limit (RL)	Method Blank & Field Equipment Blank	(A), (S)
	Sensitivity	Level of Detection (LOD) Verification	LOD Sample (spiked at 1 to 4 times the detection limit)	(A)

Section 5e. Secondary Data Criteria and Limitations Table

Any secondary data for the project sites will be provided in the site-specific QAPP Addendum.

Section 6. Project Specific Method and Standard Operating Procedures (SOPs) Reference Table

Copies of the Field Sampling SOPs and Analytical laboratory SOPs will be provided in the site-specific QAPP Addendum, as may be applicable.

ANALYTICAL METHOD REFERENCE (*Include document title, method name/number, revision number, date)*
1a. Method 8260B: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), part of Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; USEPA, Revision 3, August 2006.
2a. SW846 8270D Semivolatile Compounds by Gas Chromatography/Mass Spectroscopy Revision 5 July 2014
3a. SW846 8081B Organochlorine Pesticides by Gas Chromatography Revision 2 February 2007
4a. SW846 8082A Polychlorinated Biphenyls by Gas Chromatography Revision 1 February 2007
5a. EPA Method 6010C, Inductively Coupled Plasma-Atomic Emission Spectrometry, 2007 Rev. 3
6a. EPA Method 7470A, Mercury in Liquid Waste (Manual Cold Vapor Technique), 1994, Rev. 3 and EPA Method 7471B, Mercury in Soil or Semisolid Waste (Manual Cold Vapor Technique), 1994
7a. USEPA Method 537, 537.1, ISO 25101, or 533
ANALYTICAL LABORATORY SOPs (*Include document title, date, revision number, and originator=s name)*
5001A Volatile Organic Compounds by Gas Chromatography / Mass Spectrometry (GS/MS) 624.1 Rev Date 2/20/2020
5004A Volatile Organic Compounds by GC/MS 8260 Rev Date 9/18/2020
5002A, 5003B-C Base/Neutral Acid Extractable Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) Rev Date 2/24/2020
6001A Analysis of Organochlorine Pesticides GC ECD Rev Date 5/15/2020
Polychlorinated Biphenyls by GC Rev Date 2/22/2020
4207 Determination of Mercury using Cold Vapor Analysis Rev Date 9/10/2021
4216B Metals by Inductively Coupled Plasma Rev Date 2/20/2020
4206 Determination of Mercury using Cold Vapor Analysis Rev Date 6/20/2019
FIELD SAMPLING SOPs (*Include document title, date, revision number, and originator's name)*
Non-Aqueous Sample Handling, May 2020
Field Documentation, May 2020
Investigation Derived Waste Management, May 2020
Location Logging, May 2020

Soil Sampling, May 2020
Investigation Derived Waste, May 2020
Location Logging, May 2020

Section 7. Field Equipment Calibration, Maintenance, Testing, and Inspection

All equipment and instruments (other than analytical instrumentation) that require calibration, maintenance, testing or inspection are provided below. All equipment is maintained by the factory, which is responsible for availability and location of spare parts.

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria		Corrective Action	SOP Reference
YSI or equivalent	Calibrate with standard solutions	Yearly factory calibration & cleaning; Replace probes as needed	Annual	Prior to day's activities; end of day's activities; anytime anomaly suspected	pH Meter	+/- 0.1 units	Clean probe, replace battery, replace membrane, replace probe	SOP per the manufacturer's manual
					Dissolved Oxygen	± 3%		
					Specific Conductivity	± 1%		
					Temperature	± 0.1 °C		
					Turbidity	± 2 NTU		
MiniRAE Lite or equivalent PID	Calibrate with ambient air and standard reference gas (span gas)	Yearly factory calibration & cleaning by MiniRae certified service shop. Replace particulate filter trap once per month of use, or sooner in dusty environments	Test and calibrate with a known concentration of isobutylene gas. Inspect outer casing of instrument to ensure that probe is correctly attached to the body of the PID and that no foreign objects are present in the probe	Every 30 days; the sensor has been replaced; anytime anomaly suspected	NA		Clean PID lamp, replace battery, calibrate if necessary	SOP per the manufacturer's manual: MiniRae Lite User's Guide, Revision D, Effective October 2011

