REMEDIAL INVESTIGATION WORKPLAN

5 Westchester Plaza
Elmsford
Westchester County, New York

November 2021

NYSDEC Site#
C360205

Prepared for:
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Peak Project 2847

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1 INTRODUCTION

Mack-Cali CW Realty Associates L.L.C. (Mack-Cali) has entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate potential chlorinated volatile organic compound (CVOC) contamination at 5 Westchester Plaza (Site, NYSDEC Site #C360205). Per the requirements of the BCA, Peak Environmental LLC (Peak) has prepared this Remedial Investigation Workplan (RIW) for NYSDEC's approval, prior to conducting remedial investigations. The specific objectives of the Remedial Investigation (RI) are to assess if contamination identified during prior investigations is present and evaluate potential vapor intrusion. Results of the proposed investigation detailed herein will be presented in a Remedial Investigation Report.

1.1 HISTORICAL INFORMATION

The Site was improved with the existing 20,200 square foot building in 1968. Prior to construction, the Site was used as agricultural or undeveloped land from at least 1892. Since development in 1968, the Site has been used for various commercial and industrial tenant operations. A former tenant that operated at the Site from at least 1983 to at least 2007 reportedly used chlorinated solvents in their operations and were listed as a Resource Conservation and Recovery Act (RCRA) generator of hazardous halogenated solvent waste. The Site location and layout are presented as **Drawings 1** and **2**, respectively.

1.2 Previous Investigations

A summary of the investigations that have occurred at the Site are presented below. These reports are attached in **Appendix A**.

1.2.1 August 2020 Phase II Report

A Site Investigation (SI) was conducted on the Site in March 2019 and reported by Peak in the *Phase II Report* dated August 2020. The findings of that report included the following:

- A total of three soil borings were advanced and three soil samples were collected. The locations of previously collected samples are presented as **Drawing 3**. Soil samples collected on-Site did not contain CVOCs exceeding applicable New York State Development of Environmental Conservation (NYSDEC) Soil Cleanup Objectives (SCOs) for commercial sites.

- Groundwater was not investigated during the Phase II SI as it was not encountered in soil borings advanced to depths of 13.5 feet below ground surface (ft. bgs).

- Two sub-slab vapor (SSV) samples were collected as presented on **Drawing 4**. Tetrachloroethene (PCE) and trichloroethene (TCE) were detected exceeding their applicable New York State Department of Health Soil Vapor/ Vapor Intrusion Decision Matrices (NYSDOH-DM) at the two sub-slab vapor sample locations.

2 PHYSICAL SETTING

The Site is located within an approximately 0.46-acre parcel in Elmsford, New York. The Site is bounded by commercial properties which are zoned within a "Non-Residential Planned Development District". The

Site is improved with an approximately 20,200 square foot structure. The current use of the Site is non-residential planned development and is currently divided into five separate leaseholds.

2.1 Physical Conditions

The Site was evaluated for environmentally sensitive areas and human receptors including schools, parks, childcare centers and other sensitive populations. There are no applicable environmentally sensitive areas or human receptors within 1,000 feet of the property. There are no residences within 500-feet of the Site.

Soils encountered during previous subsurface investigations conducted at the Site are documented in the Soil boring Logs included in the August 2020 *Phase II Report* prepared by Peak, provided as **Appendix A**. Soils were characterized as light brown medium sands with some fill material.

2.1.1 Geology

According to the United States Department of Agriculture (USDA) Web Soil Survey soil database, the Site is described as "urban land". According to Lower Hudson Bedrock Geographic Information System (GIS) Map from the New York State Museum, the Site is contained within the Manhattan Formation which consists primarily of pelitic schists, amphibolite. Bedrock was not encountered during the investigation.

2.1.2 Hydrogeology

The Site consists of the building located at 5 Westchester Plaza, and it is entirely covered with impermeable material (i.e. building concrete floor slab). The Site recharge area was greatly decreased in 1968, when the building was constructed. Groundwater flow is presumed to follow surface topography and is therefore expected to flow to the west-southwest towards Mine Brook.

2.1.3 Topography

The Site is located approximately 270 feet above mean seal level (amsl) according to the Brownfield, New York United States Geologic Survey (USGS) Topographic Quadrangle. Runoff is transported via roof drains off-Site to vegetated grass areas adjacent to the building and storm sewers located within parking areas. Topography in the surrounding region slopes gently from the northeast to the west-southwest towards Mine Brook and the Saw Mill River. Shallow groundwater flow in unconsolidated formations would be expected to follow local topography and flow in a southwesterly direction.

2.1.4 Surface Water Bodies

The closest surface water body to the Site is Mine Brook, located approximately 0.4 miles from the Site to the west-southwest. Mine Brook ultimately leads to Saw Mill River. No other surface water bodies exist within one-half mile of the Site.

2.2 Conceptual Site Model

A conceptual site model (CSM) was developed based on the findings of the aforementioned SI and Phase II report to produce a simplified outline for understanding the distribution of impacted soil, groundwater, soil vapor, and potential migration pathways.

2.2.1 Potential Sources of Contamination

The potential source of contamination has been identified as a former tenant who operated at 5 Westchester Plaza from at least 1983 to approximately 2007 and was listed as a Resource Conservation

and Recovery Act (RCRA) large-quantity generator of hazardous halogenated solvent waste. It is suspected that during their operations, inadvertent surface releases of chlorinated solvents migrated beneath the building, impacting soil vapor.

2.2.2 Exposure Media

Sampling conducted during the SI revealed SSV impacts at two sample locations, indicating that soil vapor media was impacted and there was potential for exposure through the vapor intrusion pathway. It should be noted that the leasehold where SSV impacts were identified is currently unoccupied. Soil samples collected during the SI did not indicate impacts, and groundwater was not previously investigated. Therefore, soil and groundwater are potentially impacted media.

2.2.3 Receptor Populations

The site consists of one 20,200 square foot structure occupied by five commercial leasehold tenants. Current receptor populations include the commercial staff, customers, and staff conducting inspections or investigations onsite. These populations are expected to have limited exposure due to the short amount of time on site.

The Site was evaluated for environmentally sensitive areas and human receptors including schools, parks, childcare centers, and other sensitive populations. There are no applicable environmentally sensitive areas or human receptors within 1,000 feet of the property. There are no residences within 500-feet of the Site.

3 SCOPE OF WORK

Following is a description of the proposed Remedial Investigations including dimensions, suspected contaminants, and suspected source of discharge. Proposed Sample Location Plans for soil, vapor, and groundwater are included with this report as **Drawings 5**, **6**, and **7**, and the Proposed Sampling Summary Table is presented below. Analytical data gathered as part of this RI will be provided as an electronic deliverable submitted to Environmental Quality Information System (EQuIS).

3.1 Vapor Intrusion Investigation

Further investigation is proposed to verify SSV concentrations previously detected during the Phase II SI. Vapor intrusion (VI) will be evaluated during the heating season (November – March) by collecting indoor air samples, co-located with SSV samples. Fifteen vapor samples are proposed including seven SSV, seven indoor air (IA), and one ambient air (AA). The samples will be submitted to the laboratory for USEPA Method TO-15 for volatile organic compounds (VOCs) with a library search. **Drawing 6** depicts proposed vapor intrusion sampling locations. Information pertaining to utilities, wall divisions, foundation partitions, crawl spaces, and floor drains, will be evaluated in the field and **Drawing 6** will be updated accordingly in the next regulatory submittal.

SSV samples SV-1R and SV-2R are proposed to be collected from locations corresponding to those where CVOCs were detected during the Phase II SI. The remaining SSV samples will be collected with at least one sample from each commercial space, biased to locations where workers spend the most time. SSV and indoor air samples will be co-located, with both sets of samples being analyzed concurrently. SSV and indoor air concentrations will be compared to the NYSDOH matrix values to evaluate the VI pathway. Specific Quality Assurance/Quality Control (QA/QC) considerations are discussed in Section 4 below.

3.1.1 Building Walkthrough

Prior to sampling, a building walkthrough and survey will be conducted. The intent of the walkthrough is: to evaluate the construction details of the of the building; to assess the building foundation and possible crawl spaces; and to identify floor drains and subsurface utilities that could potentially act as preferential pathways for vapors to enter the indoor air. Based on the information obtained from the walkthrough, the proposed sampling locations may need to be modified. Identified features, including but not limited to, wall divisions, foundation partitions, crawl spaces, floor drains, and utilities will be added to site drawings.

3.1.2 Sub-Slab Vapor Sampling

To collect the sub-slab vapor samples, a field technician will use a rotary drill to install permanent vapor monitoring points directly into the subsurface soil below the concrete slab. Sub-slab vapor will be purged and sampled in accordance with Section 2.7.1 of the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (SVI). Samples will be collected in batch-certified 1-Liter (L) Summa® passivated stainless-steel canister with 2-hour regulator-controlled collection time, provided by a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory.

3.1.3 Indoor Air Sampling

Peak also proposes to conduct indoor air sampling consisting of collecting seven interior air samples co-located with the SSV samples, and one ambient air sample which will be collected over 24-hour period in a laboratory-supplied, batch-certified Summa® canister.

3.2 Soil Remedial Investigation

A RI to assess soil conditions is proposed which will consist of the installation of approximately eight soil borings, to total depths of approximately 15 feet below grade. Three soil samples that will be collected from each of the eight soil borings. One sample will be collected from the first soils encountered below the building slab (0-2 inches), a second sample will be collected from an interval between 2-24 inches, biased towards field evidence of impacts, i.e., staining, odors, and/or elevated readings from a photoionization detector (PID). A third and final sample will be collected from a deeper depth identified by an environmental professional based upon evidence of contamination for the purposes of vertical delineation. Pursuant to a telephone conversation with Mark Domaracki (NYSDEC Project Manager) on June 17, 2021, the 0-2 inch interval soil sample will be analyzed for VOCs, Target Analyte List (TAL) metals, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, Per and Polyfluoroalkyl Substances (PFAS), and 1,4-dioxane. The deeper sample intervals will initially only be analyzed for VOCs, while the other parameters will be held at the laboratory and analysis will be contingent on results of the shallower samples.

Drilling locations are subject to change based on new data or information received prior to mobilizing, discussion with knowledgeable persons during field activities, direction of the NYSDEC case manager, or other pertinent reasons. **Drawing 5** depicts the prior and proposed soil boring locations. Borings will be installed by a licensed well driller using the direct-push method to the appropriate depth for sampling using a direct-push sleeve.

During drilling activities, a Peak scientist will oversee operations to coordinate Site activities, implement safety protocols, select final drilling locations, direct drillers regarding drilling depths, field screen recovered soil for physical and chemical characteristics, prepare soil boring logs, collect and manage samples for laboratory analysis, and document Site activities.

Samples will be submitted to a NELAP certified analytical laboratory for analysis via the methods presented in Table 2 below on a turnaround time (TAT) of ten business days. Following sample collection, drilling soils will be returned to the borehole and the ground surface will be restored in-kind.

3.3 Groundwater Investigation

A RI to investigate groundwater conditions is proposed and will consist of the installation, survey, and sampling of three monitoring wells at the Site. One monitoring well will be installed in the likely downgradient direction from the building, a second well will be installed in the likely upgradient direction from the building, and the final location will be installed as close as logistically practicable to the SV-1 sample location. Proposed well locations are presented on **Drawing 7**. Monitoring well locations are subject to change based on information received prior to mobilizing, discussion with knowledgeable persons during field activities, the presence of above or below-ground utilities, direction of the NYSDEC project manager, or other pertinent reasons. The wells will be constructed so that the water table is within the screened interval and that the screen interval is at least 10 feet in length. Based on a prior investigation and review of background sources, the precise anticipated depths of the wells is unknown at this time. However, groundwater is expected to be encountered at depths greater than 15 ft., within the bedrock aquifer underlying the Site. Once installed these wells will be developed until the purged water is free of turbidity or 1 hour, whichever is longer.

After an equilibration period of at least 2 weeks, these monitoring wells will be sampled via the low-flow purging and sampling method using a pneumatically powered, positive-displacement, bladder pump. Groundwater samples will be analyzed for TAL Metals, VOCs, SVOCs, PCBs, PFAS, pesticides, and 1,4-dioxane. Due to the collection of samples for PFAS, polytetrafluoroethylene (PTFE) components such as bladders or tubing will not be used. Field and trip blanks will be collected during the groundwater sampling event.

During drilling activities, a Peak scientist will oversee operations to coordinate Site activities, implement safety protocols, select final drilling locations, direct drillers regarding drilling depths, field screen recovered soil for physical and chemical characteristics, prepare soil boring logs, and document Site activities. During sampling activities, a Peak scientist will gauge, purge, and sample each monitoring well and will document geochemical parameters such as pH, conductivity, turbidity, and dissolved oxygen collected during sampling.

Samples will be submitted to a NELAP certified analytical laboratory for analysis via the methods presented in Table 2 below on a turnaround time TAT of 10 business days. Following well installation and sample collection, drilling soils and purged groundwater will be drummed for future disposal.

3.4 Sampling Summary Table

3.4.1 Table 1 - Proposed Sample Summary Table

Field ID	Sample Depth (bgs)	Media	Analytical Parameters*
SV-1R	N/A	Sub-slab Vapor	TO+15
SV-2R	N/A	Sub-slab Vapor	TO+15
SV-3	N/A	Sub-slab Vapor	TO+15
SV-4	N/A	Sub-slab Vapor	TO+15
SV-5	N/A	Sub-slab Vapor	TO+15
SV-6	N/A	Sub-slab Vapor	TO+15
SV-7	N/A	Sub-slab Vapor	TO+15
IA-1	N/A	Indoor Air	TO+15
IA-2	N/A	Indoor Air	TO+15
IA-3	N/A	Indoor Air	TO+15
IA-4	N/A	Indoor Air	TO+15
IA-5	N/A	Indoor Air	TO+15
IA-6	N/A	Indoor Air	TO+15
IA-7	N/A	Indoor Air	TO+15
AA-1	N/A	Ambient Air	TO+15
SB-4	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-D
SB-5	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane
SB-6	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane
SB-7	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane
SB-8	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane
SB-9	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane
SB-10	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane

Field ID	Sample Depth (bgs)	Media	Analytical Parameters*
	than 24" Vertical Delineation		
SB-11	(1) 0-2" below slab (2) 2"-24" Biased to highest PID (3) Deeper than 24" Vertical Delineation	Soil	TCL VOCs, SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane

4 QUALITY ASSURANCE PROJECT PLAN

The following section summarizes the Quality Assurance Project Plan (QAPP) to be implemented for the RI, including proposed sampling/analytical methods pursuant to DER-10 / Technical Guidance for Site Investigation and Remediation (May 2010), NYSDOH SVI, and NELAP. A copy of the QAPP is included as **Appendix B**.

4.1 Soil Sampling

Soil Samples for VOC analysis will be collected utilizing the TerraCore sampling devices and therefore no trip blanks are proposed to be collected, however, a field blank is proposed to be collected. Appropriate bottle ware for the other analyses will be supplied by the laboratory. A NELAP-accredited laboratory will be utilized for sample analysis. QA/QC samples will be collected and analyzed at a rate of one sample per every twenty samples. The QA/QC samples will consist of duplicates, matrix spike/matrix spike duplicates (MS/MSD). Field blanks will be collected at a rate of one sample per week.

4.2 Vapor Intrusion Sampling

Per the NYSDOH SVI guidance document, appropriate QA/QC procedures will be followed during sample collection to ensure that sampling error is minimized, and data of known quality is obtained. Field sampling staff will avoid actions that may cause cross contamination in the field. Equipment utilized in the field will be properly maintained and calibrated. Air sampling equipment and the samples will be stored, transported, and decontaminated by Peak and the laboratory consistent with best environmental consulting practices. Vapor intrusion samples will be submitted to a NELAP-accredited laboratory for analysis of VOCs via USEPA Method TO-15.

Sample preservation and holding times, container types and volumes, sampling methods, equipment calibration, chain of custody procedures, sample storage procedures, and laboratory data deliverable format associated with the proposed Remedial Investigation will be in accordance with procedures and guidelines presented in the NYSDOH SVI.

4.3 Groundwater

Appropriate bottle ware for the groundwater analyses will be supplied by the laboratory. A NELAP-accredited laboratory will be utilized for sample analysis. QA/QC samples will be collected and analyzed at a rate of one sample per every twenty samples. The QA/QC samples will consist of duplicates, matrix spike/matrix spike duplicates (MS/MSD), and field blanks.

4.4 Table 2 - Analytical Methods / Quality Assurance Summary Table

The following table presents information related to the environmental, performance evaluation, and quality control samples to be collected per the proposed remedial investigation.

Location/Matrix	# of Samples	# of Blanks	# of QA/QC Samples	Parameters	Methods
SV/Soil Vapor	7	0	0	VOC	USEPA TO-15
IA/Indoor Air	7	0	0	VOC	USEPA TO-15
AA/Ambient Air	1	0	0	VOC	USEPA TO-15
SB/Soil	24	2	2	VOC; SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane	USEPA 8260, 8270, 6010, 7471, 8082, 8081, 537.1
MW/Groundwater	3	2	1	VOC; SVOC; Metals; PCBs; Pesticides; PFAS; and 1,4-Dioxane	USEPA 8260, 8270, 6010, 7471, 8082, 8081, 537.1

5 REMEDIAL SCHEDULE

An anticipated schedule for proposed remedial investigation activities, including timelines and target dates for the start and completion of field activities; receipt of analytical results and submission of reports is presented below.

5.1 Table 3 - Remedial Investigation Schedule

Task	Description	Proposed Start[1]	Proposed Completion[1]
Vapor Intrusion Investigation	Conducting vapor intrusion investigation as described above	2	5
Soil Remedial Investigation	Conducting soil investigation as described above	2	5
Groundwater Remedial Investigation	Installation and sampling of monitoring wells as described above	2	7
Remedial Investigation Report	Preparing and submitting Remedial Investigation Report documenting investigations	7	11

1 – Weeks after NYSDEC approval of RIW
Schedule is dependent on availability of subcontractors.

6 ROLE OF PRINCIPAL PERSONNEL

6.1 Table 4 - Role of Principal Personnel

Name	Title	Telephone
Robert Edgar	Qualified Environmental Professional	732-326-1010
Matthew Bruno	Senior Project Manager	732-326-1010
Michael Stopen	Project Manager	732-326-1010
Charles Podesta	Project Scientist	732-326-1010
Marco Michanowicz	Staff Scientist	732-326-1010

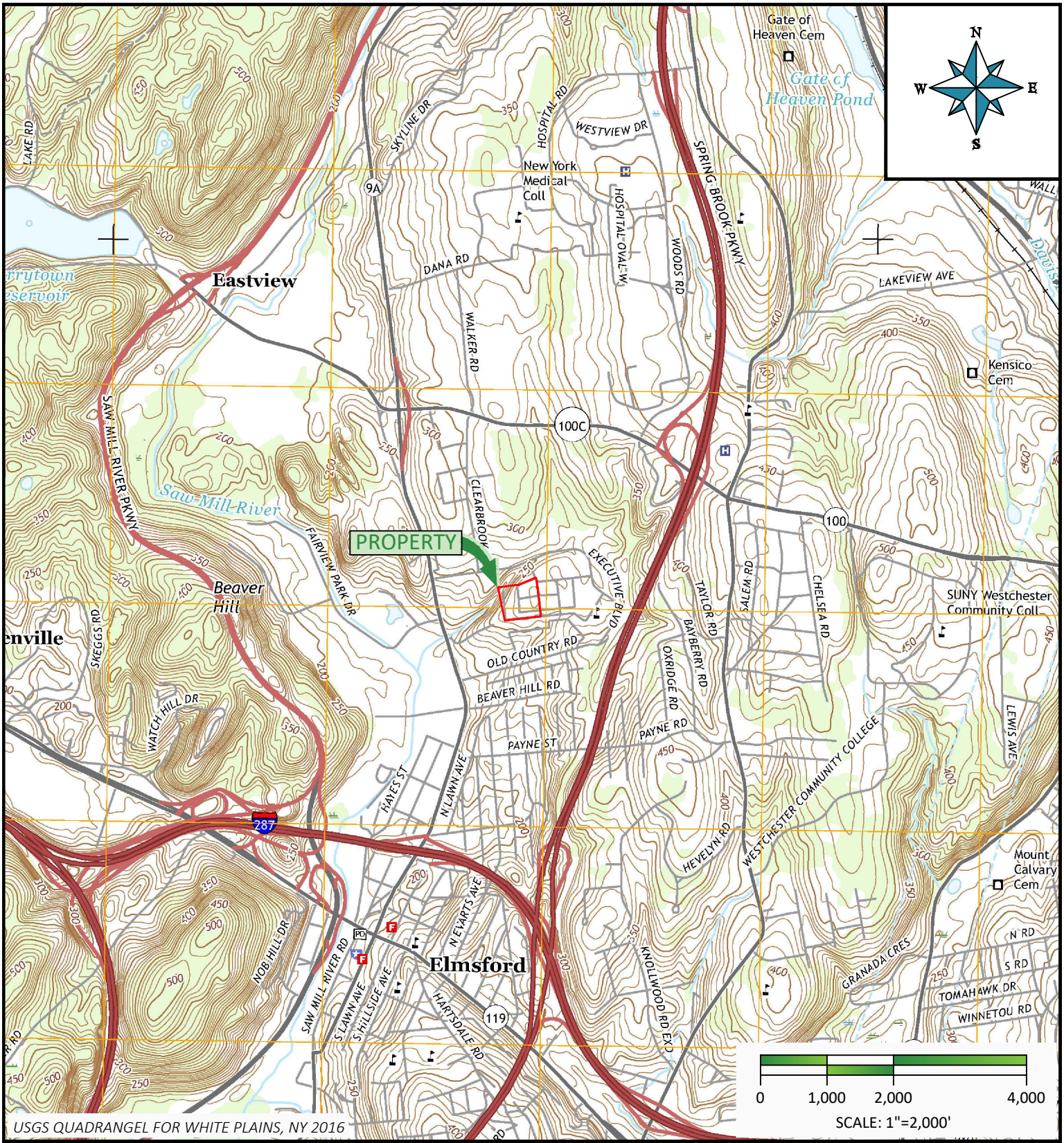
7 HEALTH AND SAFETY PLAN

A site-specific health and safety plan (HASP) has been prepared related to work to be completed by Peak for this investigation. A copy of this document is included as **Appendix C** and will be utilized for implementation of this RIW. The health and safety plan specifies Level D personal protective equipment for this project.

8 COMMUNITY AIR MONITORING PLAN

A site-specific community air monitoring plan (CAMP) has been prepared for intrusive work being conducted by Peak for this investigation. A copy of this document is included as **Appendix D** and will be utilized for implementation of this RIW. This document outlines the continuous and periodic monitoring of VOCs and particulates during the investigation.