Section 8. Analytical Laboratory Instrument and Equipment Maintenance, Testing, and Inspection

The following table provides procedures and references for analytical laboratory instrument and equipment maintenance, testing and inspection. Analytical laboratory SOPs will be provided in the site-specific QAPP Addendum, as may be applicable. All equipment is maintained by the laboratory, which is responsible for availability and location of spare parts.

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Analytical SOP Reference
GC/MS (VOCs + 30 TICS)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	Laboratory GC/MS Technician	1a
GC/MS (SVOCs + 30 TICS)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	Laboratory GC/MS Technician	2a
GC/ECD (PCBs)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	Laboratory GC/ECD Technician	4a
GC/ECD (Pesticides)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	Laboratory GC/ECD Technician	3a
ICP-SS (Metals)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	Laboratory ICP-SS Technician	5a
CV (Mercury)	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable recalibration; see Lab SOP in QAPP Addendum	Inspect the system, correct problem, recalibrate and/or	Laboratory Mercury Cold Vapor Technician	6a

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Analytical SOP Reference
					reanalyze samples.		

Analytical Laboratory Instrument Calibration

The following table provides information pertaining to initial and continuing calibrations of the analytical instrumentation that will be used in the laboratory analysis.

Instrument/Equipment	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Responsible Person	Analytical SOP Reference
GC/MS for VOCs + 30 TICS and SVOCs + 30 TICS	Refer to Method 8260	**GC/MS Initial calibration:** Whenever major instrument maintenance or modification is performed (e.g., column replacement or repair, or if the calibration verification technical acceptance criteria have not been met. C**alibration verification:** TBD	≤20%	GC/MS: inspect the system, correct problem, re-calibrate.	Laboratory GC/MS Technician	1a
GC/ECD for PCBs and Pesticides	Refer to SW846 8270D	**GC/ECD Initial calibration:** Whenever major instrument maintenance or modification is performed (e.g., column replacement or repair, cleaning or replacement of ECD, etc.) or if the calibration verification technical acceptance criteria have not been met. **Continuing calibration:** At the beginning and end of each analytical batch.	<20%	GC/ECD: inspect the system, correct problem, re-calibrate, re-analyze samples.	Laboratory GC/ECD Technician	4a
ICP/ICP-SS Metals	Refer to EPA Method 6010C	**ICP/ICP-SS Initial calibration:** Daily, prior to the analysis of samples. **Continuing calibration:** TBD	≤10%	ICP/ICP-SS: inspect the system, correct problem, re-calibrate, re-analyze samples.	Laboratory ICP-SS Technician	5a
CV Mercury	Refer to EPA Method 7470A	**CV Initial calibration:** Daily, prior to the analysis of	≤10%	CV: inspect the system, correct problem, re-	Laboratory Mercury Cold Vapor Technician	6a

		samples. **Continuing calibration:** TBD		calibrate, re-analyze samples.		

Section 9a. Sample Handling System

The following table presents the field and laboratory sample handling systems.

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): BRS or TBD Personnel
Sample Packaging (Personnel/Organization): BRS or TBD Personnel
Coordination of Shipment (Personnel/Organization): BRS or TBD Personnel
Type of Shipment/Carrier: BRS, TBD or Lab currier Personnel
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Hampton – Clark Personnel
Sample Custody and Storage (Personnel/Organization): Hampton -Clark Personnel
Sample Preparation (Personnel/Organization): Hampton-Clark Lab Personnel
Sample Determinative Analysis (Personnel/Organization): Hampton-Clark Personnel
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples to be sent to Hampton-Clark Lab by BRS or TBD Personnel the same day as the sampling. Samples to be stored on ice and continuously kept cool to 4ºC±2°C until arrival at the laboratory, up to 1 day.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): As per analytical methodology; See Section 6.
SAMPLE DISPOSAL
Personnel/Organization: Hampton-Clark Personnel
Number of Days from Analysis: Until analysis and QA/QC checks are completed; as per analytical methodology; See Section 6.

Section 9b. Sample Custody Requirements

Sample custody documentation will be contained in the laboratory's quality assurance manual which will be provided in the site-specific QAPP Addendum, as may be applicable. The following presents an overview of the sample custody requirements.

Sample Identification Procedures: Sampling media will be identified by a letter/number code as follows: SB-XX (sample depth). A one or two-digit number, beginning with 1 and increasing sequentially, will identify each boring location. Following the boring number, the end of the depth interval (listed numerically) from which the sample was collected will appear in parentheses.

Each sample will be labeled immediately following collection and recorded in chain-of-custody records.

Field Sample Custody/Tracking Procedures (sample collection, packaging, shipment, and delivery to laboratory: Samples submitted for laboratory analysis will be placed in laboratory provided sampling containers. The sample containers will be packaged in a laboratory provided cooler containing ice so that the samples can be kept cooled to approximately 4^0 C±2°C. Bubble wrap, or other protective material, will be placed in the cooler to protect the integrity of the sampling containers.

Chain-of-Custody Procedures: Samples will be collected by BRS, or TBD personnel. A chain-of-custody form will be initiated with the sample collection. All samples will be traced from bottle preparation, sample collection, shipment, laboratory receipt, and laboratory custody. Labels will be affixed to sample containers with a minimum of the following information: sample number, sample location, date/time, and name of sampler. Following sample collection, BRS, or TBD personnel will transport the samples directly to the New Jersey State-accredited laboratory where the samples will be transferred to laboratory custody following standard chain-of-custody procedure.

The chain-of-custody form is signed by all individuals responsible for sampling, sample transport and laboratory receipt. A copy of the fully signed chain of custody form is also kept with the project file by the project manager, the laboratory manager, and attached to the data package. The laboratory will be responsible for monitoring an internal chain-of-custody following receipt of the samples. Should it be required that the samples be shipped or delivered by a non-laboratory employed person (courier), the cooler/envelope/box will be sealed with the chain-of-custody form inside through the use of a chain-of-custody seal and tape prior to release by consultant personnel. The chosen laboratory's chain-of-custody form will be provided in the site-specific QAPP Addendum.

Section 10. Field and Analytical Laboratory Quality Control Summary

The following tables present field and analytical laboratory quality control measures. Analytical laboratory quality control methods will be provided in the site-specific QAPP Addendum.

Matrix	Soil/Aqueous
Analytical Group	Volatiles
Concentration Level	Reported as µg/kg (ppb)/ µg/L (ppb)
Sampling SOP(s)	Appendix D
Analytical Method/SOP Reference	EPA Method 8260B
Sampler's Name	TBD
Field Sampling Organization	BRS or TBD
Analytical Organization	Hampton-Clark or TBD
No. of Sample Locations	TBD

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Outside Contamination	<RL
Field Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Contamination/ Cross-Contamination	<RL
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified	Laboratory GC/MS Analyst and/or QA Officer	Contamination/ Cross-Contamination	No constituent > RL
Surrogate	Added to all samples prior to extraction.	Dibromofluoromethane (70-130%) 1,2-Dichloroethane-d4 (70-130%) Toluene-d8 (70-130%) Bromofluorobenzene (70-130%)	Check calculations and/or surrogate solutions; check instrument performance, correct any problems and reanalyze the sample to confirm.	Laboratory GC/MS Analyst and/or QA Officer	Accuracy	Recoveries within normal ranges per Method criteria.