DRAWINGS



USGS QUADRANGEL FOR WHITE PLAINS, NY 2016

PEAK ENVIRONMENTAL LLC
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SITE LOCATION MAP

US GEOLOGICAL SURVEY MAPS
http://www.usgs.gov/

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

DRAWN BY: JK
CHECKED BY: MS

PROJECT: 2847
NYSDEC SITE #:C360205
DATE: 11/17/2021

DRAWING 1

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PEAK ENVIRONMENTAL LLC
26 Kennedy Boulevard, Suite A, East Brunswick, NJ 08816
Phone: 732-326-1010 www.peak-environmental.com

LEGEND

PROPERTY BOUNDARY

BROWNFIELD SITE BOUNDARY LINE

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

SITE MAP

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

NYSDEC SITE #: C360205

PROJECT: 2847

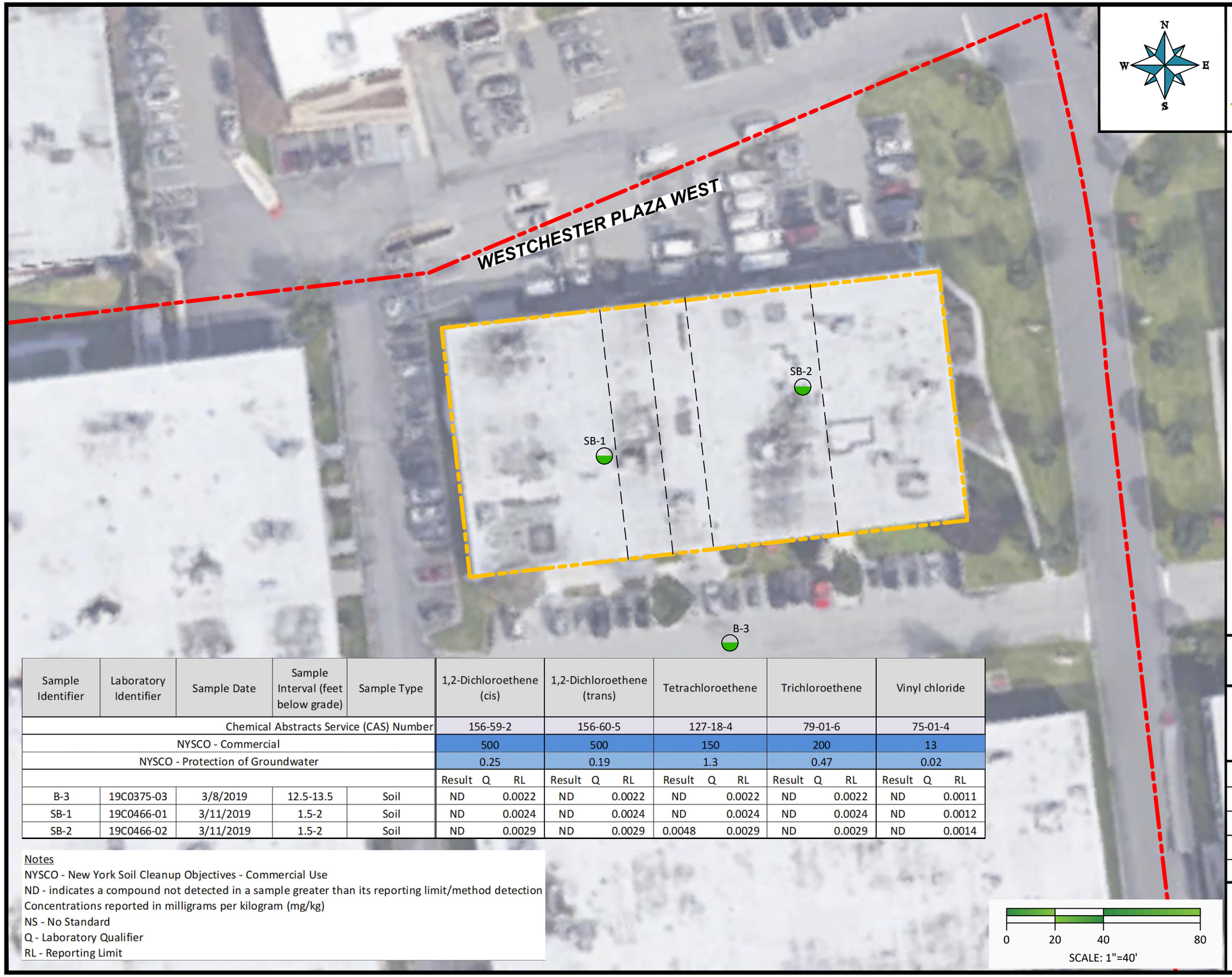
DATE: NOVEMBER 17, 2021

DRAWN BY: JK

CHECKED BY: MS

DRAWING 2

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG



Sample Identifier	Laboratory Identifier	Sample Date	Sample Interval (feet below grade)	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number					156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NYSCO - Commercial					500			500			150			200			13		
NYSCO - Protection of Groundwater					0.25			0.19			1.3			0.47			0.02		
					Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
B-3	19C0375-03	3/8/2019	12.5-13.5	Soil	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0011
SB-1	19C0466-01	3/11/2019	1.5-2	Soil	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0012
SB-2	19C0466-02	3/11/2019	1.5-2	Soil	ND		0.0029	ND		0.0029	0.0048		0.0029	ND		0.0029	ND		0.0014

Notes
NYSCO - New York Soil Cleanup Objectives - Commercial Use
ND - indicates a compound not detected in a sample greater than its reporting limit/method detection
Concentrations reported in milligrams per kilogram (mg/kg)
NS - No Standard
Q - Laboratory Qualifier
RL - Reporting Limit

0 20 40 80
SCALE: 1"=40'

N W E S

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LEGEND

- PROPERTY BOUNDARY
- BROWNFIELD SITE BOUNDARY LINE
- LEASEHOLD BOUNDARY
- EXISTING BUILDING LOCATION
- SOIL SAMPLE LOCATION
- GREEN = COMPLIANT

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

PREVIOUS SOIL SAMPLING LOCATION MAP

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

NYSDEC SITE #: C360205
PROJECT: 2847
DATE: NOVEMBER 17, 2021
DRAWN BY: JK
CHECKED BY: MS

DRAWING 3

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER_NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG

Soil Vapor/Indoor Air Matrix 1

SUB-SLAB VAPOR CONCENTRATION of COMPOUND ($\mu g/m^3$)	INDOOR AIR CONCENTRATION of COMPOUND ($\mu g/m^3$)			
	< 0.25	0.25 to < 1	1 to < 5.0	5.0 and above
< 5	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
5 to < 50	5. No further action	6. MONITOR	7. MONITOR	8. MITIGATE
50 to < 250	9. MONITOR	10. MONITOR/MITIGATE	11. MITIGATE	12. MITIGATE
250 and above	13. MITIGATE	14. MITIGATE	15. MITIGATE	16. MITIGATE

Notes

Matrix obtained from New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York

Decision Matrix 1 for carbon tetrachloride and trichloroethene

Soil Vapor/Indoor Air Matrix 2

SUB-SLAB VAPOR CONCENTRATION of COMPOUND ($\mu g/m^3$)	INDOOR AIR CONCENTRATION of COMPOUND ($\mu g/m^3$)			
	< 3	3 to < 30	30 to < 100	100 and above
< 100	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
100 to < 1,000	5. No further action	6. MONITOR/MITIGATE	7. MITIGATE	8. MITIGATE
1,000 and above	9. MITIGATE	10. MITIGATE	11. MITIGATE	12. MITIGATE

Notes

Matrix obtained from New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York

Decision Matrix 2 for tetrachloroethene and 1,1,1-trichloroethane

Vapor Sample Identifier	Laboratory Identifier	Sample Date	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number				156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NY Vapor Intrusion Screening Levels				6			6			100			6			6		
EPA Vapor Intrusion Screening Levels				NS			NS			1,570			100			93		
				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SV-1	19C0379-01	3/8/2019	Soil-Gas	ND		4	ND		4	13,000	D	14	470		5.4	ND		2.6
SV-2	19C0379-02	3/8/2019	Soil-Gas	ND		0.79	ND		0.79	650		1.4	ND		1.1	ND		0.51

Notes

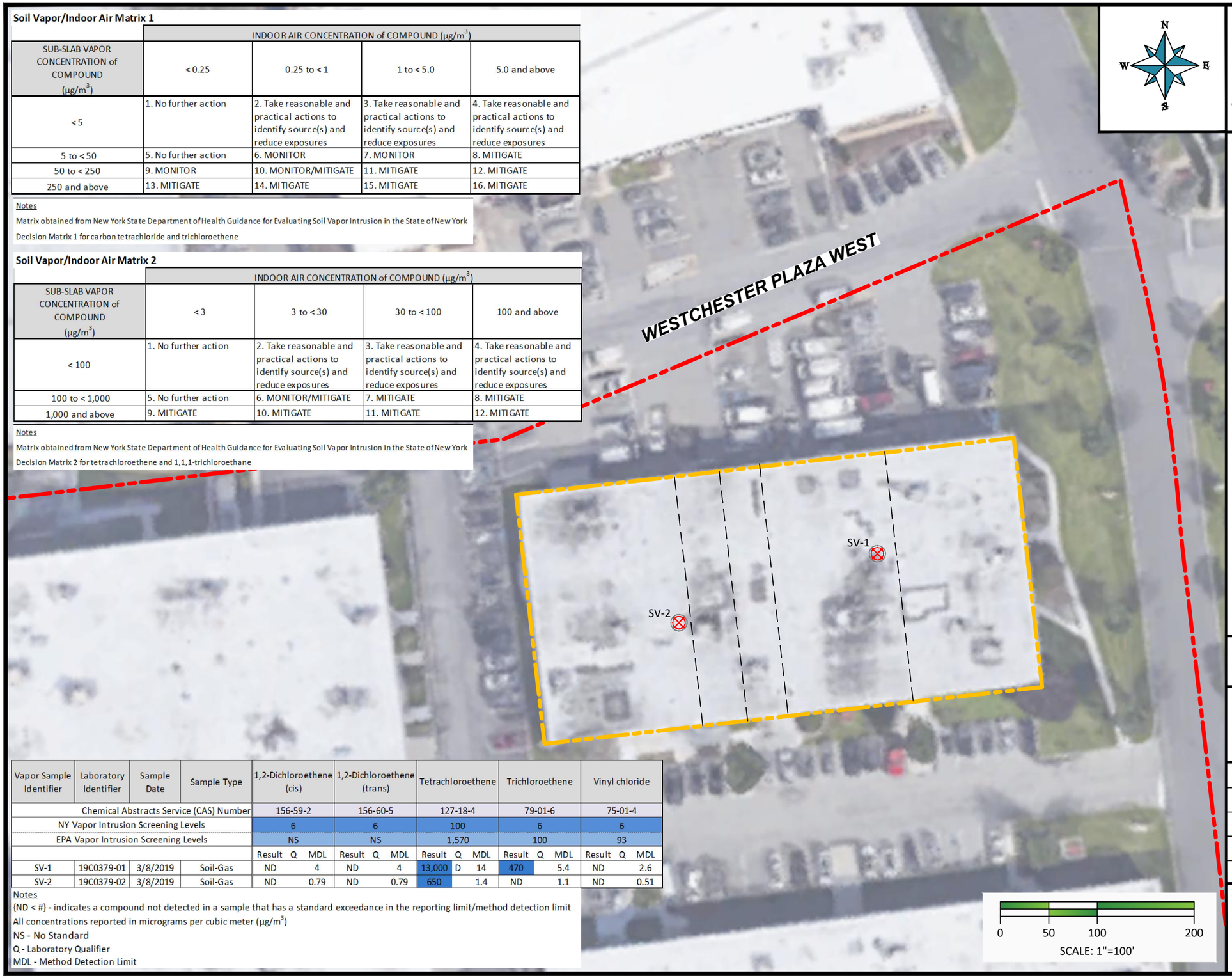
{ND < #} - indicates a compound not detected in a sample that has a standard exceedance in the reporting limit/method detection limit

All concentrations reported in micrograms per cubic meter ($\mu g/m^3$)

NS - No Standard

Q - Laboratory Qualifier

MDL - Method Detection Limit



PEAK ENVIRONMENTAL LLC
26 Kennedy Boulevard, Suite A, East Brunswick, NJ 08816
Phone: 732-326-1010 www.peak-environmental.com

LEGEND

- PROPERTY BOUNDARY
- BROWNFIELD SITE BOUNDARY LINE
- LEASEHOLD BOUNDARY
- SOIL VAPOR SAMPLE

GREEN = COMPLIANT
RED = NON-COMPLIANT
GREY = NOT ANALYZED

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

PREVIOUS VAPOR INTRUSION SAMPLING LOCATION MAP

5 WESTCHESTER PLAZA ELMSFORD, NEW YORK

NYSDEC SITE #: C360205

PROJECT: 2847

DATE: NOVEMBER 17, 2021

DRAWN BY: JK

CHECKED BY: MS

DRAWING 4

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG

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PEAK ENVIRONMENTAL LLC
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LEGEND

- PROPERTY BOUNDARY
- BROWNFIELD SITE BOUNDARY LINE
- LEASEHOLD BOUNDARY
- EXISTING BUILDING LOCATION
- SOIL SAMPLE LOCATION

GREEN = COMPLIANT
RED = NON-COMPLIANT
CYAN = PROPOSED

NOTE:

1. SAMPLE RESULTS WERE COMPARED TO THE NYSCO COMMERCIAL AND PROTECTION OF GROUNDWATER STANDARDS.

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

PROPOSED SOIL SAMPLE LOCATION MAP

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

NYSDEC SITE #: C360205
PROJECT: 2847
DATE: NOVEMBER 17, 2021
DRAWN BY: JK
CHECKED BY: MS

DRAWING 5

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER_NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG

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PEAK ENVIRONMENTAL LLC
26 Kennedy Boulevard, Suite A, East Brunswick, NJ 08816
Phone: 732-326-1010 www.peak-environmental.com

LEGEND

- PROPERTY BOUNDARY
- BROWNFIELD SITE BOUNDARY LINE
- LEASEHOLD BOUNDARY
- VAPOR INTRUSION SAMPLE LOCATION

GREEN = COMPLIANT
RED = NON-COMPLIANT
CYAN = PROPOSED

NOTES:

1. INDOOR AIR SAMPLES AND SOIL VAPOR SAMPLES WILL BE CO-LOCATED, AN AMBIENT AIR SAMPLE WILL BE COLLECTED FROM OUTSIDE THE BUILDING.
2. INFORMATION PERTAINING TO UTILITIES, WALL DIVISIONS, FOUNDATION PARTITIONS, CRAWL SPACES, AND FLOOR DRAINS, WILL BE EVALUATED IN THE FIELD AND DRAWING 6 WILL BE UPDATED ACCORDINGLY IN THE NEXT REGULATORY SUBMITTAL.
3. SAMPLE RESULTS WERE COMPARED TO THE NY VAPOR INTRUSION SCRENING LEVELS.

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

PROPOSED VAPOR INTRUSION SAMPLE LOCATION MAP

5 WESTCHESTER PLAZA ELMSFORD, NEW YORK

NYSDEC SITE #: C360205

PROJECT: 2847

DATE: NOVEMBER 17, 2011

DRAWN BY: JK

CHECKED BY: MS

DRAWING 6

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG

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Phone: 732-326-1010 www.peak-environmental.com

LEGEND

- PROPERTY BOUNDARY
- BROWNFIELD SITE BOUNDARY LINE
- LEASEHOLD BOUNDARY
- SOIL VAPOR SAMPLE LOCATION
- MONITORING WELL LOCATION

GREEN = COMPLIANT
RED = NON-COMPLIANT
CYAN = PROPOSED

NOTE:

1. SAMPLE RESULTS WERE COMPARED TO THE NY VAPOR INTRUSION SCREENING LEVELS.

SOURCES:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

PROPOSED
MONITORING WELL LOCATION MAP

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

NYSDEC SITE #: C360205

PROJECT: 2847

DATE: NOVEMBER 17, 2021

DRAWN BY: JK

CHECKED BY: MS

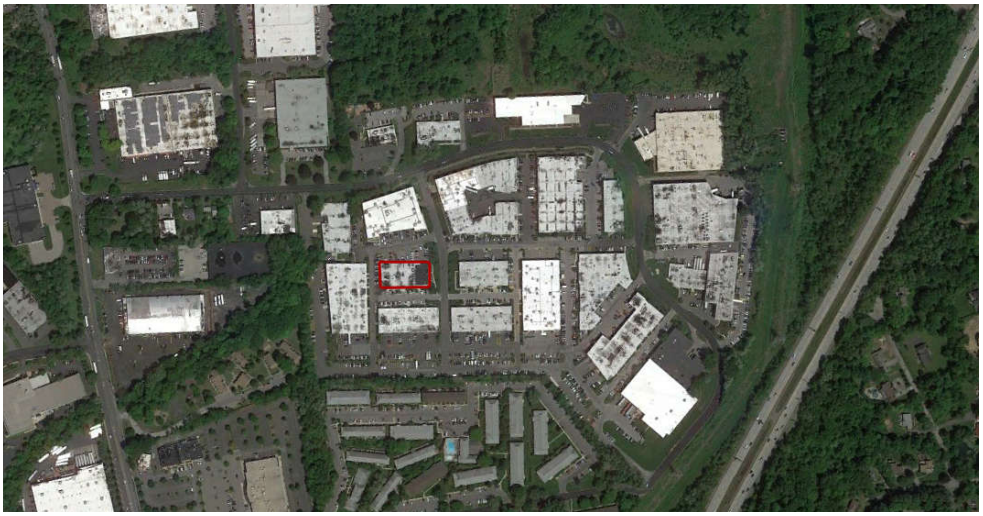
DRAWING 7

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2021-11-17_RIW MAP SET FINAL.DWG

Appendix A

PHASE II REPORT

5 Westchester Plaza
Elmsford, NY



August 2020

Prepared for:
Mack-Cali CW
Realty Associates, L.L.C.
c/o Jay A. Jaffe, Esq.

75 Livingston Avenue, Suite 301
Roseland, NJ 07068

Prepared By:
Peak Environmental LLC
26 Kennedy Blvd, Suite A,
East Brunswick, NJ 08816

Peak Project #
2847

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TABLES

DRAWINGS

APPENDICES

1 INTRODUCTION

Peak Environmental LLC (Peak) has prepared this Phase II Environmental Site Assessment (Phase II ESA) report to summarize the findings of a Phase II ESA completed by EBI Consulting in March 2019 at 5 Westchester Plaza, Elmsford, NY (Site). The objective of the Phase II ESA was to further evaluate Recognized Environmental Conditions (RECs) that were identified during a prior due diligence assessment. The investigation summarized herein included collection of soil-vapor samples to evaluate vapor intrusion at the Site and soil samples to evaluate soil quality at the Site.

2 HISTORICAL INFORMATION

The Site building was constructed in 1968 and prior land use was agricultural or undeveloped. The building is currently used by five commercial tenants. The current tenants and their operations are summarized in the table below.

Current Tenants and Operations	
Tenant	**Operation**
Apple Maintenance & Services	Cleaning and Janitorial Services
Dolphin Construction Corp.	Office and Warehouse
Promptcare Companies Inc.	Home Health Services
Vacant (formerly Singer Holding Corp. [dba Robinson Oil Co])	Former HVAC Service Center
Willemin-Macodel Inc.	Office and Distribution Center

A former tenant at the Site, Clinical Technologies Association, was listed as having generated hazardous wastes containing chlorinated volatile organic compounds (CVOCs) including tetrachloroethene (PCE) and trichloroethene (TCE). Due to the potential for environmental impacts from the use of solvents by the prior tenant, an investigation of soil-vapor and soil was conducted.

2.1 Physical Setting

The Site is located at 5 Westchester Plaza, Elmsford, NY at Block 19 within a portion of Lot 8 and is improved with a 20,200-square foot, one-story building utilized for office, warehouse, and industrial applications.

Following is a description of the physical setting of the site and surrounding areas.

2.1.1 Geology and Soils

Per the United States Geological Survey (USGS) USGS Ground Water Atlas of the United States, New York region (1997), the Site is located within the embayed section of the Coastal Plain physiographic province. This is characterized by sediments, primarily clay, sand, and gravel. These sediments overlie metamorphic and igneous rocks that crop out in Connecticut that slope to the southeast. No bedrock outcroppings were observed on the site and bedrock was not encountered during the investigation.

2.1.2 Hydrogeology

No surface water bodies were identified on or adjacent to the Site. The nearest surface water body is the Saw Mill River, located approximately 1,700 feet southwest of the Site. Groundwater is expected to follow surface topography and flow towards the river to the southwest.

2.1.3 Topography

The Site is located at an approximate elevation of 280 feet above mean sea level (msl). The Site is located on relatively flat land that slopes gently to the southwest.

2.2 Significant Events or Seasonal Variations

No significant events or seasonal variations which are believed to have influenced sampling procedures or analytical results occurred during the implementation of this Phase II ESA.

2.3 Vapor Intrusion Investigation

On March 8, 2019, temporary soil-vapor sampling ports were installed at two locations (SV-1 and SV-2). SV-1 was collected from soil vapor beneath the former Clinical Technologies Association leasehold (currently vacant) and SV-2 was collected from soil vapor beneath the Singer Holding Corporation leasehold (currently occupied).

Soil-vapor sampling ports were installed to a depth of 0.5 feet below the surface of the floor slab. A ¾-inch diameter hole was drilled through the floor slab with a drill, and a vapor pin with a dedicated silicone seal was installed into the hole to create a sample port.

Prior to soil-vapor sampling, a leak test using a water dam was performed to confirm leakage of ambient air into the sample port was not occurring. Three volumes of air were then purged from the sample port to ensure ambient air was no longer present within the sampling tube and to ensure that a representative sample was collected.

Soil-vapor samples were collected at SV-1 and SV-2 using pre-cleaned, 1-liter Summa canisters provided by the laboratory. The samples were collected and sent under chain of custody to Con-test Analytical Laboratories, a New York-certified laboratory. Samples were analyzed for CVOC analysis via Environmental Protection Agency (EPA) Method TO-15. Results of the analysis are summarized below. The laboratory deliverable is included as **Appendix A**.

Compound	NYDOH-DM	EPA VISL	SV-1	SV-2
PCE	100	1,570	**13,000**	**650**
TCE	6	100	**470**	ND

Notes: Results are shown in micrograms per cubic meter (ug/m^3)
NYSDOH-DM: New York State Department of Health Soil Vapor/ Vapor Intrusion Decision Matrices (May 2017)
EPA VISL: EPA Vapor Intrusion Screening Levels for Commercial Use (May 2018)

The concentrations of PCE within samples SV-1 and SV-2 and TCE at SV-1 were compared to the New York State Department of Health Soil Vapor/Vapor Intrusion Decision Matrices. These are used as a guidance tool to evaluate sites for further investigation. The above concentrations detected at SV-1 exceeded the maximum concentration presented for PCE and TCE. Based on these concentrations, the matrices recommend mitigation activities at the Site. In addition, PCE and TCE at SV-1 and PCE at SV-2 were compared to and exceeded the EPA Vapor Intrusion Screening Levels for Commercial Use. Sample locations are presented on **Drawing 1**, and sample results are presented on **Table 1**.

2.4 Soil Investigation

In March 2019, a soil investigation was conducted which consisted of advancing three soil borings and collection of three soil samples. Borings were advanced to depths ranging between 2 and 13.5 feet below grade (fbg). Groundwater was not encountered. Soil sample SB-1 was collected from beneath the Singer Holding Corporation leasehold, soil sample SB-2 was collected from beneath the former Clinical Technologies Association leasehold (currently vacant), and soil sample B3 was collected from the parking area immediately south of the building located at 5 Westchester Plaza.

Soil grab samples were collected in laboratory-supplied glassware, preserved according to the appropriate analytical method, and transported to the laboratory under chain-of-custody procedures. The three samples collected at the Site were analyzed for CVOCs via USEPA 8260. Results of soil sampling are summarized below, and laboratory deliverable packages are included as **Appendix A**.

Compound	375 SCO - Commercial	375 SCO - Protection of GW	SB-1 (1.5-2)	SB-2 (1.5-2)	B-3 (12.5-13.5)
PCE	150	1.3	ND	0.0048	ND
TCE	200	0.47	ND	ND	ND
cis-1,2-dichloroethene	500	0.25	ND	ND	ND
trans-1,2-dichloroethene	500	0.19	ND	ND	ND
Vinyl chloride	13	0.02	ND	ND	ND

Notes: Results are shown in milligrams per kilogram (mg/kg)
375 SCO: New York State Codes, Rules, & Regulations (NYCRR) Part 375 Soil Cleanup Objectives (SCOs) (December 2006)
Sample depth indicated at fbg.

Results of soil sampling indicated that CVOCs including PCE and TCE, previously utilized during Clinical Technologies Association operations, and their breakdown products, cis-1,2-dichloroethene (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE), were not present on-Site exceeding their respective Commercial SCOs or Protection of Groundwater SCOs. Locations of soil samples are depicted on **Drawing 2**, and sample results are presented on **Table 2**.

3 CONCLUSIONS

Lab analysis of soil samples collected indicate that soils underlying the Site are not likely impacted with CVOCs PCE, TCE, and associated breakdown products. CVOCs were not detected and laboratory reporting

limits did not exceed each compound's respective Commercial or Protection of Groundwater SCO indicating that the Site is suitable to continue to operate as a commercial property and that groundwater underlying the Site is not likely impacted by CVOCs. No further investigation is recommended.

Lab analysis of soil vapor samples collected on-Site revealed concentrations of PCE and TCE exceeding their respective NYSDOH-DM levels. In addition, PCE and TCE were detected at concentrations greater than the EPA VISLs.

Peak recommends re-sampling soil vapor to confirm the results detected in March 2019. Indoor air sampling is recommended pending the results of soil vapor resampling to evaluate the vapor intrusion pathway. Mitigation of vapor intrusion via installation of a sub-slab depressurization within the former Clinical Technologies Association leasehold may be recommended depending on the results of soil vapor resampling and indoor air sampling.