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike	1 per ≤ 20 samples	Average Recovery 70-130%* (*40-160 for the following compounds: Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane, Trichlorofluoromethane, Acetone, Carbon disulfide, 1,4-Dioxane, 4-Methy-2-Pentanone, 2-Hexanone, 1,2-Dibromo-3-chloropropane, Naphthalene)	Flag Outliers	Laboratory GC/MS Analyst and/or QA Officer	Accuracy/Matrix Interference	Recoveries within normal ranges per Method criteria.
Matrix Spike Duplicate	1 per ≤ 20 samples	≤30% RPD	Flag outliers	Laboratory GC/MS Analyst and/or QA Officer	Precision	≤30% RPD
Field Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Sampling Technician and/or QA Officer	Precision	≤ 20% RPD

Matrix	Soils/ Aqueous
Analytical Group	Semi-Volatiles
Concentration Level	Reported as mg/kg (ppm)/ µg/L (ppb)
Sampling SOP(s)	Appendix D
Analytical Method/SOP Reference	EPA Method 8270D
Sampler's Name	TBD
Field Sampling Organization	BRS or TBD
Analytical Organization	Hampton-Clark or TBD
No. of Sample Locations	TBD

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Outside Contamination	<RL

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Contamination/ Cross-Contamination	<RL
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re-extract and reanalyze affected samples or qualify analytical data "B" flag	Laboratory GC/MS extraction Technician/Analyst and/or QA Officer	Contamination/Cross-Contamination	No constituent > RL
Surrogate	Added to all samples prior to extraction.	2-Fluorophenol (30-130%) Phenol-d5 (30-130%) Nitrobenzene-d5 (30-130%) 2-Fluorobiphenyl (30-130%) 2,4,6-Tribromophenol (30-130%) Terphenyl-d14 (30-130%)	Check calculations and/or surrogate solutions; check instrument performance, correct any problems and reanalyze the sample to confirm.	Laboratory GC/MS Analyst and/or QA Officer	Accuracy	Recoveries within normal ranges per Method criteria.
Matrix Spike	1 per ≤ 20 samples	Average Recovery 70-130%* (*20-160% for the following compounds:Pyridine, N-Nitrosodimethylamine, Benzylaldehyde, Aniline,Pentachloroethane, Phenol, N-Decane,Benzyl alcohol, Hexachloroethane, 3&4Methylphenol, Benzoic Acid, Caprolactam, Hexachlorocyclopentadiene, 2,4-Dinitrophenol, 4- Nitropheno, Pentachlorophenol, Benzidine)	Flag Outliers	Laboratory GC/MS extraction Technician/Analyst and/or QA Officer	Accuracy/Matrix Interference	Recoveries within normal ranges per Method criteria.
Matrix Spike Duplicate	1 per ≤ 20 samples	≤ 30% RPD	Flag outliers	Laboratory GC/MS extraction Technician/Analyst and/or QA Officer	Precision	≤30% RPD
Field Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Sampling Technician and/or QA Officer	Precision	≤ 20% RPD

Matrix	Soils/ Aqueous
Analytical Group	PCBs
Concentration Level	Reported as mg/kg (ppm)/ µg/L (ppb)
Sampling SOP(s)	Appendix D
Analytical Method/SOP Reference	SW-846 8082A
Sampler's Name	TBD
Field Sampling Organization	BRS or TBD
Analytical Organization	Hampton-Clark or TBD
No. of Sample Locations	TBD

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Outside Contamination	<RL
Field Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Contamination/ Cross-Contamination	<RL
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re- extract and reanalyze affected sample, or qualify analytical data "B" flag	Laboratory GC-ECD extraction Technician and/or QA Officer	Contamination/ Cross-Contamination	No constituent > RL
Surrogate	Added to all samples prior to extraction.	DCB (30% - 150%) TCMX (30% - 150%)	Check calculations and/or surrogate solutions; check instrument performance , correct any problems and re-analyze the extract.	Laboratory GC-ECD extraction Technician and/or QA Officer	Accuracy	DCB (30% - 150%) TCMX (30% - 150%)
Matrix Spike	1 per ≤ 20 samples	% RPD Aroclor 1016 ≤ 30% Aroclor 1260 ≤ 30%	Flag outliers	Laboratory GC/MS extraction Technician/A nalyst and/or QA Officer	Precision	% RPD Aroclor 1016 ≤30 % Aroclor 1260 ≤30%