TABLES

Table 1. Soil-Vapor Analytical Data Summary
Chlorinated Volatile Organic Compounds

PEAK ENVIRONMENTAL LLC

Vapor Sample Identifier	Laboratory Identifier	Sample Date	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number				156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NY Vapor Intrusion Screening Levels				6			6			100			6			6		
EPA Vapor Intrusion Screening Levels				NS			NS			1,570			100			93		
				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SV-1	19C0379-01	3/8/2019	Soil-Gas	ND		4	ND		4	13,000	D	14	470		5.4	ND		2.6
SV-2	19C0379-02	3/8/2019	Soil-Gas	ND		0.79	ND		0.79	650		1.4	ND		1.1	ND		0.51

Notes

{ND < #} - indicates a compound not detected in a sample that has a standard exceedance in the reporting limit/method detection limit

All concentrations reported in micrograms per cubic meter ($\mu g/m^3$)

NS - No Standard

Q - Laboratory Qualifier

MDL - Method Detection Limit

Table 2. Soil Analytical Data Summary
Chlorinated Volatile Organic Compounds

Sample Identifier	Laboratory Identifier	Sample Date	Sample Interval (feet below grade)	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number					156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NYSCO - Commercial					500			500			150			200			13		
NYSCO - Protection of Groundwater					0.25			0.19			1.3			0.47			0.02		
					Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
B-3	19C0375-03	3/8/2019	12.5-13.5	Soil	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0011
SB-1	19C0466-01	3/11/2019	1.5-2	Soil	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0012
SB-2	19C0466-02	3/11/2019	1.5-2	Soil	ND		0.0029	ND		0.0029	0.0048		0.0029	ND		0.0029	ND		0.0014

Notes
NYSCO - New York Soil Cleanup Objectives - Commercial Use
ND - indicates a compound not detected in a sample greater than its reporting limit/method detection limit
Concentrations reported in milligrams per kilogram (mg/kg)
NS - No Standard
Q - Laboratory Qualifier
RL - Reporting Limit

DRAWINGS

Soil Vapor/Indoor Air Matrix 1

SUB-SLAB VAPOR CONCENTRATION of COMPOUND ($\mu g/m^3$)	INDOOR AIR CONCENTRATION of COMPOUND ($\mu g/m^3$)			
	< 0.25	0.25 to < 1	1 to < 5.0	5.0 and above
< 5	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
5 to < 50	5. No further action	6. MONITOR	7. MONITOR	8. MITIGATE
50 to < 250	9. MONITOR	10. MONITOR/MITIGATE	11. MITIGATE	12. MITIGATE
250 and above	13. MITIGATE	14. MITIGATE	15. MITIGATE	16. MITIGATE

Notes

Matrix obtained from New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York

Decision Matrix 1 for carbon tetrachloride and trichloroethene

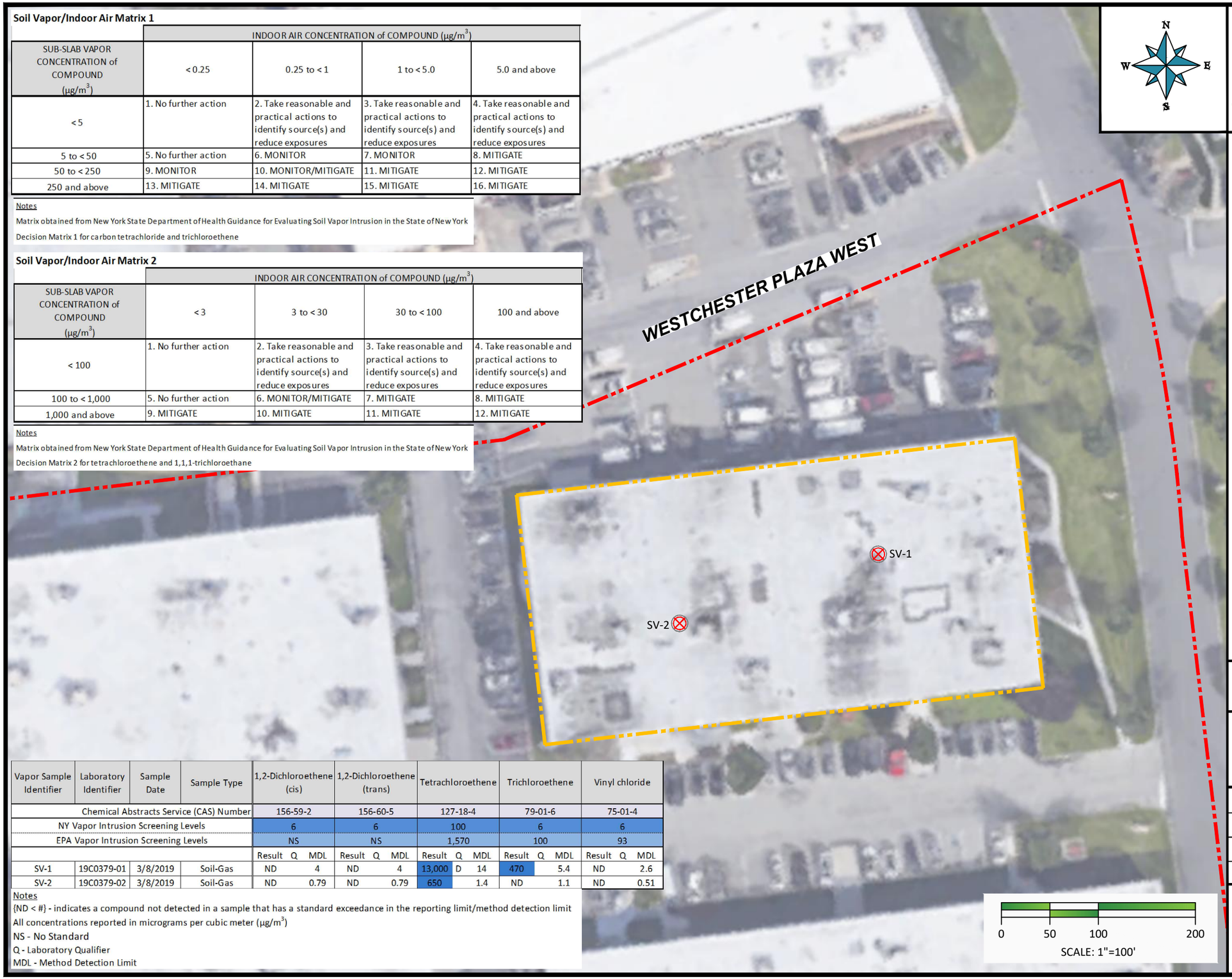
Soil Vapor/Indoor Air Matrix 2

SUB-SLAB VAPOR CONCENTRATION of COMPOUND ($\mu g/m^3$)	INDOOR AIR CONCENTRATION of COMPOUND ($\mu g/m^3$)			
	< 3	3 to < 30	30 to < 100	100 and above
< 100	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
100 to < 1,000	5. No further action	6. MONITOR/MITIGATE	7. MITIGATE	8. MITIGATE
1,000 and above	9. MITIGATE	10. MITIGATE	11. MITIGATE	12. MITIGATE

Notes

Matrix obtained from New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York

Decision Matrix 2 for tetrachloroethene and 1,1,1-trichloroethane



Vapor Sample Identifier	Laboratory Identifier	Sample Date	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number				156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NY Vapor Intrusion Screening Levels				6			6			100			6			6		
EPA Vapor Intrusion Screening Levels				NS			NS			1,570			100			93		
				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SV-1	19C0379-01	3/8/2019	Soil-Gas	ND		4	ND		4	13,000	D	14	470		5.4	ND		2.6
SV-2	19C0379-02	3/8/2019	Soil-Gas	ND		0.79	ND		0.79	650		1.4	ND		1.1	ND		0.51

Notes

(ND < #) - indicates a compound not detected in a sample that has a standard exceedance in the reporting limit/method detection limit

All concentrations reported in micrograms per cubic meter ($\mu g/m^3$)

NS - No Standard

Q - Laboratory Qualifier

MDL - Method Detection Limit

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Phone: 732-326-1010 www.peak-environmental.com

LEGEND

PROPERTY BOUNDARY

SITE BOUNDARY LINE

SOIL VAPOR SAMPLE

GREEN = COMPLIANT
RED = NON-COMPLIANT
GREY = NOT ANALYZED

SOURCE:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

SOIL-GAS SAMPLE LOCATION MAP
OCTOBER 30, 2020

5 WESTESTER PLAZA
ELMSFORD, NEW YORK

PROJECT: 2847

DATE: OCTOBER 30, 2020

DRAWN BY: JK

CHECKED BY: MB

DRAWING 1

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2020-10-30_PHASEII_SOILGAS SAMPLE LOCATION MAP.DWG

Sample Identifier	Laboratory Identifier	Sample Date	Sample Interval (feet below grade)	Sample Type	1,2-Dichloroethene (cis)			1,2-Dichloroethene (trans)			Tetrachloroethene			Trichloroethene			Vinyl chloride		
Chemical Abstracts Service (CAS) Number					156-59-2			156-60-5			127-18-4			79-01-6			75-01-4		
NYSCO - Commercial					500			500			150			200			13		
NYSCO - Protection of Groundwater					0.25			0.19			1.3			0.47			0.02		
					Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
B-3	19C0375-03	3/8/2019	12.5-13.5	Soil	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0022	ND		0.0011
SB-1	19C0466-01	3/11/2019	1.5-2	Soil	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0024	ND		0.0012
SB-2	19C0466-02	3/11/2019	1.5-2	Soil	ND		0.0029	ND		0.0029	0.0048		0.0029	ND		0.0029	ND		0.0014

Notes
NYSCO - New York Soil Cleanup Objectives - Commercial Use
ND - indicates a compound not detected in a sample greater than its reporting limit/method detection
Concentrations reported in milligrams per kilogram (mg/kg)
NS - No Standard
Q - Laboratory Qualifier
RL - Reporting Limit

0 20 40 80
SCALE: 1"=40'

N W E S

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Phone: 732-326-1010 www.peak-environmental.com

LEGEND

- PROPERTY BOUNDARY
- SITE BOUNDARY LINE
- EXISTING BUILDING LOCATION
- SOIL SAMPLE LOCATION
- GREEN = COMPLIANT

SOURCE:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

SOIL SAMPLE LOCATION MAP

5 WESTCHESTER PLAZA
ELMSFORD, NEW YORK

PROJECT: 2847
DATE: AUGUST 20, 2020
DRAWN BY: JK
CHECKED BY: MB

DRAWING 2

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\101-CAD\2020-08-20_PHASEII_SOIL SAMPLE LOCATION MAP.DWG

Appendix A

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

April 20, 2020

Brian Kilcoyne
EBI Consultants
21 B Street
Burlington, MA 01803

Project Location: 1,5,7,8 Westchester Plaza, Elmsford, NY
Client Job Number:
Project Number: 1219000068
Laboratory Work Order Number: 19C0466

Enclosed are results of analyses for samples received by the laboratory on March 12, 2019. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Michelle M. Koch
Project Manager

Table of Contents

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

EBI Consultants
21 B Street
Burlington, MA 01803
ATTN: Brian Kilcoyne

REPORT DATE: 4/20/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 1219000068

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 19C0466

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: 1,5,7,8 Westchester Plaza, Elmsford, NY

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
SB-1 (1.5-2)	19C0466-01	Soil		SM 2540G	
				SW-846 8260C-D	
SB-2 (1.5-2)	19C0466-02	Soil		SM 2540G	
				SW-846 8260C-D	

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

REVISED REPORT per client, only report samples -01 and -02 per the DEC 4/20/2020

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 1,5,7,8 Westchester Plaza, Elmsfo Sample Description: Work Order: 19C0466

Date Received: 3/12/2019

Field Sample #: SB-1 (1.5-2) Sampled: 3/11/2019 12:15

Sample ID: 19C0466-01

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
cis-1,2-Dichloroethylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 10:48	MFF
trans-1,2-Dichloroethylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 10:48	MFF
Tetrachloroethylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 10:48	MFF
Trichloroethylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 10:48	MFF
Vinyl Chloride	ND	0.012	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 10:48	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	83.9	70-130		3/14/19 10:48
Toluene-d8	100	70-130		3/14/19 10:48
4-Bromofluorobenzene	102	70-130		3/14/19 10:48

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 1,5,7,8 Westchester Plaza, Elmsfo Sample Description: Work Order: 19C0466

Date Received: 3/12/2019

Field Sample #: SB-1 (1.5-2) Sampled: 3/11/2019 12:15

Sample ID: 19C0466-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.6		% Wt	1		SM 2540G	3/18/19	3/18/19 15:57	VLH

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 1,5,7,8 Westchester Plaza, Elmsfo Sample Description: Work Order: 19C0466

Date Received: 3/12/2019

Field Sample #: SB-2 (1.5-2) Sampled: 3/11/2019 12:25

Sample ID: 19C0466-02

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
cis-1,2-Dichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 11:42	MFF
trans-1,2-Dichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 11:42	MFF
Tetrachloroethylene	0.0048	0.0029	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 11:42	MFF
Trichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 11:42	MFF
Vinyl Chloride	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	3/14/19	3/14/19 11:42	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	88.1	70-130		3/14/19 11:42
Toluene-d8	95.8	70-130		3/14/19 11:42
4-Bromofluorobenzene	99.3	70-130		3/14/19 11:42

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 1,5,7,8 Westchester Plaza, Elmsfo Sample Description: Work Order: 19C0466

Date Received: 3/12/2019

Field Sample #: SB-2 (1.5-2) Sampled: 3/11/2019 12:25

Sample ID: 19C0466-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	84.3		% Wt	1		SM 2540G	3/18/19	3/18/19 15:58	VLH

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Sample Extraction Data

Prep Method: % Solids **Analytical Method: SM 2540G**

Lab Number [Field ID]	Batch	Date
19C0466-01 [SB-1 (1.5-2)]	B225948	03/18/19
19C0466-02 [SB-2 (1.5-2)]	B225948	03/18/19

Prep Method: SW-846 5035 **Analytical Method: SW-846 8260C-D**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
19C0466-01 [SB-1 (1.5-2)]	B225763	4.61	10.0	03/14/19
19C0466-02 [SB-2 (1.5-2)]	B225763	4.16	10.0	03/14/19

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B225763 - SW-846 5035										
Blank (B225763-BLK1)				Prepared & Analyzed: 03/14/19						
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
Tetrachloroethylene	ND	0.0020	mg/Kg wet							
Trichloroethylene	ND	0.0020	mg/Kg wet							
Vinyl Chloride	ND	0.010	mg/Kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0416*		mg/Kg wet	0.0500		83.2	70-130			
Surrogate: Toluene-d8	*0.0490*		mg/Kg wet	0.0500		98.0	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0508*		mg/Kg wet	0.0500		102	70-130			
LCS (B225763-BS1)				Prepared & Analyzed: 03/14/19						
cis-1,2-Dichloroethylene	0.0189	0.0020	mg/Kg wet	0.0200		94.5	70-130			
trans-1,2-Dichloroethylene	0.0188	0.0020	mg/Kg wet	0.0200		94.1	70-130			
Tetrachloroethylene	0.0230	0.0020	mg/Kg wet	0.0200		115	70-130			
Trichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		96.2	70-130			
Vinyl Chloride	0.0184	0.010	mg/Kg wet	0.0200		92.0	40-130			†
Surrogate: 1,2-Dichloroethane-d4	*0.0420*		mg/Kg wet	0.0500		83.9	70-130			
Surrogate: Toluene-d8	*0.0494*		mg/Kg wet	0.0500		98.8	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0499*		mg/Kg wet	0.0500		99.8	70-130			
LCS Dup (B225763-BSD1)				Prepared & Analyzed: 03/14/19						
cis-1,2-Dichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		96.0	70-130	1.57	25	
trans-1,2-Dichloroethylene	0.0198	0.0020	mg/Kg wet	0.0200		98.8	70-130	4.87	25	
Tetrachloroethylene	0.0235	0.0020	mg/Kg wet	0.0200		118	70-130	2.41	25	
Trichloroethylene	0.0187	0.0020	mg/Kg wet	0.0200		93.4	70-130	2.95	25	
Vinyl Chloride	0.0186	0.010	mg/Kg wet	0.0200		93.0	40-130	1.08	25	†
Surrogate: 1,2-Dichloroethane-d4	*0.0423*		mg/Kg wet	0.0500		84.7	70-130			
Surrogate: Toluene-d8	*0.0493*		mg/Kg wet	0.0500		98.6	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0508*		mg/Kg wet	0.0500		102	70-130			

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 8260C-D in Soil	
cis-1,2-Dichloroethylene	CT,NH,NY,ME,VA
trans-1,2-Dichloroethylene	CT,NH,NY,ME,VA
Tetrachloroethylene	NY,ME,VA
Trichloroethylene	CT,NH,NY,ME,VA
Vinyl Chloride	CT,NH,NY,ME,VA

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

con-test ANALYTICAL LABORATORY

MMK

19C0466

Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD (New York)

Doc # 380 Rev 1_03242017

39 Spruce Street
East Longmeadow, MA 01028

Company Name: EBI
Address: 21 B St. Burlington MA
Phone: 631 456 3972
Project Name: 1,5 23 Westchester Plaza
Project Location: Elmsford NY
Project Number: 1219000068
Project Manager: BKilCoyne@Ebiconsulting.com
Con-Test Quote Name/Number:
Invoice Recipient: EBI
Sampled By: Ken Lukas

Requested Turnaround Time
7-Day ☐ 10-Day ☐
Due Date: 5-Day

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery
Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

# of Containers: 4 | 1
Preservation Code: M
Container Code: GV | A

ANALYSIS REQUESTED: CVOCs | RCRA 8 METALS

Dissolved Metals Samples
☐ Field Filtered
☐ Lab to Filter

Orthophosphate Samples
☐ Field Filtered
☐ Lab to Filter

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	Matrix Code	Conc Code	CVOCs	RCRA 8 METALS
01	SB-1 (1.5-2)	3/11/19	1215		X	S	U	X	
02	SB-2 (1.5-2)		1225		X	S	U	X	
03	SB-3 (1.5-2)		1240		X	S	U	X	X
04	SB-4 (1.5-2)		1250		X	S	U	X	X
05	SB-5 (1.5-2)		1445		X	S	U	X	
06	SB-6 (1.5-2)		~~20~~ 1430		X	S	U	X	
07	SB-7 (1.5-2)		1415		X	S	U	X	
08	SB-8 (1.5-2)		1420		X	S	U	X	

Report samples -01, -02 & -08 per clients request - MEK 3/20/19

Comments: Hold all Data, ~~except SB-3~~ for — Run CVOC samples. Report RCRA 8 Results on 5 day TAT

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

3/12/19 903

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] Preservation Codes:
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

[3] Container Codes:
A = Amber Glass
G = Glass
P = Plastic
ST = Sterile
V = Vial
S = Summa Canister
T = Tedlar Bag
O = Other (please define)

	Date/Time
Relinquished by: (signature) [signature]	3-11-19
Received by: (signature) Fed ex	
Relinquished by: (signature) [signature]	
Received by: (signature) [signature] 2.5°C	3/12/19 903
Relinquished by: (signature)	
Received by: (signature)	

Program & Regulatory Information
☐ AWQ STDS ☐ NY TOGS
☐ NYC Sewer Discharge ☐ NY CP-51
☐ Part 360 GW (Landfill)
☐ NY Restricted Use
☐ NY Unrestricted Use
☐ NY Part 375
as Discussed w/ B. KilCoyne
Other

Deliverables
☐ Enhanced Data Package
☐ NYSDEC EQuIS EDD
☐ EQuIS (Standard) EDD
☐ NY Regulatory EDD
☐ NY Regs Hits-Only EDD
Other

NELAC and AIHA-LAP, LLC Accredited

Project Entity
☐ Government ☐ Municipality ☐ MWRA ☐ WRTA
☐ Federal ☐ 21 J ☐ School
☐ City ☐ Brownfield ☐ MBTA

Other
☐ Chromatogram
☐ *AIHA-LAP, LLC*

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

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FedEx

785964773259

Delivered
Tuesday 3/12/2019 at 9:03 am

DELIVERED

Signed for by: B.BECCA

GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM	TO
BURLINGTON, MA US	EAST LONGMEADOW, MA US

Multiple-piece Shipment

3 Piece shipment

TRACKING NUMBER	SHIPPER CITY, STATE	SHIP DATE	STATUS	DELIVERY DATE	DESTINATION/RECIPIENT CITY, STATE
785964773237 (master)	NANUET, NY	3/11/2019		3/12/2019	EAST LONGMEADOW, MA
785964773248	NANUET, NY	3/11/2019		3/12/2019	EAST LONGMEADOW, MA
785964773259	NANUET, NY	3/11/2019		3/12/2019	EAST LONGMEADOW, MA

Shipment Facts

TRACKING NUMBER
785964773259

SERVICE
FedEx Priority Overnight

MASTER TRACKING NUMBER
785964773237

WEIGHT
31 lbs / 14.06 kgs

DIMENSIONS
24x14x14 in.

DELIVERED TO
Shipping/Receiving

TOTAL PIECES
3

TOTAL SHIPMENT WEIGHT
31 lbs / 14.06 kgs

TERMS
Third Party

PACKAGING
Your Packaging

SPECIAL HANDLING SECTION
Deliver Weekday, Additional Handling Surcharge

STANDARD TRANSIT
3/12/2019 by 10:30 am

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples_____

con-test® ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client EBI

Received By RLF Date 3/12/19 Time 903

How were the samples received? In Cooler T No Cooler _____ On Ice T No Ice _____ Direct from Sampling _____ Ambient _____ Melted Ice _____

By Gun # 3 Actual Temp - 2.5 C

Were samples within Temperature? 2-6°C T By Blank # _____ Actual Temp - _____

Was Custody Seal Intact? NA Were Samples Tampered with? NA

Was COC Relinquished ? T Does Chain Agree With Samples? T

Are there broken/leaking/loose caps on any samples? F

Is COC in ink/ Legible? T Were samples received within holding time? T

Did COC include all pertinent Information? Client T Analysis T Sampler Name T

Project T ID's T Collection Dates/Times T

Are Sample labels filled out and legible? T

Are there Lab to Filters? F Who was notified? _____

Are there Rushes? F Who was notified? _____

Are there Short Holds? F Who was notified? _____

Is there enough Volume? T

Is there Headspace where applicable? NA MS/MSD? F

Proper Media/Containers Used? T Is splitting samples required? F

Were trip blanks received? F On COC? F

Do all samples have the proper pH? Acid NA Base NA

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	3
Meoh-	8	250 mL Amb.		250 mL Plastic		4oz Amb/Clear	5
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-	11	Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen: 3/12/19 903	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

April 20, 2020

Brian Kilcoyne
EBI Consultants
21 B Street
Burlington, MA 01803

Project Location: Westchester Plaza
Client Job Number:
Project Number: 1219000068
Laboratory Work Order Number: 19C0375

Enclosed are results of analyses for samples received by the laboratory on March 9, 2019. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Michelle M. Koch
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

EBI Consultants
21 B Street
Burlington, MA 01803
ATTN: Brian Kilcoyne

REPORT DATE: 4/20/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 1219000068

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 19C0375

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Westchester Plaza

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
B-3 (12.5-13.5)	19C0375-03	Soil		SM 2540G SW-846 8260C-D	

con-test® ANALYTICAL LABORATORY
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CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

REVISED REPORT per client - report on sample -03 per the DEC - 4/20/2020

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Michelle M. Koch
Project Manager

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Westchester Plaza | Sample Description: | Work Order: 19C0375

Date Received: 3/9/2019

Field Sample #: B-3 (12.5-13.5) | Sampled: 3/8/2019 12:30

Sample ID: 19C0375-03

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
cis-1,2-Dichloroethylene	ND	0.0022	mg/Kg dry	1		SW-846 8260C-D	3/12/19	3/12/19 8:59	MFF
trans-1,2-Dichloroethylene	ND	0.0022	mg/Kg dry	1		SW-846 8260C-D	3/12/19	3/12/19 8:59	MFF
Tetrachloroethylene	ND	0.0022	mg/Kg dry	1		SW-846 8260C-D	3/12/19	3/12/19 8:59	MFF
Trichloroethylene	ND	0.0022	mg/Kg dry	1		SW-846 8260C-D	3/12/19	3/12/19 8:59	MFF
Vinyl Chloride	ND	0.011	mg/Kg dry	1		SW-846 8260C-D	3/12/19	3/12/19 8:59	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
1,2-Dichloroethane-d4	88.4	70-130		3/12/19 8:59	
Toluene-d8	99.6	70-130		3/12/19 8:59	
4-Bromofluorobenzene	99.2	70-130		3/12/19 8:59	

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Westchester Plaza | Sample Description: | Work Order: 19C0375

Date Received: 3/9/2019

Field Sample #: B-3 (12.5-13.5) | Sampled: 3/8/2019 12:30

Sample ID: 19C0375-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.5		% Wt	1		SM 2540G	3/13/19	3/14/19 6:36	VLH

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Sample Extraction Data

Prep Method: % Solids **Analytical Method: SM 2540G**

Lab Number [Field ID]	Batch	Date
19C0375-03 [B-3 (12.5-13.5)]	B225587	03/13/19

Prep Method: SW-846 5035 **Analytical Method: SW-846 8260C-D**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
19C0375-03 [B-3 (12.5-13.5)]	B225524	5.23	10.0	03/12/19

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B225524 - SW-846 5035										
Blank (B225524-BLK1)				Prepared & Analyzed: 03/12/19						
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
Tetrachloroethylene	ND	0.0020	mg/Kg wet							
Trichloroethylene	ND	0.0020	mg/Kg wet							
Vinyl Chloride	ND	0.010	mg/Kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0432*		mg/Kg wet	0.0500		86.5	70-130			
Surrogate: Toluene-d8	*0.0494*		mg/Kg wet	0.0500		98.9	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0493*		mg/Kg wet	0.0500		98.6	70-130			
LCS (B225524-BS1)				Prepared & Analyzed: 03/12/19						
cis-1,2-Dichloroethylene	0.0191	0.0020	mg/Kg wet	0.0200		95.6	70-130			
trans-1,2-Dichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		96.2	70-130			
Tetrachloroethylene	0.0221	0.0020	mg/Kg wet	0.0200		111	70-130			
Trichloroethylene	0.0200	0.0020	mg/Kg wet	0.0200		100	70-130			
Vinyl Chloride	0.0182	0.010	mg/Kg wet	0.0200		91.1	40-130			†
Surrogate: 1,2-Dichloroethane-d4	*0.0444*		mg/Kg wet	0.0500		88.8	70-130			
Surrogate: Toluene-d8	*0.0493*		mg/Kg wet	0.0500		98.6	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0510*		mg/Kg wet	0.0500		102	70-130			
LCS Dup (B225524-BSD1)				Prepared & Analyzed: 03/12/19						
cis-1,2-Dichloroethylene	0.0191	0.0020	mg/Kg wet	0.0200		95.4	70-130	0.209	25	
trans-1,2-Dichloroethylene	0.0186	0.0020	mg/Kg wet	0.0200		93.1	70-130	3.28	25	
Tetrachloroethylene	0.0219	0.0020	mg/Kg wet	0.0200		110	70-130	1.09	25	
Trichloroethylene	0.0189	0.0020	mg/Kg wet	0.0200		94.4	70-130	5.96	25	
Vinyl Chloride	0.0183	0.010	mg/Kg wet	0.0200		91.5	40-130	0.438	25	†
Surrogate: 1,2-Dichloroethane-d4	*0.0435*		mg/Kg wet	0.0500		87.1	70-130			
Surrogate: Toluene-d8	*0.0504*		mg/Kg wet	0.0500		101	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0520*		mg/Kg wet	0.0500		104	70-130			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 8260C-D in Soil	
cis-1,2-Dichloroethylene	CT,NH,NY,ME,VA
trans-1,2-Dichloroethylene	CT,NH,NY,ME,VA
Tetrachloroethylene	NY,ME,VA
Trichloroethylene	CT,NH,NY,ME,VA
Vinyl Chloride	CT,NH,NY,ME,VA

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

con-test ANALYTICAL LABORATORY

19C0375

Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

Doc # 380 Rev 1_03242017

CHAIN OF CUSTODY RECORD (New York)

39 Spruce Street
East Longmeadow, MA 01028

Page 1 of 1

Company Name: EBI Consulting
Address: 21 B Street
Phone: (781) 275 2800
Project Name: Westchester Plaza
Project Location: Westchester Plaza
Project Number: 1219000068
Project Manager: Brian Milcayne
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: Bryan Shaw

Requested Turnaround Time
7-Day ☐ 10-Day ☐
Due Date: 5-Day

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery
Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

# of Containers: 6+3
[2] Preservation Code: VG
[3] Container Code

ANALYSIS REQUESTED: * VOCs 8260 | RCRA-8 6010 | VOCs 8260

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	[1] Matrix Code	Conc Code	VOCs 8260	RCRA-8 6010	VOCs 8260
1	B-1 (3-4)	3/8/19	1100		X	S	uk	X		
2	B-2 (6-8)	↓	1115		X	↓	↓	X	X	X
3	B-3 (12.5-13.5)		1230		X					
4	B-4 (3-4)		1315		X					
5	B-5 (5-6)		1330		X					
6	B-6 (1-2)		1345		X	↓				
	B-5	↓	1400		X	GW	↓	↓		

Comments: Run all samples Hold soil data only
Report B-2 (6-8) VOCs + RCRA 8

Report samples -01, -02, -03, -04 & -06 per clients request - MEK 3/20/19

Relinquished by: (signature)	Date/Time:
Received by: (signature) 3.9	Date/Time: 3/9/19 1125
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Dissolved Metals Samples
☐ Field Filtered
☐ Lab to Filter

Orthophosphate Samples
☐ Field Filtered
☐ Lab to Filter

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] Preservation Codes:
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

[3] Container Codes:
A = Amber Glass
G = Glass
P = Plastic
ST = Sterile
V = Vial
S = Summa Canister
T = Tedlar Bag
O = Other (please define)

Program & Regulatory Information
☐ AWQ STDS
☐ NYC Sewer Discharge
☐ Part 360 GW (Landfill)
☒ NY Restricted Use
☒ NY Unrestricted Use
☒ NY Part 375
☒ NY TOGS
☒ NY CP-51

Other:

Deliverables
☐ Enhanced Data Package
☐ NYSDEC EQuIS EDD
☐ EQuIS (Standard) EDD
☐ NY Regulatory EDD
☐ NY Regs Hits-Only EDD

Other:

NELAC and AIHA-LAP, LLC Accredited

Project Entity
☐ Government ☐ Municipality ☐ MWRA ☐ WRTA
☐ Federal ☐ 21 J ☐ School
☐ City ☐ Brownfield ☐ MBTA

Other
☐ Chromatogram
☐ *AIHA-LAP, LLC*

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

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FedEx

785924200819

Delivered
Saturday 3/09/2019 at 11:25 am

DELIVERED

Signed for by: M.PROPESTIC

GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM	TO
BURLINGTON, MA US	EAST LONGMEADOW, MA US

Multiple-piece Shipment

4 Piece shipment

TRACKING NUMBER	SHIPPER CITY, STATE	SHIP DATE	STATUS	DELIVERY DATE	DESTINATION/RECIPIENT CITY, STATE
785924200782 (master)	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200793	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200808	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200819	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA

Shipment Facts

TRACKING NUMBER
785924200819

SERVICE
FedEx Priority Overnight

MASTER TRACKING NUMBER
785924200782

WEIGHT
21 lbs / 9.53 kgs

DIMENSIONS
25x13x14 in.

DELIVERED TO
Shipping/Receiving

TOTAL PIECES
4

TOTAL SHIPMENT WEIGHT
21 lbs / 9.53 kgs

TERMS
Third Party

PACKAGING
Your Packaging

SPECIAL HANDLING SECTION
Saturday Delivery, No Signature

STANDARD TRANSIT

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples_____

con-test® ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client FBI

Received By RAP Date 3/9/19 Time 1125

How were the samples received? In Cooler T No Cooler _____ On Ice T No Ice _____ Direct from Sampling _____ Ambient _____ Melted Ice _____

Were samples within Temperature? 2-6°C T By Gun # 5 Actual Temp - 3.9 By Blank # _____ Actual Temp - _____

Was Custody Seal Intact? NA Were Samples Tampered with? NA

Was COC Relinquished ? T Does Chain Agree With Samples? T

Are there broken/leaking/loose caps on any samples? F

Is COC in ink/ Legible? T Were samples received within holding time? T

Did COC include all pertinent Information? Client T Project T Analysis T ID's T Sampler Name T Collection Dates/Times T

Are Sample labels filled out and legible? T

Are there Lab to Filters? F Who was notified? _____

Are there Rushes? F Who was notified? _____

Are there Short Holds? F Who was notified? _____

Is there enough Volume? T

Is there Headspace where applicable? F MS/MSD? F

Proper Media/Containers Used? T Is splitting samples required? F

Were trip blanks received? F On COC? F

Do all samples have the proper pH? NA Acid _____ Base _____

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-	6	250 mL Amb.		250 mL Plastic		4oz Amb/Clear MR 7	
Bisulfate-		Flashpoint		Col./Bacteria		2oz Amb/Clear	
DI-	12	Other Glass		Other Plastic		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen: 3/9/19 1125	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

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April 20, 2020

Brian Kilcoyne
EBI Consultants
21 B Street
Burlington, MA 01803

Project Location: Westchester Plaza
Client Job Number:
Project Number: 1219000068
Laboratory Work Order Number: 19C0379

Enclosed are results of analyses for samples received by the laboratory on March 9, 2019. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Michelle M. Koch
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

EBI Consultants
21 B Street
Burlington, MA 01803
ATTN: Brian Kilcoyne

REPORT DATE: 4/20/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 1219000068

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 19C0379

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Westchester Plaza

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
SV-1	19C0379-01	Sub Slab		EPA TO-15	
SV-2	19C0379-02	Sub Slab		EPA TO-15	

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CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

REVISED REPORT per client to only report samples -01 and -02 per DEC 4/20/2020

EPA TO-15

Qualifications:

RL-11

Elevated reporting limit due to high concentration of target compounds.

Analyte & Samples(s) Qualified:

19C0379-01[SV-1]

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

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ANALYTICAL RESULTS

Project Location: Westchester Plaza
Date Received: 3/9/2019
Field Sample #: SV-1
Sample ID: 19C0379-01
Sample Matrix: Sub Slab
Sampled: 3/8/2019 09:41

Sample Description/Location:
Sub Description/Location:
Canister ID: 2338
Canister Size: 1 liter
Flow Controller ID: 4339
Sample Type: 10 min

Work Order: 19C0379
Initial Vacuum(in Hg): 30
Final Vacuum(in Hg): 4
Receipt Vacuum(in Hg): -3.6
Flow Controller Type: Fixed-Orifice
Flow Controller Calibration
RPD Pre and Post-Sampling:

EPA TO-15

Sample Flags: RL-11

Analyte	ppbv Results	ppbv RL	Flag/Qual	ug/m3 Results	ug/m3 RL	Dilution	Date/Time Analyzed	Analyst
cis-1,2-Dichloroethylene	ND	1.0		ND	4.0	20	3/13/19 1:35	BRF
trans-1,2-Dichloroethylene	ND	1.0		ND	4.0	20	3/13/19 1:35	BRF
Tetrachloroethylene	1900	2.0		13000	14	40	3/13/19 2:03	BRF
Trichloroethylene	87	1.0		470	5.4	20	3/13/19 1:35	BRF
Vinyl Chloride	ND	1.0		ND	2.6	20	3/13/19 1:35	BRF

Surrogates	% Recovery	% REC Limits	
4-Bromofluorobenzene (1)	106	70-130	3/13/19 2:03
4-Bromofluorobenzene (1)	107	70-130	3/13/19 1:35

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ANALYTICAL RESULTS

Project Location: Westchester Plaza
Date Received: 3/9/2019
Field Sample #: SV-2
Sample ID: 19C0379-02
Sample Matrix: Sub Slab
Sampled: 3/8/2019 10:18

Sample Description/Location:
Sub Description/Location:
Canister ID: 2093
Canister Size: 1 liter
Flow Controller ID: 4320
Sample Type: 10 min

Work Order: 19C0379
Initial Vacuum(in Hg): 30
Final Vacuum(in Hg): 3
Receipt Vacuum(in Hg): -1.8
Flow Controller Type: Fixed-Orifice
Flow Controller Calibration
RPD Pre and Post-Sampling:

EPA TO-15

Analyte	ppbv Results	ppbv RL	Flag/Qual	ug/m3 Results	ug/m3 RL	Dilution	Date/Time Analyzed	Analyst
cis-1,2-Dichloroethylene	ND	0.20		ND	0.79	4	3/13/19 2:31	BRF
trans-1,2-Dichloroethylene	ND	0.20		ND	0.79	4	3/13/19 2:31	BRF
Tetrachloroethylene	96	0.20		650	1.4	4	3/13/19 2:31	BRF
Trichloroethylene	ND	0.20		ND	1.1	4	3/13/19 2:31	BRF
Vinyl Chloride	ND	0.20		ND	0.51	4	3/13/19 2:31	BRF

Surrogates	% Recovery	% REC Limits	
4-Bromofluorobenzene (1)	108	70-130	3/13/19 2:31

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Sample Extraction Data

Prep Method: TO-15 Prep **Analytical Method: EP**

Lab Number [Field ID]	Batch	Pressure Dilution	Pre Dilution	Pre-Dil Initial mL	Pre-Dil Final mL	Default Injection mL	Actual Injection mL	Date
19C0379-01 [SV-1]	B225648	1.5	1	N/A	1000	400	30	03/12/19
19C0379-01RE1 [SV-1]	B225648	1.5	1	N/A	1000	400	15	03/12/19
19C0379-02 [SV-2]	B225648	1.5	1	N/A	1000	400	150	03/12/19

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QUALITY CONTROL

Air Toxics by EPA Compendium Methods - Quality Control

Analyte	ppbv Results	ppbv RL	ug/m3 Results	ug/m3 RL	Spike Level ppbv	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag/Qual
Batch B225648 - TO-15 Prep											
Blank (B225648-BLK1)					Prepared & Analyzed: 03/12/19						
cis-1,2-Dichloroethylene	ND	0.020									
trans-1,2-Dichloroethylene	ND	0.020									
Tetrachloroethylene	ND	0.020									
Trichloroethylene	ND	0.020									
Vinyl Chloride	ND	0.020									
Surrogate: 4-Bromofluorobenzene (1)	*8.36*				*8.00*		*105*	*70-130*			
LCS (B225648-BS1)					Prepared & Analyzed: 03/12/19						
cis-1,2-Dichloroethylene	4.72				5.00		94.5	70-130			
trans-1,2-Dichloroethylene	5.16				5.00		103	70-130			
Tetrachloroethylene	4.83				5.00		96.6	70-130			
Trichloroethylene	4.67				5.00		93.4	70-130			
Vinyl Chloride	4.58				5.00		91.6	70-130			
Surrogate: 4-Bromofluorobenzene (1)	*8.58*				*8.00*		*107*	*70-130*			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
RL-11	Elevated reporting limit due to high concentration of target compounds.

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INTERNAL STANDARD AREA AND RT SUMMARY

EPA TO-15

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Initial Cal Check (S033208-ICV1)			Lab File ID: B030629.D			Analyzed: 03/07/19 00:08			
Bromochloromethane (1)	100480	5.058	99144	5.063	101	60 - 140	-0.0050	+/-0.50	
1,4-Difluorobenzene (1)	225997	6.277	217905	6.283	104	60 - 140	-0.0060	+/-0.50	
Chlorobenzene-d5 (1)	202086	9.877	197548	9.876	102	60 - 140	0.0010	+/-0.50	

INTERNAL STANDARD AREA AND RT SUMMARY

EPA TO-15

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Calibration Check (S033442-CCV1)			Lab File ID: B031212.D			Analyzed: 03/12/19 14:27			
Bromochloromethane (1)	95118	5.078	99144	5.063	96	60 - 140	0.0150	+/-0.50	
1,4-Difluorobenzene (1)	261863	6.292	217905	6.283	120	60 - 140	0.0090	+/-0.50	
Chlorobenzene-d5 (1)	229268	9.879	197548	9.876	116	60 - 140	0.0030	+/-0.50	
LCS (B225648-BS1)			Lab File ID: B031213.D			Analyzed: 03/12/19 14:54			
Bromochloromethane (1)	98428	5.059	95118	5.078	103	60 - 140	-0.0190	+/-0.50	
1,4-Difluorobenzene (1)	268671	6.279	261863	6.292	103	60 - 140	-0.0130	+/-0.50	
Chlorobenzene-d5 (1)	236578	9.872	229268	9.879	103	60 - 140	-0.0070	+/-0.50	
Blank (B225648-BLK1)			Lab File ID: B031217.D			Analyzed: 03/12/19 16:59			
Bromochloromethane (1)	97625	5.056	95118	5.078	103	60 - 140	-0.0220	+/-0.50	
1,4-Difluorobenzene (1)	261008	6.276	261863	6.292	100	60 - 140	-0.0160	+/-0.50	
Chlorobenzene-d5 (1)	231064	9.87	229268	9.879	101	60 - 140	-0.0090	+/-0.50	
SV-1 (19C0379-01)			Lab File ID: B031235.D			Analyzed: 03/13/19 01:35			
Bromochloromethane (1)	97192	5.063	95118	5.078	102	60 - 140	-0.0150	+/-0.50	
1,4-Difluorobenzene (1)	275334	6.277	261863	6.292	105	60 - 140	-0.0150	+/-0.50	
Chlorobenzene-d5 (1)	241715	9.87	229268	9.879	105	60 - 140	-0.0090	+/-0.50	
SV-1 (19C0379-01RE1)			Lab File ID: B031236.D			Analyzed: 03/13/19 02:03			
Bromochloromethane (1)	94981	5.07	95118	5.078	100	60 - 140	-0.0080	+/-0.50	
1,4-Difluorobenzene (1)	271770	6.29	261863	6.292	104	60 - 140	-0.0020	+/-0.50	
Chlorobenzene-d5 (1)	236491	9.877	229268	9.879	103	60 - 140	-0.0020	+/-0.50	
SV-2 (19C0379-02)			Lab File ID: B031237.D			Analyzed: 03/13/19 02:31			
Bromochloromethane (1)	93934	5.057	95118	5.078	99	60 - 140	-0.0210	+/-0.50	
1,4-Difluorobenzene (1)	263158	6.277	261863	6.292	100	60 - 140	-0.0150	+/-0.50	
Chlorobenzene-d5 (1)	232724	9.876	229268	9.879	102	60 - 140	-0.0030	+/-0.50	

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CONTINUING CALIBRATION CHECK

EPA TO-15

S033442-CCV1

COMPOUND	TYPE	CONC. (ppbv)		RESPONSE FACTOR			% DIFF / DRIFT	
		STD	CCV	ICAL	CCV	MIN (#)	CCV	LIMIT (#)
cis-1,2-Dichloroethylene	A	5.00	4.88	0.8331708	0.8133056		-2.4	30
trans-1,2-Dichloroethylene	A	5.00	4.85	0.8265832	0.8015644		-3.0	30
Tetrachloroethylene	A	5.00	4.93	0.4545134	0.4477904		-1.5	30
Trichloroethylene	A	5.00	4.76	0.3266607	0.3106663		-4.9	30
Vinyl Chloride	A	5.00	4.78	0.6091799	0.5826027		-4.4	30

Column to be used to flag Response Factor and %Diff/Drift values with an asterisk

* Values outside of QC limits

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
EPA TO-15 in Air	
cis-1,2-Dichloroethylene	AIHA,FL,NY,ME,NH,VA
trans-1,2-Dichloroethylene	AIHA,NJ,NY,ME,NH,VA
Tetrachloroethylene	AIHA,FL,NJ,NY,ME,NH,VA
Trichloroethylene	AIHA,FL,NJ,NY,ME,NH,VA
Vinyl Chloride	AIHA,FL,NJ,NY,ME,NH,VA

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

1910379

con-test ANALYTICAL LABORATORY

Phone: 413-525-2332
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Email: info@contestlabs.com

http://www.contestlabs.com

Doc #378 Rev 1_03242017

CHAIN OF CUSTODY RECORD (AIR)

39 Spruce Street
East Longmeadow, MA 01028

Page 1 of 1

Company Name:	EBI Consultiny
Address:	21 B Street Burlington MA 01803
Phone:	(781) 273-2500
Project Name:	Westchester Plaza
Project Location:	Westchester Plaza
Project Number:	i2190003068
Project Manager:	Brian McElroyne
Con-Test Quote Name/Number:	
Invoice Recipient:	
Sampled By:	Bryanshaw

Requested Turnaround Time
7-Day ☐ 10-Day ☐
Due Date:

Rush Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery
Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

ANALYSIS REQUESTED

Lab Use	Client Use	Collection Data		Duration	Flow Rate	Matrix	Volume	ANALYSIS REQUESTED				" Hg				
Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Total Minutes Sampled	☐ m³/min ☒ L/min	Code	☒ Liters ☐ m³	TO-15*				Initial Pressure	Final Pressure	Lab Receipt Pressure	Summa Can ID	Flow Controller ID
1	SV-1	0932	0941	9	0.1	SS	1	X				30	4	-3.4	2336	4339
2	SV-2	1008	1018	10	↓	↓	↓	↓				30	3	-1.8	4093	4338
3	SV-3	1522	1532	10	↓	↓	↓	↓				29	4	-3.6	2290	4321
4	SV-4	1600	1614	14	↓	↓	↓	↓				29	10	-10.3	2346	4320

Please fill out completely, sign, date and retain the yellow copy for your records

Summa canisters and flow controllers must be returned within 15 days of receipt or rental fees will apply

For summa canister and flow controller information please refer to Con-Test's Air Media Agreement

Comments: * Chlorinated solvents only

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Matrix Codes:
SG = SOIL GAS
IA = INDOOR AIR
AMB = AMBIENT
SS = SUB SLAB
D = DUP
BL = BLANK
O = Other _____

Relinquished by: (signature)	Date/Time: 3-6-19
Received by: (signature)	Date/Time: 3/9/19 1125
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Detection Limit Requirements
MA
CT
Other:

Special Requirements
☐ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ Other

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NELAC and AIHA-LAP, LLC Accredited

Project Entity
☐ Government ☐ Municipality ☐ MWRA ☐ WRTA
☐ Federal ☐ 21 J ☐ School
☐ City ☐ Brownfield ☐ MBTA

Other
☐ Chromatogram
☐ *AIHA-LAP,LLC*

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet

Table of Contents

FedEx

785924200782

Delivered
Saturday 3/09/2019 at 11:25 am

DELIVERED

Signed for by: M.PROPESTIC

GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM	TO
BURLINGTON, MA US	EAST LONGMEADOW, MA US

Multiple-piece Shipment

4 Piece shipment

TRACKING NUMBER	SHIPPER CITY, STATE	SHIP DATE	STATUS	DELIVERY DATE	DESTINATION/RECIPIENT CITY, STATE
785924200782 (master)	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200793	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200808	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA
785924200819	ELMSFORD, NY	3/08/2019		3/09/2019	EAST LONGMEADOW, MA

Shipment Facts

TRACKING NUMBER
785924200782

SERVICE
FedEx Priority Overnight

MASTER TRACKING NUMBER
785924200782

WEIGHT
35 lbs / 15.88 kgs

DIMENSIONS
22x18x14 in.

DELIVERED TO
Shipping/Receiving

TOTAL PIECES
4

TOTAL SHIPMENT WEIGHT
90 lbs / 40.82 kgs

TERMS
Third Party

PACKAGING
Your Packaging

SPECIAL HANDLING SECTION
Saturday Delivery, No Signature

STANDARD TRANSIT

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples_____

con-test® ANALYTICAL LABORATORY

Doc# 278 Rev 6 2017

Air Media Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client EBI

Received By RAP | Date 3/9/19 | Time 1125

How were the samples received? In Cooler | On Ice | No Ice
In Box T | Ambient | Melted Ice

Were samples within Temperature Compliance? 2-6°C | By Gun # | Actual Temp -
By Blank # | Actual Temp -

Was Custody Seal Intact? NA | Were Samples Tampered with? NA

Was COC Relinquished ? T | Does Chain Agree With Samples? T ★

Are there any loose caps/valves on any samples? F

Is COC in ink/ Legible? T

Did COC Include all Pertinent Information? Client T | Analysis T | Sampler Name T
Project T | ID's T | Collection Dates/Times T

Are Sample Labels filled out and legible? T

Are there Rushes? F | Who was notified?

Samples are received within holding time? T

Proper Media Used? T | Individually Certified Cans? F

Are there Trip Blanks? F | Is there enough Volume? T

Containers:	#	Size	Regulator	Duration	Accessories:			
Summa Cans	4	1L	4	10 min	Nut/Ferrule		IC Train	
Tedlar Bags					Tubing			
TO-17 Tubes					T-Connector		Shipping Charges	
Radiello					Syringe			
Pufs/TO-11s					Tedlar			

Can #'s					Reg #'s				
2336					4338				
2093					4320				
2290					4339				
2346					4328				
Unused Media					**Pufs/TO-17's**				

Comments:

Info written down in "can #s" + "Reg #s" is what I physically received. Client wrote down the wrong info on COC. ★

Sampling date is 3/8/19 per sample labels.

Appendix B

QUALITY ASSURANCE PROJECT PLAN

5 Westchester Plaza
Elmsford, New York, 10523

November 12, 2021

Peak Project # 2847

NYSDEC# C360205

Prepared for:
Mack-Cali CW Realty Associates L.L.C.
210 Hudson St., Suite 400
Jersey City, NJ 07311

Prepared By:
Peak Environmental, LLC
26 Kennedy Blvd, Suite A,
East Brunswick, NJ 08816

Title and Approval Page

Quality Assurance Project Plan (QAPP) of the 5 Westchester Plaza site located at 5 Westchester Plaza, Elmsford, New York, 10523 dated 11/12/2021.

Senior Project Manager

Signature:_____ Date: 11/12/2021 .
Matthew Bruno, Peak Environmental LLC

Quality Assurance Coordinator

Signature:_____ Date: 11/12/2021 .
Matthew Bruno, Peak Environmental LLC

Site Specific Health and Safety Officer

Signature:_____ Date: 11/12/2021 .
Michael Stopen Peak Environmental LLC

Distribution List

Upon approval and implementation of this Quality Assurance Project Plan (QAPP) for the 5 Westchester Plaza, the original shall be kept with the Quality Assurance (QA) Coordinator; with a copy placed with the Project Manager.

The control version of this document is the electronic version viewed online only. If this is a printed copy of the document, or any part of the document (e.g. text, standard operating procedures, etcetera), it is an uncontrolled version and may or may not be the version currently in use.

The following people will be notified of the location of the official (most current) version of the QAPP by email:

Name	Title	Organization	Contact Information
Michael Stopen	Project Manager	Peak Environmental LLC	732-326-1010
Matthew Bruno	Senior Project Manager	Peak Environmental LLC	732-326-1010
Robert Edgar	Qualified Environmental Professional	Peak Environmental LLC	732-326-1010

TABLE OF CONTENTS

List of Appendices

This Quality Assurance Project Plan (QAPP) was prepared for 5 Westchester Plaza located in Westchester County, Elmsford, New York, 10523. The QAPP details the specific policies, organizations, objectives, functional activities, and quality assurance/quality control (QA/QC) activities that were implemented.

1 INTRODUCTION

This document represents the Quality Assurance Project Plan (QAPP) for investigating the vapor intrusion and migration pathway at the Site located at 5 Westchester Plaza, Elmsford, New York, 10523 (hereinafter referred to as "the Site"). This QAPP describes the field and laboratory Quality Assurance (QA) and Quality Control (QC) measures to be implemented during the project.