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate	1 per ≤ 20 samples	% RPD Aroclor 1016 ≤ 30% Aroclor 1260 ≤ 30%	Flag outliers	Laboratory GC-ECD extraction Technician and/or QA Officer	Precision	% RPD Aroclor 1016 ≤30 % Aroclor 1260 ≤30%
Field Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Sampling Technician and/or QA Officer	Precision	≤ 20% RPD

Matrix	Soils/ Aqueous
Analytical Group	Pesticides
Concentration Level	Reported as mg/kg (ppm)/ µg/L (ppb)
Sampling SOP(s)	Appendix D
Analytical Method/SOP Reference	SW-846 8081B
Sampler's Name	TBD
Field Sampling Organization	BRS or TBD
Analytical Organization	Hampton-Clark or TBD
No. of Sample Locations	TBD

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Outside Contamination	<RL
Field Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Contamination/ Cross-Contamination	<RL
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re-extract and reanalyze affected samples or qualify analytical data "B" flag	Laboratory GC extraction Technician/ Analyst and/or QA Officer	Contamination/ Cross-Contamination	No constituent > RL

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate	Added to all samples prior to extraction.	TCMX (30-150%) DCB (30-150%)	Check calculations and/or surrogate solutions; check instrument performance, correct any problems and re-analyze the extract.	Laboratory GC extraction Technician/ Analyst and/or QA Officer	Accuracy	TCMX (30-150%) DCB (30-150%)
Matrix Spike	1 per ≤ 20 samples	Average Recovery 30-150%	Flag Outliers	Laboratory GC extraction Technician/ Analyst and/or QA Officer	Accuracy/Matrix Interference	Average Recovery 30-150%
Matrix Spike Duplicate	1 per ≤ 20 samples	RPD ≤30%	Flag outliers	Laboratory GC extraction Technician/ Analyst and/or QA Officer	Precision	≤30% RPD
Field Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Sampling Technician and/or QA Officer	Precision	≤20% RPD

Matrix	Soils/ Aqueous
Analytical Group	Metals
Concentration Level	Reported as mg/kg (ppm)/ µg/L (ppb)
Sampling SOP(s)	Appendix D
Analytical Method/SOP Reference	SW-846 6010C, 6020A, 7471B
Sampler's Name	TBD
Field Sampling Organization	BRS or TBD
Analytical Organization	Hampton-Clark or TBD
No. of Sample Locations	TBD

Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Outside Contamination	<RL
Field Blank	1 per ≤ 20 samples	<RL	reanalyze affected sample, qualify analytical data	Laboratory Analyst and/or QA Officer	Contamination/ Cross-Contamination	<RL
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re-extract and reanalyze affected samples	Laboratory Metals Technician/ Analyst and/or QA Officer	Contamination/ Cross-Contamination	No constituent > RL
Matrix Spike	1 per ≤ 20 samples	100 ±25% Recovery	Flag Outliers	Laboratory Metals Technician/ Analyst and/or QA Officer	Accuracy/Matrix Interference	100 ±25% Recovery
Matrix Spike Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Laboratory Metals Technician/ Analyst and/or QA Officer	Precision	≤ 20% RPD
Field Duplicate	1 per ≤ 20 samples	≤ 20% RPD	Flag outliers	Sampling Technician and/or QA Officer	Precision	≤20% RPD
Laboratory Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re-extract and reanalyze affected samples	Laboratory Metals Technician/ Analyst and/or QA Officer	Contamination/ Cross-Contamination	No constituent > RL

Section 11a. Data Management and Documentation

The following table presents project related data management and documentation criteria.