1.1 Project Scope and Complexity

The scope of the project to be conducted under this QAPP is the investigation of one area of concern (AOC): the main building at 5 Westchester Plaza with vapor intrusion and potential soil impacts from hazardous waste generation with historic release of chlorinated solvent waste. The scope of work involves the investigation of chlorinated solvents, referred as contaminants of concern (COC), hereinafter, in soils, soil vapor, and groundwater beneath the Site within the property boundary. The approach to the investigation involves:

- Installing soil borings for the collection of soil samples to delineate observed residual concentrations of COCs in soils;
- Collecting soil samples and submitting them to a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory for analysis; and,
- Colleting soil gas and indoor air samples onsite to delineate observed residential concentrations of COC in soil gas and indoor air.
- Installation and sampling of onsite monitoring wells to investigate groundwater.

1.2 Project Schedule

Project schedules are site-specific and will be presented in the site-specific work plan or other individual report submittal.

2 NAMES AND CONTACT INFORMATION OF PROJECT SPECIFIC PERSONNEL

2.1 Qualified Environmental Professional (QEP)

The QEP for this site is:

Robert M. Edgar / Peak Environmental LLC, (732) 326-1010.

2.2 Project Manager

The Project Manager is responsible for the overall project coordination and day-to-day management of the project team. The Senior Project Manager will review reports and all correspondence prior to submission and will act as overall technical coordinator. The Project Manager and Senior Project Manager for this site are:

Michael Stopen / Environmental LLC, (732) 326-1010.

Matthew Bruno / Environmental LLC, (732) 326-1010.

2.3 Quality assurance coordinator

The Quality Assurance Coordinator is responsible for the quality assurance of the project data. The Quality Assurance Coordinator for this site is:

Matthew Bruno / Peak Environmental LLC, (732) 326-1010.

2.4 Corporate Health and Safety Manager

The Corporate Health and Safety Manager is responsible for the overall coordination of the health and safety of the Peak employees working on this project. The Corporate Health and Safety Manager for this site is:

Robert Barnes / Peak Environmental LLC, 732-326-1010

2.5 Site Specific Health and Safety Officer

The Site Specific Health and Safety Officer is responsible for direct oversight and coordination of health and safety issues on-site. The Site Specific Health and Safety Officer is:

Michael Stopen / Peak Environmental LLC, (732) 326-1010.

2.6 Field Personnel

The field personnel will be responsible for implementing sampling procedures as described in the work plan and in this QAPP. The field personnel consist of:

Marco Michanowicz / Peak Environmental LLC, (732) 326-1010.

Charles Podesta / Peak Environmnetal LLC, (732) 326-1010.

2.7 Laboratory and Laboratory Contact

Soil, soil vapor, and groundwater samples collected by Peak as part of this investigation will be analyzed by Alpha Analytical, 35 Whitney Rd, Suite 5, Mahwah, New Jersey, 07430, a NYDOH Certified Analytical Laboratory (NY Cert. # MA935). Alpha Analyticalwill provide New York Standard Laboratory Deliverables, including Quality Assurance/Quality Control (QA/QC) data, the laboratory's discussion of the reliability of the data, ability to meet holding times, and certifications.

2.8 Special Training Needs/Certification

Peak personnel and subcontractors working on this site will be properly trained and qualified individuals.

3 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) are based on the concept that various uses of data collected during the remedial activities require varying degrees of data quality. Data quality is defined as the degree of certainty of a data set with respect to precision, accuracy, representativeness, completeness and comparability (PARCC). DQOs are qualitative and quantitative statements specifying the required quality of data necessary to support remedial activities. These activities include confirmation and delineation sampling. A description of PARCC parameters is presented below.

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions".

Accuracy is the degree of agreement of a measurement (or an average of measurements) with an accepted reference or "true value". Accuracy is one estimate of the bias in a system.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

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

Comparability expresses the confidence with which one data set can be compared to another data set. It is the responsibility of the field team to collect representative and complete samples. It is the responsibility of the analytical laboratory to analyze these samples using accepted protocols resulting in data that meet PARCC standards.

Sensitivity is the ability of an analytical procedure to quantify an analyte at a given concentration.

3.1 Precision

3.1.1 Field Precision Objectives

Field precision will not be evaluated, and field duplicate samples will not be collected.

3.1.2 Laboratory Precision Objectives

Laboratory precision will be evaluated as specified in the method or laboratory Standard Operating Procedure. This may include laboratory Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples or laboratory duplicates as well as blank spike and/or blank spike duplicate samples to assess laboratory precision. The precision objectives will be those specified in the method. For method specific measurement performance criteria and QC samples please see Appendix A.

3.2 Accuracy

3.2.1 Field Accuracy Objectives

The attainment of accurate data in the field will be determined through proper sampling procedures that minimize bias, defined to be "the constant or systematic distortion of a measurement process, different from random error, which manifests itself as a persistent positive or negative deviation from the known or true value". The sampling procedures will include calibration of field instruments, and adherence to sample holding times and preservation requirements. Accuracy in the field will be evaluated through the use of trip blanks and/or field blanks. These blanks should contain no target analytes above the reporting limit.

3.2.2 Laboratory Accuracy Objectives

Laboratory accuracy will be expressed as percent recovery and will be determined through the analysis of matrix spike recoveries, surrogates and laboratory control recoveries samples, and reference material recoveries. Laboratory accuracy objectives limits will be those specified in the method. For method specific measurement performance criteria and QC samples please see Appendix A.

3.3 Representativeness

Representativeness is dependent upon the proper design of a sampling program and proper laboratory protocol. The rationale behind the sampling program is discussed in the site-specific work plan. Representativeness will be determined by ensuring that the work plan, proper sampling techniques and analytical procedures are followed, samples are appropriately preserved, and sample holding times are not exceeded.

Sampling procedures have been established to assure that samples collected are representative of the sampled media. Field handling protocols (e.g., sample storage and handling in the field, and shipping) have also been designed to protect the representativeness of the samples. Proper field documentation will be used to demonstrate that procedures have been followed and that sample identification and integrity have been maintained. For method specific measurement performance criteria and QC samples please see Appendix A.

3.4 Completeness

3.4.1 Field Completeness Objective

Field completeness will be measured on the basis of the number of valid field and sample measurements relative to the number of samples planned to be collected.

3.4.2 Laboratory Completeness Objectives

Laboratory completeness will be measured by the number of valid measurements obtained compared to the number of valid samples submitted/collected. For method specific measurement performance criteria and QC samples please see Appendix A.

3.5 Comparability

The degree to which existing and planned analytical data can be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as

documented in this QAPP, are expected to provide comparable data. However, any modification in protocol or Quality Assurance objectives may affect data comparability.

When comparing data, it is important to compare data under the same set of conditions. In order to ensure comparability of data the following will be adhered to: (1) using Standard Operating Procedures; (2) using standard laboratory methods; (3) recording data in a consistent manner; (4) reporting data in appropriate and consistent units, (5) using confirmatory sampling and analysis when using alternative sampling and analysis methodologies; and, (6) ensuring holding times and preservation requirements are adhered.

For method specific measurement performance criteria and QC samples please see Appendix A.

3.6 Sensitivity

The laboratory will monitor the data quality through constant instrument performance and that instrument sensitivity will be monitored through the use of method blanks, calibration check samples, etc. in accordance with the methods listed in Table 5.1. The sensitivity requirements mandate that the method used has the adequate sensitivity to accurately measure and whose reporting limit is at or below the relevant and applicable regulatory limits for each contaminant of concern for the site. For method specific measurement performance criteria and QC samples please see Appendix A.

3.7 Site-Specific DQOs

The categories of data quality to be utilized during the activities at the site are consistent with those outlined in the USEPA DQO Guidance (USEPA, 2000), a multi-step process that ensures the quality, type and quantity of environmental data used is appropriate for its intended use, and are described below.

- DQO Level 1 – Field Screening Utilizing Portable Instrumentation: Data used for site health and safety monitoring and field screening during site characterization activities. The data generally determines the presence or absence of certain constituents and is generally qualitative rather than quantitative. Field screening data provides the lowest data quality.

- DQO Level 2 – Field Laboratory Analysis: Data used for field screening during site characterization activities, evaluation of remedial alternatives, engineering design and monitoring during implementation of alternatives. The data generally determines levels of certain constituents relative to a calibration standard and is generally qualitative or quantitative.

- DQO Level 3 – Engineering Level Data: Data used for site characterization, risk assessment, evaluation of alternatives, engineering design and monitoring during implementation of alternatives. The data is quantitative and is generated using EPA analytical laboratory procedures, however, it does not include full Contract Laboratory Protocol (CLP) documentation.

- DQO Level 4 – Laboratory Analysis: Data used for risk assessment, evaluation or alternatives and engineering design. The data is quantitative and is generated using EPA analytical laboratory procedures. All analyses require full Analytical Services Protocol (ASP)/CLP analytical protocols including Data Usability Summary Reports. The majority of the data generated during the Site Investigation will be DQO Level 4.

- DQO Level 5 – Non-Standard Special Analytical Services: Data for use when analysis by non-standard procedures is required to obtain specific or lower detection limits or analyses are not of a nature typically performed under the CLP Routine Analytical Service Program.

DQOs have been developed for the tasks outlined in the Work Plan. During the Site Remediation process it is anticipated that the following DQO Levels will be utilized.

DQO Level	Type of Activity
DQO Level 1 data (field screening)	Generated during the screening of vapor intrusion samples, soil samples, and health and safety monitoring.
DQO Level 4 data (laboratory analysis)	Generated during activities related soil, soil gas, ambient air and indoor air sampling.
DQO Level 2 data (field analysis)	Not expected to be generated as part of the remedial investigation activities. However, this type of data may be generated during activities relating to a supplemental remediation, if required.
DQO Level 3 data (engineering data)	Not expected to be generated as part of the remedial investigation activities. However, this type of data may be generated during activities relating to a supplemental remediation, if required.
DQO Level 5 data (non-standard special analytical services)	Not expected to be generated as part of the remedial investigation activities. However, this type of data may be generated during activities relating to a supplemental remediation, if required.

4 SAMPLE DESIGN AND RATIONALE

Soil sampling and vapor intrusion sampling will take place on Site to confirm contamination levels from previous sampled locations. Eight soil samples will be collected from a maximum depth of 15 feet. Six soil gas samples will be collected throughout the building location with two indoor air samples and one ambient air samples on hold.

This section describes the components of the sampling procedures that will be performed to meet the quality assurance objectives for the project.

4.1 Sampling Protocols

Detailed sampling protocols are provided and discussed in the workplan. Prior to beginning each sampling event, the field manager will ensure that the field personnel understand the purpose and objectives of the event. Topics to review and discuss with the team may include sampling locations, types of samples to be collected, number of samples collected, sample numbering, preservation requirements, parameter(s) to be analyzed, sampling procedures, equipment decontamination procedures, and chain-of-custody requirements.

4.2 Sample Handling

The project manager is responsible for ensuring that samples are collected with properly decontaminated equipment and containerized in properly cleaned sample bottles. A summary of the recommended sample containers, volume, and preservation for each analytical method is provided in Table 5.1.

4.3 Sampling Equipment Decontamination

Pre-cleaned equipment will be used for all soil sampling. All reusable or non-dedicated field equipment (e.g., sampling spoons, mixing bowls, spade/trowel) will be decontaminated prior to reuse. Equipment will be cleaned in the following manner:

- Nitrile gloves (or equivalent) well be worn during decontamination
- Excess soil will be removed using paper towels or by dry brushing
- The equipment will be rinsed with potable water, rinse water will be collected in one of the decontamination buckets
- A spray bottle containing LiquinoxTM (or equivalent non-phosphate detergent) and water will be used and clean with the stiff-bristle brush until all evidence of soil or other material has been removed
- Rinse with deionized or distilled water three times, ensuring that all detergent from the previous step has been removed
- Place the equipment on a piece of aluminum foil to air dry
- A trash bag should be provided for waste paper towels, aluminum foil, and used nitrile gloves.

Incidental trash generated during this investigation (including discarded nitrile gloves, aluminum foil, paper towels, and disposable equipment) will be placed in plastic trash bags and disposed of as solid waste.

Equipment decontamination is an integral part of the data collection and QA process. The implementation of proper decontamination practices and procedures will begin in the field prior to use of sample collection equipment. All field sampling equipment will be decontaminated before use and after each sample location.

Disposable sampling equipment will be used to the extent practicable, to reduce the chances for cross-contamination. Any reusable sampling equipment will be decontaminated after each use. The field decontamination procedure for sampling equipment will include, at a minimum, washing equipment in each of the following solutions:

- Solution #1 – Tap water rinse
- Solution #2 – Non-ionic detergent (i.e., Alconox) and tap water scrub
- Solution #3 – Tap water rinse

5 ANALYTICAL METHODS / QUALITY ASSURANCE SUMMARY TABLE

The following table 5.1 presents information related to the environmental, performance evaluation, and quality control samples to be collected.

Quality Assurance Project Plan
5 Westchester Plaza - 2847
Revision: 0
Date: 4/2/2021

Quality Assurance Sample Summary Table 5.1

Parameter	Matrix	Purpose	Number of Samples	Frequency	Field/Trip Blanks	Duplicates	Analytical Method	Container	Preservation	Maximum Holding Times
Volatile Organics	Soil	Remedial Investigation	24	One Time Only	1	2	8260B	(1) to (3) Encore Samplers or (3) 40 mL Glass, Teflon-lined septum	Cool 4°C, Sodium Bisulfate and Methanol if 40-mL Glass used	48 hours to lab prep. / 14 days
Volatile Organics (Air)	Air	Remedial Investigation	15	One Time Only	0	0	TO-15	Summa Canister (6-Liter or 1-Liter)	Ambient	30 days
Volatile Organics	Aqueous	Remedial Investigation	3	One Time Only	2	1	624	(3) 40 mL Glass, Teflon-lined septum per sample	Cool 4°C; HCl <2	14 days
Semi-Volatile Organics	Soil	Remedial Investigation	24	One Time Only	1	2	8270C	50 g - Glass with Teflon-lined cap	Cool 4°C	14 days
Semi-Volatile Organics	Aqueous	Remedial Investigation	3	One Time Only	1	1	625	1 L - Glass with Teflon-lined cap	None	7 days
PCBs	Soil	Remedial Investigation	24	One Time Only	1	1	8082	50 g - Glass with Teflon-lined cap	Cool 4°C	14 days
PCBs	Aqueous	Remedial Investigation	3	One Time Only	1	1	608	1 L - Glass with Teflon-lined cap	None	7 days
Pesticides	Soil	Remedial Investigation	24	One Time Only	1	1	8081	50 g - Glass with Teflon-lined cap	Cool 4°C	14 days
Pesticides	Aqueous	Remedial Investigation	3	One Time Only	1	1	608	1 L - Glass with Teflon-lined cap	None	7 days
Metals	Soil	Remedial Investigation	24	One Time Only	1	1	SW 6010 / SW 6020	10 g - Polyethylene	Cool 4°C	6 months
Metals	Aqueous	Remedial Investigation	3	One Time Only	1	1	200.7 or 200.8	200 ml - Polypropylene	HNO3 < 2	6 months
PFAS	Soil	Remedial Investigation	24	One Time Only	1	1	537.1	Provided by Laboratory	Provided by Laboratory	14 Days
PFAS	Aqueous	Remedial Investigation	3	One Time Only	1	1	537.1	Provided by Laboratory	Provided by Laboratory	14 Days

5.1 Quality Control Requirements

5.1.1 Field Quality Control

A cooler (temperature) blank will be placed in a cooler so that the temperature of each cooler can be measured accurately upon receipt at the laboratory without compromising sample integrity. Thus, the cooler blank is a surrogate sample: the cooler blank for water and soil/sediment samples is deionized water. The cooler blanks lid should be clearly labeled so the laboratory custodian will recognize and use it to measure temperatures upon receipts. Cooler blanks are not assigned a unique field sample identification number.

No field duplicates and sample blanks will be collected for this study**.**

5.1.2 Analytical Laboratory Quality Control

The QC samples are intended to assess the major components of total study error, which facilitates the final evaluation of whether environmental data are of sufficient quality to support the related decisions. The QC sample requirements are designed to provide measurement error information that can be used to initiate corrective actions with the goal of limiting the total measurement error.

QC samples and frequency applicable to analytical chemistry laboratories are detailed in Appendix B. If matrix spikes and duplicate matrix spikes are being collected then it must be an authentic field sample, not one of the field duplicates. If there is insufficient field sample for a matrix spike or matrix spike duplicate, a laboratory control sample duplicate will be prepared to assess laboratory precision. Appendix C defines the general required accuracy and precision for QC samples, along with corrective actions that must be implemented if QC criteria are not met.

All QC sample failures and associated corrective actions will be documented. If data must be reported with failing QC results, then data qualifiers will be assigned to the QC sample data. Appendix D defines data qualifiers that will be applied by the laboratories.

6 DESCRIPTION OF SAMPLING METHODOLOGIES

In accordance DER-10, sampling methods, sample preservation requirements, sample handling time, decontamination procedure for field equipment, and frequency for field blanks, field duplicates and trip blanks will conform to applicable industry methods. Following is a detailed description of sampling methodologies for each matrix tested along with standard operating procedures references.

6.1 Soil Sampling

Pre-cleaned equipment will be used for all soil sampling. All reusable or non-dedicated field equipment (e.g., sampling spoons, mixing bowls, spade/trowel) will be decontaminated prior to reuse. Equipment will be cleaned in the following manner:

- Nitrile gloves (or equivalent) well be worn during decontamination
- Excess soil will be removed using paper towels or by dry brushing
- The equipment will be rinsed with potable water, rinse water will be collected in one of the decontamination buckets
- A spray bottle containing LiquinoxTM (or equivalent non-phosphate detergent) and water will be used and clean with the stiff-bristle brush until all evidence of soil or other material has been removed
- Rinse with deionized or distilled water three times, ensuring that all detergent from the previous step has been removed
- Place the equipment on a piece of aluminum foil to air dry
- A trash bag should be provided for waste paper towels, aluminum foil, and used nitrile gloves.

Incidental trash generated during this investigation (including discarded nitrile gloves, aluminum foil, paper towels, and disposable equipment) will be placed in plastic trash bags and disposed of as solid waste.

6.2 Groundwater Sampling

Water level probes will be decontaminated between each sampling location in accordance with Section 4.3. Prior to well purging or sampling the initial static water levels will be measured and recorded to the nearest 0.01-foot from the surveyed reference point for all wells as identified in the workplan. Water level measurements will be collected at all applicable site monitoring wells within the same day. Well depth will be recorded, at the end of sample collection, as well as the general physical condition of the well during each sampling event on the sampling form.

If free product is suspected or if strong odors are present in a well, free product thickness will be measured using an interface probe or a clean disposable bailer lowered slowly into the well. A tape measure will be used to determine the thickness in the bailer. Any well containing free product will not be sampled, unless a fingerprint analysis will be required. The groundwater monitoring wells will be sampled in order from historically lowest concentration to highest. Sample order will be based on previous analytical results.

A minimum of three well volumes will be purged and the purged volume will be recorded on the sampling form. Groundwater samples will be collected using a pump or bailer.

The use of bailers when samples are being collected for VOCs analysis is not permitted due to the likelihood of analyte losses. Use of bailers should be limited to those situations where use of a pump is not possible. The rationale for use of bailers will be documented in the field notes.
Groundwater monitoring wells will be sampled in accordance with the NJDEP FSPM. Disposable single-use 3/8-inch high density polyethylene (HDPE) tubing will be inserted into the screened interval at each well and positioned opposite the screen. Water samples will be collected with a peristaltic pump at a low flow rate. Prior to collecting groundwater samples, wells will be developed, then purged using a peristaltic pump until water quality parameters have stabilized, per the stabilization criteria shown in the table below. Water quality parameters to be measured in the field are temperature, pH, dissolved oxygen (DO), specific electrical conductance (SEC), turbidity, and oxidation/reduction potential (ORP). Field parameters are primarily used to determine stability of recharge of the well and to ensure a groundwater sample is representative of the formation. Purge water will be containerized and sored on-site, then disposed of at an appropriate facility once characterized.
Recommended bottle types and preservatives for each COC are listed in Table 5.1.

6.3 Vapor Intrusion Sampling

Pre-cleaned equipment will be used for all soil sampling. All reusable or non-dedicated field equipment (e.g., sampling spoons, mixing bowls, spade/trowel) will be decontaminated prior to reuse. Equipment will be cleaned in the following manner:

- Nitrile gloves (or equivalent) well be worn during decontamination
- Excess soil will be removed using paper towels or by dry brushing
- The equipment will be rinsed with potable water, rinse water will be collected in one of the decontamination buckets
- A spray bottle containing LiquinoxTM (or equivalent non-phosphate detergent) and water will be used and clean with the stiff-bristle brush until all evidence of soil or other material has been removed
- Rinse with deionized or distilled water three times, ensuring that all detergent from the previous step has been removed
- Place the equipment on a piece of aluminum foil to air dry
- A trash bag should be provided for waste paper towels, aluminum foil, and used nitrile gloves.

Incidental trash generated during this investigation (including discarded nitrile gloves, aluminum foil, paper towels, and disposable equipment) will be placed in plastic trash bags and disposed of as solid waste.

6.4 Sediment Sampling

Sediment sampling will not be conducted as part of this investigation.

6.5 Surface Water Sampling

Surface water sampling will not be conducted as part of this investigation.

7 SAMPLE CUSTODY

7.1 Sample collection

Based on the fact that invasive, subsurface work is necessary for implementing this phase of the project, appropriate sampling technologies will be utilized that are consistent with the subsurface conditions at the site. The use of mechanized drilling equipment to advance boreholes will be used. The specific groundwater sampling techniques will be dictated by findings of the soil boring and monitoring well installation activities, such as depth to groundwater and subsurface characteristics, as well as the resultant effects of said findings, such as the depth at which a screen was installed within a groundwater monitoring point. A multitude of industry standard techniques may be employed, including but not limited to the use of discrete samplers on drilling equipment of the use of centrifugal, submersible, or bladder pumps. Regardless of sampling techniques, the following general procedures will be followed.

7.2 Containers

The containers, sample volumes, number of samples, sample preservation and holding times are shown in Table 5.1. But in general, soil samples collected for VOC analysis will be collected either by use of EnCore™ samplers and submitted to the laboratory for extraction within 48 hours of sampling, or by using a coring device to collect and transfer a weighted aliquot of soil into pre-weighted 40-milliliter (ml) glass vials with Teflon padded lids, that contain sodium bisulfate or methanol.

Groundwater samples for VOC analysis will be collected in 40 ml-glass vials that have lids fitted with a Teflon pad for sealing the cap. The groundwater samples will be taken without air space or bubbles at the top of the vial that may cause volatilization. The groundwater samples for BNAs will be collected in clean 1-liter (L) amber glass bottles provided by the laboratory. The number of bottles required for the analysis will be determined by the laboratory.

Dependent on the required sampling methodologies, samples to monitor field parameters will be collected and in-line from a flow-through cell.

7.3 Labeling

Samples will be labeled in accordance with the tracking requirements for the site. After a sample container has been filled, the container will be sealed and labeled with an identification number and permit information.

The ID number is the minimal information that must be written on the sample containers. Other pertinent information typically includes the date and time of sample collection, the analytical method to be applied, the chain-of-custody recorder, and the initials of the person that collected the sample.

All containers will be properly labeled by using a permanent marker or a ballpoint pen. Samples for a certified fixed-based laboratory will be labeled for proposer identification. Sample labels will accompany the physical samples to the laboratory. The sample label will be disposed of with samples.

7.4 Sample Storage in the Field

All samples collected under the investigation proposed in this section will be placed in a shuttle cooled and maintained at 4°Celsius, and shipped under chain-of-custody to a NYDOH-certified laboratory for analysis.

7.5 Sample Holding Times

The sample holding time starts as soon as the sample has been collected. Consequently, all samples will be shipped in a shuttle cooled to 4°Celsius (where applicable, such as soils and groundwater) and delivered to a NYDOH-certified fixed-base laboratory as expeditiously as possible within the handling time allotted by the laboratory based on parameter specific constraints.

7.6 Sample Delivery

Samples for NYDOH-certified fixed-based laboratory analysis will be shipped to a fixed-based laboratory within 24 hours under proper chain-of-custody. For the fixed-based laboratory, either a commercial shipping company will deliver the samples or project personnel will deliver them.

8 FIELD INSTRUMENTATION CALIBRATION AND PREVENTATIVE MAINTENANCE

8.1 Field Equipment

All required equipment will be provided by Peak and its subcontractors in order to conduct the field work for this site.

8.2 Laboratory Equipment

All analytical instruments and equipment will be maintained according to the laboratory Standard Operating Procedures (SOP) and the manufacturers' requirements. Laboratory equipment and instrument maintenance is defined in the laboratory SOPs. All routine maintenance and nonroutine repairs are to be documented in a bound logbook. The information recorded should include analyst initials, date maintenance was performed, a description of maintenance activity, and result of any retesting.

8.3 Instrument/Equipment Calibration and Frequency

Laboratory and field equipment will be calibrated in accordance with U.S. EPA guidance or the manufacturers' recommendations. Field equipment refers to articles used for on-site monitoring, testing and sampling, whereas laboratory equipment refers to articles used in the laboratory in support of data collection.

8.3.1 Field Equipment

A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. Trained team members will perform scheduled calibration, field calibrations, checks, and instrument maintenance prior to use each day. Additionally, calibration will be checked as necessary to ascertain that proper measurements are being taken.