Field Sample Collection Documents and Records	Analytical Laboratory Documents and Records	Data Assessment Documents and Records	Project File
• Site and field logbooks • Applicable figures and tables for sampling location identification • Geoprobe Logs • Organic Vapor Headspace Analysis Logs • Monitoring Well Construction Logs • Chain-of-Custody (COC) forms	• Sample receipt logs • Internal and external COC forms • Equipment calibration logs • Sample preparation worksheets/logs • Sample analysis worksheets/run logs • Telephone/email logs • Corrective action documentation • Narrative • Sample Data • Calibration data (initial and continuing verification) • QC forms (surrogate, spike recovery, blank summary and drift forms).	• Data validation reports • Field inspection checklist(s) • Laboratory Audit checklist (if performed) • Review forms for electronic entry of data into database • Corrective action documentation • ASP Category B analytical data package provided by the laboratory • Data Usability Summary Report	• Project files to be stored in BRS electronic project directory for a period of at least five years. Files will also be stored at NJEDA.

Section 11b. Project Reports

The types of reports that will be routinely provided during the Brownfields project (e.g., status reports, final reports, etc.) are provided below.

Type of Report *	Frequency (Daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Status Report	Monthly	By the 10th day of the month	BRS	EPA Region 2 BPO and NJEDA
Laboratory Analytical Data Package	One Time	Within 10 days of laboratory receipt of field samples	Hampton-Clark or TBD	TBD
Data Usability Summary Report (If Required)	One Time	Within 10 days of receipt of laboratory analytical data package	BRS	TBD
Phase II ESA Report	One Time	Within 30 days of receipt of Data Usability Summary Report (if required)	BRS	EPA Region 2 BPO and NJEDA

* Any other report related to the site investigation will be delivered within 30 days of the delivery date and will be sent to NJEDA, BRS, and the EPA Project Officer.

Section 12a. Planned Project Assessments Table

The following table identifies the type, frequency and responsible parties of planned assessment activities for the project.

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
On-Site Field Inspection	Periodically	Internal	BRS or TBD	Project Manager, BRS or TBD	Project Manager, BRS or TBD	Senior Project Scientist, BRS or TBD	Project Manager, BRS
Inspection of Field Logs	Periodically	Internal	BRS or TBD	Project Manager, BRS or TBD	Project Manager, BRS or TBD	Senior Project Scientist, BRS or TBD	Project Manager, BRS
Review of Laboratory Data Package	Upon receipt of data package	Internal and External	BRS	Project Manager, BRS	Project Manager, BRS	Senior Project Scientist, BRS	Project Manager, BRS
Review of Data Usability Summary Report	Upon receipt of Data Usability Summary Report	Internal	BRS	Project Manager, BRS	Project Manager, BRS	Senior Project Scientist, BRS	Project Manager, BRS
Review of Phase II ESA Report	Upon Completion	Internal	BRS	Project Manager, BRS	Project Manager, BRS	Senior Project Scientist, BRS	Project Manager, BRS

Section 12b. Assessment Findings and Corrective Action Responses

The following table lists anticipated corrective actions that will be undertaken for planned project assessments identified in the table in Section 12a. This table is to be updated by BRS and sent to the EPA PO and NJEDA prior to implementation of the Phase II and/or other site investigatory work.

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Observations/ Deviations from Work Plan/Log Books	Field supervisor field log	Project Manager, BRS or TBD	Within one business day	Field supervisor field log	Project Manager, BRS	Within one business day
Laboratory Data Package	Data Usability Summary Report	Project Manager, BRS	Within 30 days from receipt of Laboratory Data Package	Email/Telephone	Project Manager, NJEDA	Within one business day
Data Usability Summary Report	Written Report	Project Manager, BRS	Within one business day	Internal Email	Project Manager, NJEDA	Within one business day
Phase II ESA Report	Electronic and/or handwritten	Project Manager, BRS	Upon completion of report review	Internal Report QA/QC signoff sheet	Project Manager, BRS	Upon completion of internal QA/QC

Section 13a. Project Data Verification Process (Step I)

The following table describes the processes that will be followed to verify document project data completeness.