Team members are familiar with field calibration, operation, and maintenance of the equipment, and will perform the prescribed field operating procedures outlined in the operation and field manuals accompanying the respective instrument. Field personnel will keep records of all field instruments calibrations and field checks in the field logbooks or in Instrument Calibration Forms (Appendix E). Calibration information recorded in field logbooks will include date, time, instrument model and serial number, a description of calibration or field check procedure, and any instrument deviations.

If onsite monitoring equipment should fail, the Field Supervisor will be contacted immediately. Replacement equipment will be provided or the malfunction will be repaired in a timely fashion.

8.3.2 Laboratory Equipment and Instruments

Laboratory equipment and instrument calibration procedures will be completed by the laboratory in accordance with the laboratory SOPs, Appendix F.

9 SAMPLE CUSTODY

Once the samples have been collected, sealed, labeled, and placed in a shuttle cooled to 4°C Celsius, they are placed in the custody of the person who collected the samples. The person assuming custody of the samples is responsible for ensuring that the samples are protected and are not tampered with or altered in any way. When the samples are transferred to the custody of another person, that person assumes responsibility for the samples. The samples must be in the possession of control of the "responsible person" (i.e., the person having custody of the samples) at all times.

9.1 Field Operations

The section describes field procedures for maintaining sample custody. Other information describing field operations may be found in the workplan and its appendices. A summary of the recommended sample containers, volume, preservation, and hold times for each analytical method is provided in Table 5.1.

9.2 Field Records

Field personnel will be required to keep accurate written records of their daily activities in a bound logbook or with field forms. All entries will be legible, written in waterproof ink, and contain accurate and inclusive documentation of the team's activities, including instrument calibration, samples collected, field data and observations, any problems encountered, and actions taken to solve problems. Entry errors or changes will be crossed out with a single line and initialed by the person making the correction. Field logbooks of field forms will be available for review by the QA coordinator during systems audits or at any other time for QC checks by the field manager. This documentation provides verification of sampling procedures.

9.3 Sample Custody

The custody of the sample is maintained by:

- The sample is in the sampler's possession;
- The sample is in the sampler's view after being in possession;
- The sample was in the sampler's possession and then was locked up to prevent tampering; and,
- The sample is in a designated secure area.

9.4 Sample Labels and Identification

Samples will be labeled in accordance with the tracking requirements for the site. After a sample container has been filled, the container will be sealed and labeled with an identification number and permit information.

The ID number is the minimal information that must be written on the sample containers. Other pertinent information typically includes the date and time of sample collection, the analytical method to be applied, the chain-of-custody recorder, and the initials of the person that collected the sample.

All containers will be properly labeled by using a permanent marker or a ballpoint pen. Samples for a certified fixed-based laboratory will be labeled for proposer identification. Sample labels will accompany the physical samples to the laboratory. The sample label will be disposed of with samples.

9.5 Chain-of-Custody Record

As indicated above, once samples have been collected, sealed, labeled, and placed in a shuttle cooled to 4°C Celsius, they are placed in the custody of the person who collected the samples. The information typically included on a chain-of-custody (C-O-C) record is sample identification, the date and time the sample was collected, the type and volume of the sample container, the type of matrix (soil, groundwater, or air), the number of samples, and the analyses to be performed on each sample. Each time responsibility for the samples is transferred from one person to another, the person relinquishing responsibility and the person accepting responsibility for the samples are required to sign the chain-of-custody and note the date and time that the transfer occurred. The C-O-C record remains with the samples listed on the record at all times until a fixed-based laboratory accepts the samples. Control of the samples is maintained by placing custody seals on the sample container. When shipping samples in a shuttle, the chain-of-custody is placed inside the chest along with the samples, the chest is taped closed with duct tape or boxing take, and custody seals are placed across the opening and the tape.

All sample ice chests will be accompanied by the C-O-C record, which identifies their contents. The original record plus one copy will accompany the ice chest; the other copy will be retained in the project file. One copy will be returned to the project team with the analytical results and the original is retained in the laboratory files with the analytical data.

All ice chests will be secured with custody seals for transportation to the off-site laboratory. Custody seals are not required for onsite analysis with the provision that the samples are delivered shortly after collection and that they will not be left unattended. Custody seals must be applied to all ice chests left unattended that contain samples.

The method of shipment, courier name(s), and other pertinent information is entered in the “Remarks” section when the samples are to be shipped (i.e., Federal Express, Express Mail, etc.) instead of hand delivered.

Upon receipt by the fixed-base laboratory, the laboratory assumes responsibility for the samples. The laboratory logs in the samples and assigns unique laboratory identification to each sample submitted under the chain-of-custody. The original chain-of-custody remains with the samples until such time that the analytical data package for the samples compiled, at which time the original chain-of-custody is included in the laboratory deliverable.

9.6 Shipping Procedures

The objective of sample handling procedures is to ensure that samples arrive at the laboratory intact, at the proper temperature, and free of external contamination. For all samples which will be shipped to the

analytical service laboratory via overnight carriers (or delivered), C-O-C procedures will be followed during transport.

When samples are required to be stored at 4° C or less, generous amounts of ice will be packed with the samples. The ice will be of sufficient volume and will be distributed in the coolers so that the proper storage temperature will be maintained until the samples reach the laboratory.

The following procedures will be used to prevent bottle breakage and cross contamination:

- All samples will be transported inside hard plastic coolers;
- All glass bottles will be protected to prevent glass to glass contact;
- The coolers will be taped shut and sealed with custody seals to indicate unauthorized opening of the cooler; and,
- Samples that are known or suspected to contain high levels of chemical constituents (based on past monitoring data or observation) will be packaged and transported separately from other samples.

10 LABORATORY SAMPLE STORAGE PROCEDURES

Upon receipt of coolers containing samples, an initial inspection of the sample shuttle and associated samples will be performed for signs of damage; the presence of custody seals, airbills or air bill stickers; and a chain-of-custody. Laboratory personnel will check sample containers for damage and appropriate volume, container type, and preservation for the proposed analysis, and will record broken or damaged containers, or samples that are not in the proper container on a sample receipt log. Laboratory personnel will then measure the temperature of the incoming samples, record the temperature on the chain-of-custody, and document any samples outside of the acceptable temperature range. Once an initial inspection of the coolers has been completed, samples will be logged into the laboratory's LIMS system. To mitigate sample cross contamination, laboratory personnel will tighten the lid on every sample bottle and remove any sample residue from the exterior surface. If the sample bottle has residue that is not removable, it will be placed in a sealable bag to eliminate any potential contact with other samples. Samples will be maintained in sample storage refrigerators, where the temperature is maintained at 4°Celsius and both monitored and recorded daily.

10.1 Sample Handling

The following section describes the activities related to sample receipt, storage, and tracking.

- Upon receipt, the sample custodian will inspect all sample containers for integrity. The presence of leaking or broken containers or custody seals will be noted on the C-O-C form. The sample custodian will sign the C-O-C form (with date and time of receipt), thus assuming custody of samples.

- The information on the C-O-C from will be compared with that on the sample tags and labels to verify sample identity. Any inconsistencies will be resolved with the project chemist before sample analysis proceeds.

- The temperature of incoming coolers of samples will be checked and the temperature recorded on the internal C-O-C record.

- Preserved samples (i.e., those requiring pH adjustments) will be checked and any improperly preserved samples noted on the C-O-C.

- Samples will be moved to a controlled sample storage refrigerator for storage prior to analysis.

- Document control will retain a legible cope of the original C-O-C form.

- Samples will be maintained in storage refrigerators prior to sample preparation and analysis.

10.2 Sample Identification

As samples are logged into the laboratory sample tracking system each sample is assigned a unique sample control number and is correlated with the field sample numbers obtained from the field C-O-C forms, as both numbers are entered into the system for a given job. Analytical requirements for each sample are entered into the computer. A hard copy of the work order and other information is printed and filed with

the received documentation. Labels are printed with sample information and secured to each sample. Data sheets and work sheets are printed for each batch of samples and are distributed to the appropriate laboratory managers.

10.3 Sample Custody Records

Sample custody and documentation in analytical laboratories are organized around sample and analysis management systems. For example, these systems are computer software systems specifically designed for tracking and handling the large amount of information required for the efficient management of an analytical chemistry laboratory.

Following sample log in, the samples are placed in a designated secured storage area. Samples are maintained at the appropriate temperature from the time of receipt until the analyses are complete. Samples in freezers are maintained at 0°C from the time of receipt until the analyses are complete. Subsequent sample custody and all transactions are documented. Sample custody is documented according to the laboratory SOP, Appendix F.

The analyst receives the samples from sample control and completes the sample work sheets or custody sheet. After analysis, the sample is returned to the designated storage location in sample control. The sample is stored until the assigned time or written permission is given to either properly dispose of the sample. All sample documentation is maintained in secure storage in a controlled access area.

11 DATA MANAGEMENT

Data management (e.g., paper flow, data tracking, data entry, etc.) and data assessment (e.g., verification, validation and data quality assessment) activities require adequate QC procedures to ensure that the SOPs are being followed and result in records/reports that are accurate and appropriate. The laboratory must document its data management procedures in an SOP. Data verification and review is described in Section 13.

12 LABORATORY QA/QC

The NYDOH approved laboratory has developed a system of SOPs, report formats, and review mechanisms for all areas of the laboratory. The SOPs are available for all laboratory functions including but not limited to:

- Laboratory Policies and Procedures
- Purchasing
- Sample Receiving and Log-In Procedures
- Maintenance and Security of samples throughout the Laboratory System
- Performing all Analytical Methods of Analysis
- Instrument Maintenance
- Document Control Procedures
- Data Management and Handling, including data security and archiving
- Method Compliance, Report Preparation and Data Validation

In addition, data validation is an integral part of the QA/QC program. All organic analyses meet specific requirements for surrogate spiking recoveries, as well as spike/spike duplicate recoveries. Shewhart curves are continuously reviewed and updated in order to set upper and lower control limits for each analyte, as well as maintain instrument accuracy, precision, and MDL integrity. A copy of the Laboratory SOP is included in Appendix F.

13 DATA REVIEW AND USABILITY

This section of the QAPP provides a description of the data review activities that will occur after the data collection phase of the project is completed. The requirements and methods for data review, verification, and validation, as well as the process for reconciling data generated with the DQOs are discussed. This section provides a process to evaluate data, identify usability of data and address various data assessment issues performed by the laboratory, samplers and independent reviewer(s), lists of criteria for rejecting, accepting and qualifying data. Implementation of these methods will determine whether or not the data conform to the specified performance criteria, thus satisfying the project objectives.

13.1 Data Review, Validation, and Oversight

Data review includes data verification, validation, and oversight, as well as reconciliation of the data quality with user requirements. The data verification process includes the initial review of the data packages to ensure that the analyses requested have been provided. Data validation is the process of reviewing data and accepting, qualifying or rejecting data on the basis of sound criteria using established U.S. EPA guidelines. Final technical data review of analytical data occurs after independent data validation has been completed. It provides an indication of overall trends in data quality and usability. These procedures are detailed below.

13.1.1 Data Review and Usability

All phases of the project (e.g., field monitoring and sampling activities and laboratory activities) will be inspected to identify if any issues were encountered that may designate the data unusable. The data quality assessment will follow the process outlined in the Data Quality Process (DQA) outline provided in Appendix G. The DQA and Data Usability Evaluation (DUE) forms will be used to document the data review. A copy of the DQA and DUE forms is included as Appendices H and I, respectively.

13.1.2 Data Verification and Usability

The analytical data generated during field investigations will be assembled in packages by sample delivery group, processing batch or analytical batch. The analytical chemistry data packages will contain supporting QC data for the associated field samples and will be validated.

Each analytical laboratory is responsible for reviewing each data package prior to release for validation. At a minimum, the following reviews must be performed:

- Peer review of the data by a qualified analyst;
- Review of the reported data and deviations by a technical supervisor or data coordinator; and,
- QA office review of 10% of the data

Implementation of these procedures is defined in laboratory SOPs (Appendix F). Reviews must ensure the following:

- All data for project samples are reported accurately and completely;

- Sample analysis was conducted in accordance with required laboratory procedures and analytical methods specified in the QAPP;
- Criteria for data quality have been met or deviations are documented in the package narrative and data flags have been appropriately applied;
- Each data set is appropriately reviewed; and,
- All project requirements have been met.

13.1.3 Laboratory Data Validation

Data validation is conducted to assess the compliance of chemistry data with the DQOs defined in this QAPP. Data are assessed for completeness and compliance with the requirements of the analytical methods. Validation is conducted on each data package to determine the adequacy of the data to meet the DQOs.

13.1.4 Field Data Validation

Validation of objective field and technical data will be performed at two different levels. On the first level, data will be validated at the time of collection by following standard procedures and quality control checks. At the second level, data will be validated by the PM or his designee who will review the data to ensure that the correct codes and units have been included. After data reduction into tables the PM will review data sets for anomalous values. Any inconsistencies or anomalies but the PM will be resolved immediately, if possible, by seeking clarification from the field personnel response for collecting the data.

Subjective field and technical data will be validated by the PM, who will review field reports for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made to confirm the recorded observations. Whenever possible, peer review will also be incorporated into the data validation process, particularly for subjective data, to maximize consistency among field personnel. In addition, for field analyses and tests, an independent review of applicable items described previously for laboratory data validation will be conducted (e.g., calibration methods, control limits, instrument checks, etc.). A record of field data validation will be made using the data validation/review forms in Appendices H and I.

13.1.5 Reconciliation with User Requirements

Once the data evaluation results have been compiled the PM will review to ensure that all of the QC criteria fall within the acceptable limits as defined in this QAPP. Data validation will be conducted by filling in the information in

If however, problems are encountered in the field or laboratory, then the PM will evaluate the cause of failure (if possible) and make a decision to discard the data and re-sample. If the failure is associated with an analysis, then equipment maintenance and calibration methodologies will be reassessed as identified by the laboratory. If the failure is associated with sample collection and re-sampling is required, the field personnel will be retrained. The table in Appendix J lists some typical data verification and validation issues as well as provides potential suggestions for action items and identifies implications for data usability.

APPENDIX A

Table 1 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Linear Dynamic Range (LDR)	At a minimum the LDR should be check every 6 months	A minimum of 3 different concentration standards across the ICP range; one should be near the upper limit of the range.	NA	Analyst
Accuracy	A	Initial Calibration	Daily prior to sample analysis	Minimum of a calibration blank plus a standard per manufacturing recommended procedures; RL standard may be included in multi-point calibration curve; linear curve fit with correlation coefficient $\geq$0.995.	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; must contain all target analytes ICV: 90-110% recovery	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Accuracy	A	Initial Calibration Blanks (ICB)	After ICV	Must be matrix-matched (and same concentration of acid found in standards and samples); ICB: < ± RL	Re-analyze ; if still out, Re-calibrate and reanalyze.	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 of every 10 samples and at end of run	Same source as calibration standards; conc. near mid-point of calibration curve; must contain all target analytes CCV: 90 - 110% recovery	Re-analyze; if still out, Re-calibrate and reanalyze. all samples since last acceptable CCV	Analyst

Table 1 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Sensitivity	A	Continuing Calibration Blanks (CCB)	After each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); CCB: < ± RL	Re-calibrate, if still out, Re-calibrate and reanalyze.	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be digested with samples using same preparation method and amount of acids; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level	Analyst
Accuracy	A	Interference Check Standards (ICSA and ICSAB)	Daily after calibration	ICSA & ICSB: 80-120% recovery ICSA: non-spiked analytes ≤ 2x RL	Re-analyze; if still out; adjust interference and background correction, and/or linear ranges as needed & recalibrate and reanalyze all field samples since last complaint ICSA & ICSB	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must contain all target analytes and be matrix-specific; Aq. LCS: 80-120% recovery; Soil/Sediment/solid LCS: vendor control limits (95% confidence limits)	Re-analyze, if still out; redigest & Re-analyze LCS & all field samples in batch	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. For soil and aqueous samples: Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Re-analyze, qualify data	Analyst/Data Reviewer

Table 1 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Evaluate LCS, unspiked sample and qualify data	Analyst/Data Reviewer
Precision	S & A	Matrix Spike Duplicate (MSD) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample. For soil and aqueous samples: Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Lab narrates outlier; qualify data	Analyst/Data Reviewer
Accuracy	A	Post digestion spike	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Should be performed if MS/MSD recoveries were unacceptable: 80-120% recovery	Lab narrates outlier; qualify data	Analyst/Data Reviewer
Accuracy	A	Serial Dilution	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Perform 5x dilution on same sample used for MS. % Difference ≤ 10% for results >50x IDL (which will most likely equate to 10X RL).	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ linear calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range; report from diluted analysis	Analyst/Data Reviewer
Overall Precision & Represent-ativeness	S & A	Field Duplicate Sample [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment; Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer

Table 1 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy (preservation)	S & A	Sample preservation	every field sample	Aq.: Total Metals: HNO_3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO_3 pH < 2 but cannot be used for regulatory compliance) Soil/Sediment: collect unpreserved per SW-846 Chapter 3 Table 3-2	Lab narrates outlier. Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Accuracy/ Sensitivity	S & A	Holding Time (HT)	every field sample	For aqueous and soil samples six months. If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier. Potential data usability issue	Data Reviewer
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous Potential data usability issue, Soil/Sediment: non-matrix matched aqueous EB use professional judgment	Data Reviewer
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 6010B (*Inductively Coupled Plasma-Mass Spectrometry*, December 1996 and February 2007) and (*Quality Assurance and Quality Control Requirements and Performance Standards for SW846 Method 6010B, Trace Metals by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP)*).

Table 2 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Linear Dynamic Range (LDR)	At a minimum the LDR should be check every 6 months	A minimum of 3 different concentration standards across the ICP range one should be near the upper limit of the range.	NA	Analyst
Accuracy	A	Initial Calibration	Daily prior to sample analysis	Minimum of a calibration blank plus a standard per manufacturing recommended procedures; RL standard may be included in multi-point calibration curve; linear curve fit with correlation coefficient $\geq$0.998.	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; must contain all target analytes ICV: 90-110% recovery	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Sensitivity	A	Low Level Initial Calibration Verification	For method 6010C, LLICV must be analyzed at the beginning of the run before any samples and at the end of the run.	Same source as calibration standards; must contain all target analytes at the RL 70-130% recovery	Re-analyze. If still out, Re-calibrate/re-analyze. Suspend all analyses until LLICV meets criteria unless all results > 10x RL	Analyst
Accuracy	A	Initial Calibration Blanks (ICB)	After ICV	Must be matrix-matched (and same conc. of acid found in standards and samples); ICB: < ± RL	Re-analyze ; if still out, Re-calibrate and reanalyze.	Analyst

Table 2 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run	Same source as calibration standards; conc. near mid-point of calibration curve; must contain all target analytes CCV: 90 - 110% recovery	Re-analyze; if still out, Re-calibrate and reanalyze. All samples since last acceptable CCV	Analyst
Sensitivity	A	Low Level Continuing Calibration Verification	For method 6010C, LLCCV must be analyzed at the beginning of the run before any samples and at the end of the run.	Same source as initial calibration standards; must contain all target analytes at the RL 70-130% recovery	Re-analyze. If still out, Re-calibrate/re-analyze. Suspend all analyses until LLICV meets criteria unless all results > 10x RL	Analyst
Sensitivity	A	Continuing Calibration Blanks (CCB)	After each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); CCB: < ± RL	Re-analyze ; if still out, Re-calibrate and reanalyze.	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be digested with samples using same preparation method and amount of acids; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level	Analyst

Table 2 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Interference Check Standards (ICSA and ICSAB)	Daily after calibration	ICSA & ICSB: 80-120% recovery ICSA: non-spiked analytes ≤ 2x RL	Re-analyze; if still out, adjust interference and background correction, and/or linear ranges as needed & recalibrate and reanalyze all field samples since last complaint ICSA & ICSB	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must contain all target analytes and be matrix-specific; Aq. LCS: 80-120% recovery; Soil/Sediment/sol-id LCS: vendor control limits (95% confidence limits)	Re-analyze, if still out' redigest & Re-analyze LCS & all field samples in batch	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. For soil and aqueous samples: Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Re-analyze, qualify data	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Evaluate LCS, unspiked sample and qualify data	Analyst/Data Reviewer
Precision	S & A	Matrix Spike Duplicate (MSD) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample. For soil and aqueous samples: Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Lab narrates outlier; qualify data	Analyst/Data Reviewer

Table 2 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Post digestion spike	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Should be performed if MS/MSD recoveries were unacceptable: 80-120% recovery	Lab narrates outlier; qualify data	Analyst/Data Reviewer
Accuracy	A	Serial Dilution	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Perform 5x dilution on same sample used for MS % Difference ≤ 10% for results >10x RL.	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ linear calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range; report from diluted analysis	Analyst/Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Sample [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment; Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer
Accuracy (preservation)	S & A	Sample preservation	every field sample	Aq.: Total Metals: HNO_3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO_3 pH < 2 but cannot be used for regulatory compliance) Soil/Sediment: collect unpreserved per SW-846 Chapter 3 Table 3-2	Lab narrates outlier. Potential data usability issue	Data Reviewer

Table 2 QAPP Worksheet All Matrices – Metals (ICP) USEPA SW-846 6010C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum ≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Accuracy/ Sensitivity	S & A	Holding Time (HT)	every field sample	For aqueous and soil samples six months. If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier. Potential data usability issue	Data Reviewer
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous Potential data usability issue, Soil/Sediment: non-matrix matched aqueous EB use professional judgment	Data Reviewer
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, January 2012 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 6010C (*Inductively Coupled Plasma-Mass Spectrometry*, Revision 3 February 2007).

Table 3 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Tuning	Daily prior to calibration	Manufacturer's Recommendation & SW-846 Method 6020A Tuning Criteria	Re-optimize instrument and re-tune, suspend all analysis until tuning is successful	Analyst
Accuracy	A	Initial Calibration	Daily following tuning prior to sample analysis	Minimum of a calibration blank plus a standard per manufacturing recommended procedures	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards and at the midpoint of the linear range. Must contain all target analytes ICV: 90-110% recovery.	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 10 samples and after the last sample	CCV: 90 - 110% recovery	Re-analyze; if still out, Re-calibrate and reanalyze. All samples since last acceptable CCV	Analyst
Sensitivity	A	Initial and Continuing Calibration Blanks (ICB and CCB)	After ICV and after each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); ICB/CCB: < ± RL	Re-calibrate, if still out, Re-calibrate and reanalyze.	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be digested with samples using same preparation method and amount of acids; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level	Analyst

Table 3 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Interference Check Standards (ICSA and ICSAB)	Daily after calibration	ICSA & ICSAB: 80-120% recovery	This is a method requirement of SW-846 6020. If the ICSA or ICSAB are out of specifications, it indicates that the instrument is not running properly. Retune and reanalyze the associated samples.	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must contain all target analytes and be matrix-specific; Aq. LCS: 80-120% recovery; Soil/Sediment/solid LCS: vendor control limits (95% confidence limits)	Re-analyze if still out re-analyze & redigest with all samples in a batch unless site specific MS is in control Lab narrates outlier.	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per $\leq$ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. Results ≥ 5xRL, RPD ≤ 20 aqueous, 35% solids%; Results < 5xRL: absolute difference between results ≤ RL.	Qualify data	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per $\leq$ 20 field samples	Must be performed on a Site field sample; & must contain all target analytes; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Lab narrates outlier Evaluate LCS, unspiked sample and qualify data	Analyst/Data Reviewer

Table 3 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	S & A	Matrix Spike Duplicate (MSD) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample. Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Post digestion spike	Not applicable	Should be performed if MS/MSD recoveries were unacceptable: 80-120% recovery	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Serial Dilution	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Perform 5x dilution on same sample used for MS % Difference ≤ 10% for results >50x RL.	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	Every field sample and QC sample	For all analysis the intensity of any IS must fall between 30 and 120% of the IS in the initial calibration standard.	The sample must be diluted fivefold and reanalyzed with the appropriate amounts of IS.	Analyst/Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ upper calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range; report from diluted analysis	Analyst/Data Reviewer
Overall Precision & Representativeness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer

Table 3 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy (preservation)	S & A	Sample preservation	every field sample	Aq.: Total Metals: HNO_3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO_3 pH < 2 but cannot be used for regulatory purposes) Soil/Sediment: collect unpreserved per SW-846 Chapter 3 Table 3-2	Lab narrates outlier. Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	every field sample	For aqueous and soil samples six months. If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier. Potential data usability issue	Data Reviewer
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous Potential data usability issue, Soil/Sediment: non-matrix matched aqueous EB use professional judgment	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:

1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 6020 (*Inductively Coupled Plasma-Mass Spectrometry*, September 1994).