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Site/Field Logbooks	Field notes will be prepared daily by the Environmental Consultant Project Manager and will be complete, appropriate, legible and pertinent. Upon completion of field work, logbooks will be placed in the project files.	I	Project Manager, BRS or TBD
Chains of custody	COC forms will be reviewed against the samples packed in the specific cooler prior to shipment. The reviewer will initial the form. An original COC will be sent with the samples to the laboratory, while copies are retained for (1) the Sampling Trip Report and (2) the project files.	I	Project Manager, BRS or TBD
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	I	Hampton-Clark
Laboratory analytical data package	Data packages will be reviewed as to content and sample information upon receipt by the Environmental Consultant Project Manager and the Third Party Data Validation Personnel.	I/E	Project Manager, BRS or TBD
Final Sample Report	The project data results will be compiled in a sample report for the project. Entries will be reviewed/verified against hardcopy information.	I	Project Manager, B**RS**

Section 13b. Project Data Validation Process (Steps IIa and IIb)

The following table describes the processes that will be followed to validate project data and includes how the data will be checked, when data validation will occur and necessary documentation, and the organization responsible for data validation.

Step IIa/IIb[1]	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved.	BRS Project Manager
IIb	SOPs	Determine potential impacts from noted/approved deviations, in regard to PQOs.	BRS Project Manager
IIa	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.).	BRS Project Manager
IIa	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.).	BRS Project Manager
IIb	Laboratory data package	Determine potential impacts from noted/approved deviations, in regard to PQOs. Examples include PQLs and QC sample limits (precision/accuracy).	BRS Project Manager
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria	BRS Project Manager

1Step IIa – Compliance with Methods, Procedures, and Contracts as identified on Table 1 in Section 13d.
1Step IIb – Comparison with Performance Criteria in QAPP as identified on Table 1 in Section 13d.

Section 13c. Project Matrix and Analytical Validation (Steps IIa and IIb) [1] Summary

The following table identifies the matrix, analytical group, and concentration level that the validator will be responsible for, as well as criteria that will be used to validate those data.

Step IIa/IIb[1]	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa / IIb	Soil	VOCs + 30 TICS	Low/Medium	USEPA User's Guide to the Contract Laboratory Program, (EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD
IIa / IIb	Soil	SVOCs + 30 TICS	Low/Medium	USEPA User's Guide to the Contract Laboratory Program, (EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD
IIa / IIb	Soil	PCBs	Low/Medium	USEPA User's Guide to the Contract Laboratory Program, (EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD
IIa / IIb	Soil	Pesticides	Low/Medium	USEPA User's Guide to the Contract Laboratory Program(EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD
IIa / IIb	Soil	Metals	Low/Medium	USEPA User's Guide to the Contract Laboratory Program, (EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD
IIa / IIb	Aqueous	VOCs + 30 TICS	Low/Medium	USEPA User's Guide to the Contract Laboratory Program(EPA 540-R-08-01, November 2020) Organic and Inorganic Validation Functional Guidelines	Data Validator, BRS or TBD

1Step IIa – Compliance with Methods, Procedures, and Contracts as identified on Table 1 in Section 13d.
1Step IIb – Comparison with Performance Criteria in QAPP as identified on Table 1 in Section 13d.

Section 13d. Usability Assessment (Step III)

A data evaluator will be named in the QAPP Addendum that will review the data package provided by the laboratory to determine if the quality control data is within the performance criteria (precision, accuracy, etc). Generally, validation of the data package will include: data completeness; holding times and sample preservation; surrogate spike recoveries, MS/MSD recoveries; LCS recoveries; method blank and field blank contamination; gas chromatography tuning; initial and continuing calibration summaries; compound quantitation; internal standard area and retention time summary forms; and field duplicate sample precision. Results of data validation will be presented in a Data Usability Summary Report (DUSR), which will describe the rationale for the data and the presentation of any data limitations and/or rejections.