Table 4 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Tuning	Daily prior to calibration	Manufacturer's Recommendation & SW-846 Method 6020A Tuning Criteria	Re-optimize instrument and re-tune, suspend all analysis until tuning is successful	Analyst
Accuracy	A	Initial Calibration	Daily following tuning prior to sample analysis	Minimum of 3 calibration levels plus blank; RL and Linear Range (LR) standards may be included in calibration levels; minimum of 3 integrations for each QC and field sample; linear curve fit $r \leq 0.998$; if not including RL and LR standards then LLCV and HLCV check standards need to be analyzed (see below).	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; Must contain all target analytes at the mid-range of the calibration curve ICV: 90-110% recovery	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Sensitivity	A	Low Level Initial Calibration Check Verification (LLICV)	Daily standard at the RL or lower limit of quantitation	Same source as calibration standards; must contain all target analytes at level of the RL LLCV: 70-130% recovery	Re-analyze. If still out, Recalibrate/ reanalyze unless all results > 10x RL	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run	Same source as initial calibration standards; Must contain all target analytes at the mid-range of the calibration curve CCV: 90 - 110% recovery	Re-analyze; if still out, Re-calibrate and reanalyze. all samples since last acceptable CCV	Analyst

Table 4 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Sensitivity	A	Initial and Continuing Calibration Blanks (ICB and CCB)	After ICV and after each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); ICB/CCB: < ± RL	Re-analyze ; if still out, Re-calibrate and reanalyze	Analyst
Sensitivity	A	Low Level Continuing Calibration Verification Standard (LLCCV)	Daily only if RL standard not included in initial calibration	Same source as initial calibration standards; must contain all target analytes at level of the RL LLCV: 70-130% recovery	Re-analyze. If still out, Recalibrate/ reanalyze unless all results > 10x RL	Analyst
Accuracy	A	Linear Dynamic Range (LDR)	At a minimum the LDR should be checked every 6 months	A minimum of 3 different concentration standards across the ICP range. One should be near the upper limit of the range.	NA	Analyst
Accuracy	A	Interference Check Standards (ICSA and ICSAB)	Daily after calibration	ICSA & ICSAB: 80-120% recovery	This is a method requirement of SW-846 6020. If the ICSA or ICSAB are out of specifications, it indicates that the instrument is not running properly. Retune and reanalyze the associated samples.	Analyst/Data Reviewer
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be digested with samples using same preparation method and amount of acids; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level.	Analyst

Table 4 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must contain all target analytes and be matrix-specific; Aq. LCS: 80-120% recovery; Soil/Sediment/ solid LCS: vendor control limits (95% confidence limits)	Re-analyze, if still out' redigest & Re-analyze LCS & all field samples in batch unless site specific MS is in control Lab narrates outlier.	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Qualify data	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample; & must contain all target analytes; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Lab narrates outlier Evaluate LCS, unspiked sample and qualify data	Analyst/Data Reviewer
Precision	S & A	Matrix Spike Duplicate (MSD) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample. Results ≥ 5xRL, RPD ≤ 20% aqueous, 35% solids; Results < 5xRL: absolute difference between results ≤ RL.	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Post digestion spike	Not applicable	Should be performed if MS/MSD recoveries were unacceptable: 80-120% recovery	Lab narrates outlier qualify data	Analyst/Data Reviewer
Accuracy	A	Serial Dilution	1 per ≤ 20 field samples if less than acceptable accuracy and precision data are generated	Perform 5x dilution on same sample used for MS. Serial Dilution % Difference ≤ 10% for results >50x RL.	Lab narrates outlier qualify data	Analyst/Data Reviewer

Table 4 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Internal Standards (IS)	Every field sample and QC sample	70% $\geq$ IS for QC samples ≤ 130% 70% $\geq$ IS for field samples ≤ 130% relative intensity % of IS compared to the intensity of the IS in the ICAL.	The sample must be diluted fivefold and reanalyzed with the appropriate amounts of IS.	Analyst/Data Reviewer
Overall Precision & Representativeness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ upper calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within calibration range; report from diluted analysis	Analyst/Data Reviewer
Accuracy (preservation)	S & A	Sample preservation	Every field sample	Aq.: Total Metals: HNO_3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO_3 pH < 2 but cannot be used for regulatory compliance) Soil/Sediment: collect unpreserved per SW-846 Chapter 3 Table 3-2	Lab narrates outlier Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	For aqueous and soil samples six months. If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier. Potential data usability issue	Data Reviewer

Table 4 QAPP Worksheet All Matrices – Metals (ICP-MS) USEPA SW-846 6020A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous Potential data usability issue, Soil/Sediment: non-matrix matched aqueous EB use professional judgment	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 6020A (*Inductively Coupled Plasma-Mass Spectrometry*, February 2007).

Table 5 QAPP Worksheet All Matrices - Pesticides USEPA SW-846 8081A & B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	A	Method Blank	1 per extraction batch of up to 20 field samples (matrix-specific)	All Target compounds < RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples	Must contain all single-component target analytes, performed on Site field sample; 30-150% recovery for all compounds.	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples	Must contain all single-component target analytes, performed on Site field sample; 30-150% recovery for all compounds; RPD ≤ 30% for solids and RPD ≤ 20% for waters	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per extraction batch of up to 20 samples	Must contain all single-component target analytes, concentration should be the same as MS if appropriate, be matrix-matched, 40-140% recovery for all target analytes.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a site sample, RPD ≤ 30% for solids and RPD ≤ 20% for waters for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 2 (recommend TCMX and DCB); 30-150% recovery on both GC columns	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer

Table 5 QAPP Worksheet All Matrices - Pesticides USEPA SW-846 8081A & B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Internal Standards (IS) (optional)	Every sample including QC (optional)	Minimum of 1 IS , Areas 50-200% of CCV; RTs ± 30 sec from ICAL	Reanalyze and qualify data	Analyst/Data Reviewer
Accuracy	A	Endrin/DDT Breakdown	Before samples are analyzed and at the beginning of each 12 hour shift	% Breakdown ≤ 15% based on peak areas	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 5-levels for single-component analytes and single-level for multi-component analytes using peak height or peak area; must contain all targets and lowest level ≤ RL; %RSD ≤ 20% or "r" ≥ 0.99 for all compounds; regression analysis, if used, must not be forced through the origin	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy	A	Continuing Calibration Verification(CCV)	Prior to samples, every 12 hours or every 20 samples, whichever is more frequent, and at the end of the analytical sequence	Concentration level near mid-point of ICAL curve containing all single-component target compounds; %D ≤ 20% and analytes fall within expected retention time windows; Multi-component analytes must be verified within 12 hours of being detected in a sample	Recalibrate as required by method; note outliers in narrative.	Analyst

Table 5 QAPP Worksheet All Matrices - Pesticides USEPA SW-846 8081A & B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Quantitation	Every sample	RL ≤ results ≤ upper calibration range on a sample-specific basis; average response factors or curve-statistics generated from the ICAL must be used for quantitation and peak height or peak area, as used for ICAL, must be used for sample. Report the highest concentration from the two GC columns and results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Precision	A	Quantitation	Every sample	RPD or %D ≤ 40% between two dissimilar GC Columns	Qualify result and narrate issue except if %D > 100%, then analyze sample at a secondary dilution and qualify data as necessary.	Analyst and Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	Cool to ≤ 6º C; allow for < 2º C if samples intact	Potential data usability issue	Data Reviewer

Table 5 QAPP Worksheet All Matrices - Pesticides USEPA SW-846 8081A & B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous samples extracted within 7 days of collection; extract analyzed within 40 days of extraction. Soil/Sediment samples extracted within 14 days of collection; extract analyzed within 40 days of extraction. If Soil/Sediment samples are frozen, HT arrested and extraction HT continues when thawed. Solid samples can be maintained frozen for 1 year from collection.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing decon, collect 1 EB per 20 field samples collected by the same method	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	$\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:

1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.

2. Pesticide Compound analyses via USEPA SW-846 Method 8081A&B (*Quality Assurance and Quality Control Requirements for SW-846 Method 8081A and 8081B Chlorinated Pesticides by Gas Chromatography [GC])*.

Table 6 QAPP Worksheet All Matrices (combined) - PCB Aroclors USEPA SW-846 8082 and 8082A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	A	Method Blank	1 per extraction batch of up to 20 field samples (matrix-specific)	All Target compounds < RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples	Must contain Aroclors 1016 and 1260, performed on Site field sample, 40-140% recovery	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples	Must contain Aroclors 1016 and 1260, performed on Site field sample; 40-140% recovery; RPD ≤ 30% for solids and RPD ≤ 20% for waters	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per extraction batch of up to 20 samples	Must contain Aroclors 1016 and 1260, be matrix-matched, 40-140% recovery	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site samples;, RPD ≤ 30% for solids and RPD ≤ 20% for waters for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer

Table 6 QAPP Worksheet All Matrices (combined) - PCB Aroclors USEPA SW-846 8082 and 8082A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Surrogates	Every sample including QC	Minimum of 2 (recommend TCMX and DCB); 30-150% recovery on both GC columns	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 5-levels for Aroclors 1016 and 1260 and single-level at mid-point concentration for other Aroclors; 3-5 peaks of each Aroclor evaluated using peak height or peak area; lowest level ≤ RL; other Aroclors may be warranted for 5 point calibration if PCB contamination is known. %RSD ≤ 20% or "r" ≥ 0.99 for Aroclors 1016 and 1260; regression analysis, if used, must not be forced through the origin.	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	Prior to samples, every 12 hours or every 20 samples, whichever is more frequent, and at the end of the analytical sequence	Concentration level near mid-point of ICAL curve containing Aroclors 1016 and 1260; %D ≤ ± 20% and analytes fall within expected retention time windows; Aroclors other than 1016 and 1260 must be verified within 12 hours of being detected in a sample (unless I.S. quant technique is used)	Recalibrate as required by method; note outliers in narrative.	Analyst

Table 6 QAPP Worksheet All Matrices (combined) - PCB Aroclors USEPA SW-846 8082 and 8082A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Quantitation	Every sample	RL ≤ results ≤ upper calibration range on a sample-specific basis; average response factors or curve-statistics generated from the ICAL must be used for quantitation and peak height or peak area, as used for ICAL, must be used for sample. Report the highest concentration from the two GC columns and results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Precision	A	Quantitation	Every sample	RPD or %D ≤ 40% between two dissimilar GC Columns	Qualify result and narrate issue except if %D > 100% then analyze sample at a secondary dilution and qualify data as necessary.	Analyst and Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	Cool to ≤ 6° C; allow for < 2° C if samples intact	Potential data usability issue	Data Reviewer

Table 6 QAPP Worksheet All Matrices (combined) - PCB Aroclors USEPA SW-846 8082 and 8082A
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous samples extracted within 7 days of collection; extract analyzed within 40 days of extraction. Soil/Sediment samples extracted within 14 days of collection; extract analyzed within 40 days of extraction. If Soil/Sediment samples are frozen, HT arrested and extraction HT continues when thawed. Samples can be maintained frozen for 1 year from collection.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method.	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	$\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department

2. PCB Aroclor Compound analysis via USEPA SW-846 Method 8082 and 8082A (*Quality Assurance and Quality Control Requirements for SW-846, Polychlorinated Biphenyls (PCBs) by Gas Chromatography [GC]).*

Table 7 QAPP Worksheet All Matrices – Total Cyanide SW-846 9010C, 9013. 9014, and 9012B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Initial Calibration	Daily prior to sample analysis (unless daily CCV passes 90-110 % recover)	Minimum of 5 calibration levels plus blank; low level standard at level of RL; linear regression with a correlation coefficient r $\geq$ 0.995	Perform instrument maintenance and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration/ Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; ICV: 85-115% recovery	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 20 samples and at the end of run	Same source as calibration standards; conc. near mid-point of calibration curve; CCV: 85 - 115% recovery	Re-analyze and, if still out, Re-calibrate and Re-analyze all samples since last acceptable CCV	Analyst
Sensitivity	A	Initial and Continuing Calibration Blanks (ICB and CCB)	After ICV and after each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); ICB/CCB: < ± RL	Re-analyze; if still out, Re-calibrate, reanalyze.	Analyst
Sensitivity	A	Low Level Calibration Check Standard	Daily only if RL standard not included in initial calibration	Low Level Check Standard: 70-130% recovery	Recalibrate/re-analyze unless all results > 10x RL	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per analytical batch - not to exceed 20 field samples	Must be distilled/extracted with samples using same preparation method; MB: < RL	Re-analyze; if still out redistill & re-analyze all samples unless all detected results > 10x MB level	Analyst

Table 7 QAPP Worksheet All Matrices – Total Cyanide SW-846 9010C, 9013. 9014, and 9012B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must be matrix-matched; aqueous LCS: 80-120% recovery; Soil/Sediment LCS within vendor control limits (95% confidence)	Re-analyze, if still out; redigest (soil/sed.) & Re-analyze LCS & all field samples in batch	Analyst/ Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. Aq.: Results RPD ≤ 20%; Soil/Sediment: Results, RPD ≤ 35%;	Re-analyze, qualify data	Analyst/ Data Reviewer
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Evaluate LCS, unspiked sample, re-analyze, if necessary, and qualify data	Analyst/ Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment; Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ upper calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range, report from diluted analysis	Analyst/ Data Reviewer
Accuracy (preservation)	S & A	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	≤ 6º C per SW-846 Chapter 3 Table 3-2 but allow for Soil/Sediment: < 2º C if freezing samples are intact	Lab narrates outlier; Potential data usability issue	Data Reviewer
Accuracy (preservation)	S & A	Sample Preservation	Every field sample	Aqueous samples are preserved by adding sodium hydroxide until pH is ≥12 at time of sampling. Preserved samples can be stored up to 14 days.	Lab narrates outlier; potential data usability issue	Data Reviewer

Table 7 QAPP Worksheet All Matrices – Total Cyanide SW-846 9010C, 9013. 9014, and 9012B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous and Soil/Sediment: HT = 14 days from collection to analysis If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier; potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous Potential data usability issue, Soil/Sediment: non=matrix matched aqueous EB use professional judgment	Data Reviewer
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.
2. Method References: USEPA SW-846 Method 9010C (*Total and Amenable Cyanide: Distillation, November, 2004*); USEPA SW-846 Method 9013 (*Cyanide Extraction Procedure for Solids and Oils, July 1992);* USEPA SW-846 Method 9014 (Titrimetric and manual spectrophotometric Determinative Methods for *Cyanide, December 1996) and* USEPA SW-846 Method 9012B (Total and Amenable Cyanide *(Automated Colorimetric with offline Distillation), November 2004 Revision 2).*

Table 8 QAPP Worksheet All Matrices – Hexavalent Chromium SW-846 846 7196A and 7199
Measurement Performance Criteria & QC Samples Table– Hexavalent Chromium

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Initial Calibration	Daily prior to sample analysis	Minimum of 3 calibration levels plus blank; low-level standard at level of RL linear regression with a correlation coefficient r $\geq$ 0..995	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; ICV: 90-110% recovery	Re-analyze ; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run	Concentration level near midpoint of calibration curve; same source from ICV; CCV: 90-110% recovery	Re-analyze if still out, Re-calibrate and reanalyze all samples since last acceptable CCV	Analyst
Sensitivity	A	Initial and Continuing Calibration Blanks (ICB and CCB)	After ICV and after each CCV	Must be matrix-matched (conc. of solution to match standards and samples); ICB/CCB: < ± RL	Re-analyze ; if still out, Re-calibrate and reanalyze.	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be prepared/digested with samples in batch; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level	Analyst

Table 8 QAPP Worksheet All Matrices – Hexavalent Chromium SW-846 846 7196A and 7199
Measurement Performance Criteria & QC Samples Table– Hexavalent Chromium

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must be matrix-matched; aqueous LCS: 80-120% recovery; Soil/Sediment/ solid LCS: NIST Standard Reference Material (SRM) 2701; within control limits	Re-analyze; if still out redigest & re-analyze all samples in the batch qualify data	Analyst/Data Reviewer
Precision	A	Sample Matrix Duplicate (DUP)	1 per ≤ 20 field samples	Must be performed on a Site field sample. Aqueous/ Soil/Sediment: RPD ≤ 20%; a control limit of ± RL if original or duplicate is < 4 times the RL.	Lab narrates outlier; Qualify data	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike Aqueous samples	1 per ≤ 20 aqueous field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Re-analyze[1], Lab narrates outliers; possible usability issue.	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike (MS) soluble [Site-specific QC]	1 per ≤ 20 soil/sediment field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Re-analyze[2]; Lab narrates outliers; possible usability issue.	Analyst/Data Reviewer
Accuracy	S & A	Matrix Spike (MS) insoluble [Site-specific QC]	1 per ≤ 20 soil/sediment field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Re-analyze[2], Lab narrates outliers; possible usability issue.	Analyst/Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ upper calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range; report from diluted analysis	Analyst/Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment; Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer

Table 8 QAPP Worksheet All Matrices – Hexavalent Chromium SW-846 846 7196A and 7199
Measurement Performance Criteria & QC Samples Table– Hexavalent Chromium

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy (preservation)	S & A	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	$\leq$ 6º C per SW-846 Chapter 3 Table 3-2 but allow for Soil/Sediment: < 2º C if freezing samples are intact	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S & A	Sample preservation	every field sample	Aqueous /Soil/Sediment: collect unpreserved and keep cold (see above)	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	$\geq$ 90% Overall Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Accuracy/ Sensitivity	S & A	Holding Time (HT)	every field sample	Soil/Sediment: HT = 30 days from collection to digestion and 7 days after digestion to analysis. For aqueous samples HT = 24 hours from collection.	Potential data usability issue	Data Reviewer
Accuracy & Representative-ness	S & A	Preparation of samples and additional measurements	Soil/Sediment samples must be digested prior to analysis. See SW-846 Method 3060A for alkaline digestion. Additional measurements of pH and Eh are required for soil/sediment samples.	Aqueous samples are not digested. Sample preparation: follow procedures in Method 7196A or Method 7199 for Soil/Sediment: Alkaline digestion required as per Method 3060A. pH of alkaline digestates must be maintained at method requirements. For 7196A it is 7.5 ±0.5; 7199 9.0±0.5 Then follow procedures for analysis by either method 7196A or 7199. pH & Eh (oxidation reduction potential) measurements give indication of reducing or oxidizing conditions in field sample to assist in interpretation of soluble and insoluble MS results. See Method 3060A for further details.	Re-digest if sample pH is outside the QC limits.	Analyst/Data Reviewer

Table 8 QAPP Worksheet All Matrices – Hexavalent Chromium SW-846 846 7196A and 7199
Measurement Performance Criteria & QC Samples Table– Hexavalent Chromium

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 7196A *Hexavalent Chromium Colorimetric* and USEPA SW-846 Method 7199 (*Hexavalent Chromium by Ion Chromatography).*

[1] After reanalysis, if recovery is <30% SRP would reject associated non-detect data.

[2] After reanalysis if recovery, is 50-74% or 126-150% SRP would qualify associated data. If recoveries are<50% or >150% for both insoluble AND soluble spikes, SRP would reject associated data; otherwise would qualify associated data if one of the spikes was outside the <50% or >150% limits.

Table 9 QAPP Worksheet All Matrices - Mercury SW-846 Method 7471B and 7470A
Measurement Performance Criteria & QC Samples Table– Mercury

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Initial Calibration	Daily prior to sample analysis	Minimum of 5 calibration levels plus blank; low level standard at level of RL; linear regression with a correlation coefficient r $\geq$ 0.995	Re-optimize instrument and re-calibrate, repeat until successful	Analyst
Accuracy	A	Initial Calibration/ Initial Calibration Verification (ICV)	Daily after calibration	Separate-source from calibration standards; ICV: 90-110% recovery	Re-analyze; if still out, Re-calibrate as required by method; suspend all analysis until ICV meets criteria	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 of every 10 samples and at end of run	Same source as calibration standards; conc. near mid-point of calibration curve; CCV: –80 - 120% recovery	Re-analyze and, if still out, Re-calibrate and Re-analyze all samples since last acceptable CCV	Analyst
Sensitivity	A	Initial and Continuing Calibration Blanks (ICB and CCB)	After ICV and after each CCV	Must be matrix-matched (and same conc. of acid found in standards and samples); CCB: < ± RL	Re-analyze; if still out, Re-calibrate, reanalyze.	Analyst
Sensitivity	A	Low Level Calibration Check Standard	Daily only if RL standard is not included in initial calibration	Low Level Check Standard: 70-130% recovery	Recalibrate/reanalyze unless all results > 10x RL	Analyst
Accuracy & Sensitivity (Contamination)	A	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples	Must be digested with samples using same preparation method and amount of acids; MB: < RL	Re-analyze; if still out redigest & re-analyze all samples unless all detected results > 10x MB level	Analyst

Table 9 QAPP Worksheet All Matrices - Mercury SW-846 Method 7471B and 7470A
Measurement Performance Criteria & QC Samples Table– Mercury

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Laboratory Control Sample (LCS)	1 per digestion batch - not to exceed 20 field samples	Must be matrix-specific; aqueous LCS: 80-120% recovery; Soil/Sediment LCS vendor control limits (95% confidence)	Re-analyze, if still out; redigest (soil/sed.) & Re-analyze LCS & all field samples in batch	Analyst/ Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. Aq.: Results RPD ≤ 20%; Soil/Sediment: Results, RPD ≤ 35%;	Re-analyze, qualify data	Analyst/ Data Reviewer
Accuracy	S & A	Matrix Spike (MS) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample; MS: 75-125% recovery; professional judgment if sample concentration > 4x spike level	Evaluate LCS, unspiked sample, re-analyze, if necessary, and qualify data	Analyst/ Data Reviewer
Precision	S & A	Matrix Spike Duplicate (MSD) [Site-specific QC]	1 per ≤ 20 field samples	Must be performed on a Site field sample Aq.: Results ≥ 5xRL, RPD ≤ 20%; Results < 5xRL: absolute difference between results ≤ RL. Soil/Sediment: Results ≥ 5xRL, RPD ≤ 35%; Results < 5xRL: absolute difference between results ≤ 2xRL	Lab narrates outlier; Re-analyze, qualify data	Analyst/ Data Reviewer
Accuracy	A	Quantitation	Not applicable	RL ≤ results ≤ upper calibration range on a sample-specific basis. Report all Aq. results in µg/L or mg/L and all Soil/Sediment results in mg/Kg on a dry-weight basis.	Perform dilution to bring analyte within linear range, report from diluted analysis	Analyst/ Data Reviewer
Overall Precision & Representativeness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	Aq.: Results ≥ 5xRL: RPD ≤ 30%; Results < 5xRL: professional judgment; Soil/Sediment: Results ≥ 5xRL: RPD ≤ 50%; Results < 5xRL: professional judgment	Potential data usability issue; indication of sample heterogeneity	Data Reviewer

Table 9 QAPP Worksheet All Matrices - Mercury SW-846 Method 7471B and 7470A
Measurement Performance Criteria & QC Samples Table– Mercury

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy (preservation)	S & A	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	Soil/Sediment: $\leq$ 6º C per SW-846 Chapter 3 Table 3-2 but allow for < 2º C if freezing samples are intact	Lab narrates outlier; Potential data usability issue	Data Reviewer
Accuracy (preservation)	S & A	Sample preservation	Every field sample	Aq.: Total Metals: HNO_3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO_3 pH < 2 but cannot be used for regulatory compliance) Soil/Sediment: collect unpreserved and keep cold (see above)	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous and Soil/Sediment: HT = 28 days from collection to analysis If Soil/Sediment samples are frozen, HT arrested and HT begins when thawed. Samples can be maintained frozen for 1 year from collection.	Lab narrates outlier; Potential data usability issue	Data Reviewer
Accuracy & Sensitivity (Contamination)	S & A	Equipment Rinsate Blank (EB)	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Aqueous EB: < RL Soil/Sediment EB <RL on solid equivalent basis	Aqueous potential data usability issue, Soil/Sediment: non-matrix matched aqueous EB use professional judgment	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	Minimum $\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator

Table 9 QAPP Worksheet All Matrices - Mercury SW-846 Method 7471B and 7470A
Measurement Performance Criteria & QC Samples Table– Mercury

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Method References = USEPA SW-846 Method 7471B (*Mercury in Solid or Semisolid Waste by Manual Cold Vapor Technique*, February 2007) and USEPA SW-846 Method 7470A (*Mercury in Aqueous Samples by Manual Cold Vapor Technique*, September 1994).

Table 10 QAPP Worksheet Aqueous – VOAs USEPA 524.2
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	A	Laboratory Reagent Blank (LRB) or Method Blank	1 per batch of up to 20 field samples (matrix-specific)	Target analytes must be < RL, Except for common laboratory contaminates (acetone, methylene chloride and MEK) which must be < 5x RL, surrogates in criteria	Reanalyze. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Laboratory Fortified Matrix (LFM) [Site-specific QC]	Performed at least quarterly and if criteria in Section 9.4 of 524.2 are not met.	Must contain all target analytes, performed on Site field sample, 70-130%; difficult analytes ** must exhibit percent recoveries between 40-160%.	Evaluate LFM, unspiked sample, and qualify data and narrate issue	Analyst/Data Reviewer
Accuracy	A	Quality Control Sample (QCS)	Performed at least quarterly	Must contain all target analytes, performed on Site field sample, 70-130%; difficult analytes ** must exhibit percent recoveries between 40-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Fortified Blank (LFB)	1 per batch of up to 20 samples	Must contain all target analytes, spiked into a blank matrix, acceptable recoveries of 70-130%; difficult analytes ** must exhibit percent recoveries between 40-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per $\leq$ 20 field samples performed	Must be performed on a Site field sample. RPDs ≤ 20%	Qualify data and narrate issues of non-conformance	Analyst/Data Reviewer

Table 10 QAPP Worksheet Aqueous – VOAs USEPA 524.2
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Surrogates	Every sample including QC	2 surrogates 1,2-dichlorobenzene-d_4 and Bromofluorobenzene (BFB); area recoveries 70-130% of CCAL or 50-150% of ICAL	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	Every sample including QC	Fluorobenzene; Areas 70-130% of CCV or 50-150% of ICAL	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	BFB Tune	Every 12 hours	Method tune criteria based on criteria in Table 3 of USEPA-524.2	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 3-standards; must contain all targets and lowest standard ≤ RL; average RRF $\geq$ 0.05;%RSD ≤ 20% for all compounds	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hours prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; %D ≤ 30%	Recalibrate as required by method; note outliers in narrative.	Analyst
Accuracy	A	Quantitation	Every sample	RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer

Table 10 QAPP Worksheet Aqueous – VOAs USEPA 524.2
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	4º C ± 2º C; allow for < 2º C if samples intact sample preservation per USEPA 524.2 Section 8.2.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 14 days of collection (24 hours if unpreserved); sample preservation per Section 8.0 of Method 524.2	Potential data usability issue	Data Reviewer

Table 10 QAPP Worksheet Aqueous – VOAs USEPA 524.2
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP April 2014; to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.