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

Identify analytes detected. Review causes of possible low-biased results, including low recoveries, improper preservation, improper handling, or holding time exceedance. Review causes of possible high-biased results, including high recoveries or blank contamination. Assess uncertainty measures, including variability in duplicate results, LCS/LCSD and MS/MSD.

Describe the evaluative procedures used to assess overall measurement error associated with the project:
Determine if the quality control data is within the performance criteria (precision, accuracy, etc) through validation process IIb (Validation Activities). The performance measures used for project data validation are included on the Data Validation General Flagging Conventions provided by Envirodata, the database software package used, and provided after Table 1 and the Data Usability Evaluation worksheet below. This file provides performance measure calculations and how these criteria will be determined and reported.

Identify the personnel responsible for performing the usability assessment:
BRS or TBD

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
A Data Usability Evaluation worksheet will be completed in a format determined by the environmental database used by BRS. An example will be provided in the QAPP Addendum.

Table 1

Data Elements for Data Review Process				
Item	Step I - Data Verification	Step IIa - Data Validation Compliance	Step IIb - Data Validation Comparison	Step III - Data Usability
Planning Documents				
Evidence of approval of QAPP	X			Use outputs from previous steps
Identification of personnel	X			
Laboratory name	X			
Methods (sampling & analytical)	X	X	X	
Performance requirements (including QC criteria)	X	X		
Project quality objectives	X		X	
Reporting forms	X	X		
Sampling plans – locations, maps grids, sample ID numbers	X	X		
Site identification	X			
SOPs (sampling & analytical)	X	X		
Staff training & certification	X			
List of project-specific analytes	X	X		
Analytical Data Package				
Case narrative	X	X	X	Use outputs from previous steps
Internal lab chain of custody	X	X		
Sample condition upon receipt, & storage records	X	X		
Sample chronology (time of receipt, extraction/digestion, analysis)	X	X		
Identification of QC samples (sampling /lab)	X	X		
Associated PE sample results	X	X	X	
Communication Logs	X	X		
Copies of lab notebook, records, prep sheets	X	X		
Corrective action reports	X	X		
Definition of laboratory qualifiers	X	X	X	
Documentation of corrective action results	X	X	X	
Documentation of individual QC results (e.g., spike, duplicate, LCS)	X	X	X	
Documentation of laboratory method deviations	X	X	X	
Electronic data deliverables	X	X		
Instrument calibration reports	X	X	X	
Laboratory name	X	X		
Laboratory sample identification no.	X	X		
QC sample raw data	X	X	X	
QC summary report	X	X	X	
Data Elements for Data Review Process				

Raw data	X	X	X	Use outputs from previous steps
Reporting forms, completed with actual results	X	X	X	
Signatures for laboratory sign-off (e.g., laboratory QA manager)	X	X		
Standards traceability records (to trace standard source form NIST, for example)	X	X	X	
Sampling Documents				
Chain of custody	X	X		Use outputs from previous steps
Communication logs	X	X		
Corrective action reports	X	X	X	
Documentation of corrective action results	X	X	X	
Documentation of deviation from methods	X	X	X	
Documentation of internal QA review	X	X	X	
Electronic data deliverables	X	X		
Identification of QC samples	X	X	X	
Meteorological data from field (e.g., wind, temperature)	X	X	X	
Sampling instrument decontamination records	X	X		
Sampling instrument calibration logs	X	X		
Sampling location and plan	X	X	X	
Sampling notes & drilling logs	X	X	X	
Sampling report (from field team leader to project manager describing sampling activities)	X	X	X	
External Reports				
External audit report	X	X	X	Use outputs from previous steps
External PT sample results	X	X		
Laboratory assessment	X	X		
Laboratory QA plan	X	X		
MDL study information	X	X	X	
NELAP accreditation	X	X		