2. Volatile Organic Compound analyses via USEPA 524.2 (*Measurement of Purgeable Organic Compounds in water by Capillary Column Gas Chromatography/Mass Spectroscopy [GC/MS]).*

** Potentially "difficult" analytes include: acetone, methyl ethyl ketone, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane, and 1, 4-dioxane.

Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	BFB Tune	Every 12 hours	Method tune criteria based on criteria in Table 4 of USEPA-SW846 Method 8260B	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; Full Scan: RF for SPCCs Section 7.3.5.4; %RSD ≤ 15% for all compounds except CCC's which must be ≤30% RSD or "r" ≥ 0.99; SIM: %RSD ≤ 20% or "r" ≥ 0.99 for all compounds; regression analysis, if used, must not be forced through the origin	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy/ Sensitivity	A	Method Blank	1 per preparatory batch of up to 20 field samples (matrix-specific)	Targets analytes must be < RL except for common laboratory contaminates (acetone, methylene chloride and MEK) which must be < 5x RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per $\leq$ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, % recovery 70-130% except for difficult analytes** which must exhibit % recovery between 40-160%	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer

Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, recovery criteria same as MS; RPDs ≤ 20% for waters and ≤ 30% for solids	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per preparatory batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 40-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if a MS/MSD was not performed	Must be performed on a Site field sample. RPDs ≤ 20% for waters and ≤ 30% for solids for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 3 surrogates at retention times across GC run for all matrices; surrogates must be between 70-130% for all compounds.	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	3 per sample including QC	Minimum of 3 IS , Areas 50-200% of the most recent CCV; RTs ±30 sec. from midpoint ICAL standard	Reanalyze and qualify data	Analyst/Data Reviewer
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hours prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; *Full Scan and SIM*: min RRF criteria met; %D or % Drift ≤ 20% for all compounds	Recalibrate as required by method; note outliers in narrative.	Analyst

Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Quantitation	Every sample	RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	≤ 6º C; allow for < 2º C if samples intact sample preservation per SW-846 Chapter 4 Table 4-1	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 14 days of collection (7 days if unpreserved). Aqueous samples adjust pH to < 2 with HCL or per SW-846 Table 4-1 preservatives.	Potential data usability issue	Data Reviewer

Table 11 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260B
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method.	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014, to be compliant with EPA Region 2 guidance and meets the data quality needs of the Department.

2. Volatile Organic Compound analyses via USEPA SW-846 Method 8260B (*Quality Assurance and Quality Control Requirements for SW-846 Method 8260B* or 8260C *Volatile Organic Compounds by Gas Chromatography/Mass Spectroscopy [GC/MS]).*

** Potentially "difficult" analytes include: acetone, methyl ethyl ketone, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane, carbon disulfide, 1,2-Dibromo-3-chloropropane, chloroethane, naphthalene, trichlorofluoromethane, and 1, 4-dioxane.

Table 12 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	BFB Tune	Every 12 hours	Method tune criteria based on criteria in Table 3 of USEPA-SW846 Method 8260C	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCV fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; Full Scan: %RSD ≤ 20% for all compounds and minimum RF found in Table 4 or "r" ≥ 0.99; SIM: %RSD ≤ 20% and minimum RF found in Table 4 or "r" ≥ 0.99 for all compounds;	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy/ Sensitivity	A	Method Blank	1 per preparatory batch of up to 20 field samples (matrix-specific)	Targets analytes must be < RL except for common laboratory contaminates (acetone, methylene chloride and MEK) which must be < 5x RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, % recovery 70-130% except for difficult analytes** which must exhibit % recovery between 40-160%	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer

Table 12 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field samples per matrix	Must contain all target analytes, performed on Site field sample, recovery criteria same as MS; RPDs ≤ 20% for waters and ≤ 30% for solids	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per preparatory batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 40-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if a MS/MSD was not performed	Must be performed on a Site field sample. RPDs ≤ 20% for waters and ≤ 30% for solids for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 3 surrogates at retention times across GC run for all matrices; surrogates must be between 70-130% for all compounds.	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	3 per sample including QC	Minimum of 3 IS , Areas 50-200% of the most recent midpoint CCV standard; RTs ± 30 sec. from midpoint ICAL standard	Reanalyze and qualify data	Analyst/Data Reviewer
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hour prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; *Full Scan and SIM*: min RRF criteria met; %D or % Drift ≤ 20% for all compounds	Recalibrate as required by method; note outliers in narrative.	Analyst

Table 12 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Quantitation	Every sample	RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	≤ 6º C; allow for < 2º C if samples intact sample preservation per SW-846 Chapter 4 Table 4-1	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 14 days of collection (7 days if unpreserved). Aqueous samples adjust pH to < 2 with HCL or per SW-846 Table 4-1 preservatives.	Potential data usability issue	Data Reviewer

Table 12 QAPP Worksheet All Matrices – VOAs by USEPA SW-846 8260C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014, to be compliant with EPA Region 2 guidance and meets the data quality needs of the Department.

2. Volatile Organic Compound analyses via USEPA SW-846 Method 8260C (*Quality Assurance and Quality Control Requirements for SW-846 Method 8260C* or 8260C *Volatile Organic Compounds by Gas Chromatography/Mass Spectroscopy [GC/MS]).*

** Potentially "difficult" analytes include: acetone, methyl ethyl ketone, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane, carbon disulfide, 1,2-Dibromo-3-chloropropane, chloroethane, naphthalene, trichlorofluoromethane, and 1, 4-dioxane.

Table 13 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	DFTPP Tune	Every 12 hours	Method tune criteria based on criteria in Table 3 of USEPA-SW846 Method 8270C	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCAL fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; *Full Scan*: RF ≥ 0.05 for SPCCs; %RSD ≤ 15% for all compounds except CCCs which must be ≤20% RSD or "r" ≥ 0.99; *SIM*: %RSD ≤ 20% or "r" ≥ 0.99 for all compounds	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy/ Sensitivity	A	Method Blank	1 per extraction batch of up to 20 field samples	Must be matrix matched; Phthalates < 5xRL; All other Targets < RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field per matrix samples	Must contain all target analytes, performed on Site field sample, % recovery 70-130% except for difficult analytes** which must exhibit % recovery between 20-160%	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and narrate issue	Analyst/Data Reviewer

Table 13 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field per matrix samples	Must contain all target analytes, performed on Site field sample, % recovery criteria same as MS. RPDs ≤ 20% for waters and ≤ 30% for solids	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per extraction batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 20-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. RPD ≤ 20% for waters and ≤ 30% for solids for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 3 base-neutral and 3 acid surrogates at RTs across GC run; for solids matrices must be between 30-130% for all compounds; for water matrices 30-130% for BN surrogates and 15-110% for Acid surrogates	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	6 per sample including QC	Minimum of 6 IS , Areas 50-200% of the most recent CCV standard; RTs ± 30 sec. from midpoint ICAL standard	Reanalyze and qualify data	Analyst/Data Reviewer
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hour prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; *Full Scan*: %D or %Drift ≤ 20% for CCCs and ≤ 30% for all other compounds *SIM*: %D or %Drift ≤ 30%	Recalibrate as required by method; note outliers in narrative.	Analyst

Table 13 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Quantitation	Every sample	RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	≤ 6º C; allow for < 2º C if samples intact sample preservation per SW-846 Chapter 4 Table 4-1	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous samples extracted within 7 days of collection; extract analyzed within 40 days of extraction. Soil/Sediment samples extracted within 14 days of collection; extract analyzed within 40 days of extraction. If Soil/Sediment samples are frozen, HT arrested and extraction HT continues when thawed. Solid samples can be maintained frozen for 1 year from collection.	Potential data usability issue	Data Reviewer

Table 13 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270C
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, Collect 1 EB per 20 field samples collected by the same method	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:

1. This table was prepared by NJDEP, January 2011 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.
2. Semivolatile Organic Compound analyses via USEPA SW-846 Method 8270D (*Quality Assurance and Quality Control Requirements for SW-846 Method* 8270D *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectroscopy [GC/MS]).* 8270D:

** Potentially "difficult" analytes include: benzenthiol, benzoic Acid, 2,4-dintrophenol, 3&4 – methylphenol, 4-nitrophenol, pentachlorophenol, phenol, aniline, aramite, A,A-dimethylphenethylamine, benzidine, benzaldehyde, benzyl Alcohol, caprolactam, chlorobenzilate, 3,3'-Dimethylbenzidine, 1,4-Dioxane, 7,12-Dimethylbenz(a)anthracene, Diallate, Dibenz(a,j)acridine, Diphenylamine, Disulfoton, p-(dimethylamine)azobenzene, decane, famphur, hexachlorocyclopentadiene, hexachloroethane, hexachlorophene, hexachloropropene, kepone, 4,4'-methylenebis(2-chloroaniline), methapyrilene, methyl methanesulfonate, methyl parathion, n-nitrosodimethylamine, 4-nitroquinoline-1-oxide, 2-Picoline, parathion, pentachloroethane, pentachlorobenzene, pentachloronitrobenzene, phorate, pronamide, pyridine, p-phenylenediamine, o-tricresyl phosphate and Tetraethyl. Please note that many of the surrogates may fall outside of the 15 – 110% range 2-Fluorophenol, Phenol-d5, 2,4,6-tribromophenol and terphenyl-d14.

Table 14 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270D
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	DFTPP Tune	Every 12 hours	Method tune criteria based on criteria in Table 3 of USEPA-SW846 Method 8270D	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCAL fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; *Full Scan*: RF see Table 4 for minimum RF; %RSD ≤ 20% for all compounds or "r" ≥ 0.99; *SIM*: %RSD ≤ 20% or "r" ≥ 0.99 for all compounds	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy/ Sensitivity	A	Method Blank	1 per extraction batch of up to 20 field samples	Must be matrix matched; Phthalates < 5xRL; All other Targets < RL, surrogates in criteria	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field per matrix samples	Must contain all target analytes, performed on Site field sample, % recovery 70-130% except for difficult analytes** which must exhibit % recovery between 20-160%	Evaluate LCS, unspiked sample, reanalyze, if necessary, and qualify data and Narrate issue	Analyst/Data Reviewer

Table 14 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270D
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Matrix Spike/ Matrix Spike Duplicate [Site-specific QC]	1 per ≤ 20 field per matrix samples	Must contain all target analytes, performed on Site field sample, % recovery criteria same as MS. RPDs ≤ 20% for waters and ≤ 30% for solids	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample (LCS)	1 per extraction batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 20-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	1 per ≤ 20 field samples if an MS/MSD was not performed	Must be performed on a Site field sample. RPD ≤ 20% for waters and ≤ 30% for solids for results > 2x RL	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	Minimum of 3 base-neutral and 3 acid surrogates at RTs across GC run; for solids Matrices must be between 30-130% for all compounds; for water matrices 30-130% for BN surrogates and 15-110% for acid surrogates	Reanalyze, if necessary, qualify data	Analyst/Data Reviewer
Accuracy	A	Internal Standards (IS)	6 per sample including QC	Minimum of 6 IS, Areas 50-200% of the most recent t CCV standard; RTs ± 30 sec. from midpoint ICAL standard	Reanalyze and qualify data	Analyst/Data Reviewer

Table 14 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270D
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Continuing Calibration Verification (CCV)	1 every 12 hour prior to analysis of samples	Concentration level near mid-point of ICAL curve containing all target compounds; *Full Scan*: %D or %Drift ≤ 20% for CCCs and ≤ 30% for all other compounds; *SIM*: %D or %Drift ≤ 30%	Recalibrate as required by method; note outliers in narrative.	Analyst
Accuracy	A	Quantitation	Every sample	RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and RL ≤results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J"	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must be ≤ PRL	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	≤ 6º C; allow for < 2º C if samples intact sample preservation per SW-846 Chapter 4 Table 4-1	Potential data usability issue	Data Reviewer

Table 14 QAPP Worksheet All Matrices – - SVOAs by USEPA SW-846 8270D
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Aqueous samples extracted within 7 days of collection; extract analyzed within 40 days of extraction. Soil/Sediment samples extracted within 14 days of collection; extract analyzed within 40 days of extraction. If Soil/Sediment samples are frozen, HT arrested and extraction HT continues when thawed. Solid samples can be maintained frozen for 1 year from collection.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing decontamination of equipment, collect 1 EB per 20 field samples collected by the same method	Target analytes < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	$\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:

1. This table was prepared by NJDEP, January 2011 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Semivolatile Organic Compound analyses via USEPA SW-846 Method 8270D (*Quality Assurance and Quality Control Requirements for SW-846 Method* 8270D *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectroscopy [GC/MS]).* 8270D:

** Potentially "difficult" analytes include: Benzenthiol, Benzoic Acid, 2,4-Dintrophenol, 3&4 – Methylphenol, 4-Nitrophenol, Pentachlorophenol, Phenol, Aniline, Aramite, A,A-Dimethylphenethylamine, Benzidine, Benzaldehyde, Benzyl Alcohol, Caprolactam, Chlorobenzilate, 3,3'-Dimethylbenzidine, 1,4-Dioxane, 7,12-Dimethylbenz(a)anthracene, Diallate, Dibenz(a,j)acridine, Diphenylamine, Disulfoton, p-(dimethylamine)azobenzene, Decane, Famphur, Hexachlorocyclopentadiene, Hexachloroethane, Hexachlorophene, Hexachloropropene, Kepone, 4,4'-methylenebis(2-chloroaniline), Methapyrilene, Methyl methanesulfonate, Methyl parathion, n-Nitrosodimethylamine, 4-Nitroquinoline-1-oxide, 2-Picoline, Parathion, Pentachloroethane, Pentachlorobenzene, Pentachloronitrobenzene, Phorate, Pronamide, Pyridine, p-Phenylenediamine, o-tricresyl phosphate and Tetraethyl. Please note that many of the surrogates fall outside or the 15 – 110% range 2-Fluorophenol, Phenol-d5, 2,4, 6-Tribromophenol and Terphenyl-d14.

Table 15 QAPP Worksheet Air – VOAs USEPA TO-15 (and NJDEP LLTO-15)
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	BFB Tune	Every 24 hours	Method tune criteria based on criteria in Table 3 of USEPA- Method TO-15	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCAL fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; Full Scan: %RSD ≤ 30% for all compounds (allowance for 2 compounds up to ≤ 40%)	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst
Accuracy	A	Initial Calibration Verification Sample NJDEP TO-15 ONLY	Immediately after last ICAL std. and before any field sample.	Must contain all target; 30% recovery for all compounds (allowance for 2 compounds up to ≤ 40%)	Re-analyze; if failure still observed then take corrective action: re-calibration may be necessary	Analyst
Accuracy	A	Internal Standards (IS)	Minimum of 3 IS recommend Bromochloromethane, 1,4-Difluorobenzene and Chlorobenzene-d_5	Areas 60-140% of CCAL; Areas; RTs $\pm$ 0.33 minutes from CCAL RTs	Reanalyze and qualify data	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	Every 24 hours	Must be performed on a Site field sample. RPDs ≤ 25% for results > 5x the RL.	Qualify data and narrate issues of non-conformance	Analyst/Data Reviewer

Table 15 QAPP Worksheet Air – VOAs USEPA TO-15 (and NJDEP LLTO-15)
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Calibration Verification (CCV)	1 every 24 hours prior to analysis of samples	Concentration level near mid-point of ICAL curve using a concentration in the ICAL) containing all target compounds; *Full Scan and SIM*: min RRF criteria met; %D or % Drift ≤ 30% for all compounds	Recalibrate as required by method; note outliers in narrative.	Analyst
Accuracy	A	Laboratory Control Sample (LCS)	1 per preparatory batch of up to 20 samples	Must contain all target analytes, be matrix-matched; % Recovery 70-130% except for difficult analytes ** must exhibit percent recoveries between 40-160%.	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Reporting Limit Laboratory Control Sample (RLLCS) – NJDEP TO-15 ONLY	1per 24 hours Instrument Performance Check/ calibration sequence	Must contain all compounds; % recovery within 60-140 % of the known value for 90 % of the compounds	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Quantitation	Every sample	RL ≤ results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation.	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Report up to the 15 TICs that have the highest estimated concentration	Potential data usability issue	Data Reviewer

Table 15 QAPP Worksheet Air – VOAs USEPA TO-15 (and NJDEP LLTO-15)
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Canister Certification	Batch or individual canister certification must be performed as directed by data user	Canister certifications target analytes must be < RL.	Reclean canisters until certification pass the acceptance criteria.	Analyst
Accuracy	S & A	Flow Controller Certification	Every Flow Controller	Pre-sampling and Post-sampling Flow Controller calibration checks RPD $\leq$ 20%	Narrate flow controller RPD non-conformance	Analyst
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	1 per 20 field samples	RPD ≤ 25% for results > 5x RL; Professional judgment for results < 5xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S & A	Temperature, atmospheric pressure and canister pressure	Every Canister	Lab must evacuate to -27 to -30 inches of Hg prior to shipment to site. Sampler must document the canister initial vacuum at the site, date/time sampling starts, ambient pressure and temperature; the sampling stop date and time and canister final vacuum. If vacuum is -27 to -30 inches of Hg upon receipt at the site, the canister may be used for sample collection. (allowances are given for vacuum down to -24 inched Hg with notification given to the investigator)The laboratory must document the canister receipt vacuum.	Potential data usability issue if initial field vacuum is too low or the final field and laboratory receipt vacuums differ significantly (e.g. by 6 inches Hg)	Data Reviewer

Table 15 QAPP Worksheet Air – VOAs USEPA TO-15 (and NJDEP LLTO-15)
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy (preservation)	S & A	Canister pressure	Every Canister	Sampler must check vacuum prior to taking samples. If the vacuum is -27 to -30 inches of Hg when it left the lab, then the vacuum should be -24 to -30 inches of Hg for samples to be taken. If the vacuum is less, then the canister should not be used.	Notify the laboratory and request a new canister or seek guidance.	Sampler
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 30 days of collection.	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	$\geq$ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Accuracy/ Sensitivity	A	Method Blank	1 every 24 hour prior to analysis of samples	Target analytes < RL	NA	Data Reviewer
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:

1. This table was prepared by NJDEP, April 2014 to be compliant with and the SRP VITG and meet the data quality needs of the Department.

2. Volatile Organic Compound analyses via USEPA Method TO-15 (*Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed by Gas Chromatography/Mass Spectroscopy [GC/MS]).*

** Potentially "difficult" analytes include: hexachlorobutadiene, 1, 2, 4-trichlorobenzene, naphthalene, acetone and 1, 4-dioxane.

[1] Please note that trip blanks, field blanks and MS/MSDs are not usually included in sampling activities associated with canister based air sampling.

Table 16 QAPP Worksheet Air – VOAs USEPA TO-17
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity Accuracy	A	BFB Tune	Every 24 hours	Method tune criteria based on criteria in Table 3 of USEPA- Method TO-15	Perform instrument maintenance; reanalyze until acceptable	Analyst
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCAL fails	Minimum 5-standards; must contain all targets and lowest standard ≤ RL; for all compounds: %RSD ≤ 30% except naphthalene ≤ 40% or "r" ≥ 0.99 regression analysis, if used, must not be forced through the origin	Method allows for 2 exceptions up to a limit of 40% RSD. Recalibrate, note outliers in narrative	Analyst
Accuracy	A	Daily Calibration	1 every 24 hours prior to analysis of samples	Concentration level near mid-point of ICAL containing all target compounds; %D ≤ ± 30% IS % Recovery of CCV 50-200% of IS response in the ICAL	Recalibrate if > 10% target compounds exceed criteria or %D > 40%; note outliers in narrative.	Analyst
Accuracy	A	Laboratory Control Sample or Audit Standard	1 every 24 hours prior to analysis of samples	% Recovery 70-130%	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/ Data Reviewer
Accuracy	A	Internal Standards (IS)	Minimum of 3 IS recommend Fluorobenzene, 1,4-Dichlorobenzene-d_4, and Chlorobenzene-d_5	Areas 60-140% of CCAL; Areas; RTs ± 0.33 minutes from CCAL RTs	Reanalyze and qualify data	Analyst/ Data Reviewer

Table 16 QAPP Worksheet Air – VOAs USEPA TO-17
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Analytical Duplicate [optional]	Sample split after desorption onto GC/MS	RPDs ≤ 20% for results > 5x the RL.	Qualify data and narrate issues of non-conformance	Analyst/ Data Reviewer
Accuracy	A	Quantitation	Every sample	RL ≤ results ≤ upper calibration range on a sample-specific basis; IS must be used; and average response factors or curve-statistics generated from the ICAL must be used for quantitation. Results reported between the MDL and RL qualified "J".	Perform dilution to bring analyte within linear range, qualify data	Analyst/ Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	RL ≤ 0.5 ppb (equivalent concentration)	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S & A	Safe Sampling Volume (SSV) Check	Each sorbent tube checked annually or once every 20 uses, whichever is more frequent	One-half the retention volume or two-thirds of the break-through volume on a compound-specific basis	Re-condition sorbent tube and re-check	Analyst
Accuracy	S & A	Flow Rate	Checked before and after each sampling	RPD > 10% for initial versus final flow rate, collection invalid	New collection of samples required	Sampler

Table 16 QAPP Worksheet Air – VOAs USEPA TO-17
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	S & A	Sampling Time	Every Sample	1 hour at 16.7 mL/min and 66.7 mL/min for 1L and 4L sampling volumes, respectively	Narrate sampling pump RPD non-conformance	Analyst
Overall Precision & Representativeness	A	Distributed Duplicates	Recommended Duplicates collected in parallel with different sampling volumes (e.g., 1L and 4L)	RPDs ≤ 25% for results > 5x the RL.	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S & A	Conditioning of Sorbent Tubes	Every Sorbent Tube	Packed sorbent tubes must be conditioned and properly sealed prior to initial use as specified in Method TO-17. Target compounds should be ≤ RLs.	Potential data usability issue if conditioning insufficient	Data Reviewer
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Analyses within 30 days of collection.	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator

Table 16 QAPP Worksheet Air – VOAs USEPA TO-17
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	A	Method Blank	At least 2 per monitoring exercise using same lot of Sorbent tube as used for analysis	Target analytes < RL	NA	Data Reviewer
Accuracy/ Sensitivity	S	Field Blank	1 for every 10 samples/ monitoring event	Target analytes < RL	NA	Data Reviewer
Comparability	S & A	Based on Method (SOP) and QAPP/FSP protocols	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance and meet the data quality needs of the Department.

2. Volatile Organic Compound analyses via USEPA Method TO-17 (*Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes*) and Method TO-15 (*Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectroscopy [GC/MS]).*

** Potentially "difficult" analytes include: hexachlorobutadiene, 1, 2, 4-trichlorobenzene, naphthalene, acetone and 1, 4-dioxane.

Table 17 QAPP Worksheet All Matrices – NJDEP EPH Methodology
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	A	Method Blank	1 per extraction batch of up to 20 field samples (matrix-specific)	Blank concentration < 5X value of the MDL (additional action noted in section 9.1.4 of the method)	Reanalyze and, if necessary, re-extract. Report non-conformance in narrative; compounds present in blank should be flagged "B" in samples, if detected.	Analyst
Accuracy	A	Matrix Spike(sample not fractionated) [Site-specific QC]	Minimum of 5% of samples for each matrix	Must contain all aliphatic and aromatic compounds defined in method section 6.8.6; 40 - 140% recovery for all compounds (only up to & including C28 for #2 fuel/diesel).	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Matrix Spike/ (sample fractionated]	Minimum of 5% of samples for each matrix	Must contain all aliphatic and aromatic compounds defined in method section 6.8.6; 40 - 140% recovery for all compounds (only up to & including C28 for # 2 fuel/diesel).	Reanalyze, if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) (#2 fuel/diesel)	1 per extraction batch (up to 20 samples of similar matrix)	Must contain #2 fuel/diesel, 40-140% recovery for # 2 fuel/diesel. (continued below)	Reanalyze, or re-extract/re-analyze plus associated samples if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer

Table 17 QAPP Worksheet All Matrices – NJDEP EPH Methodology
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Precision	A	Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) (#2 fuel/diesel)		RPDs ≤ 25%	Reanalyze, or re-extract/re-analyze plus associated samples if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) (non-#2 fuel/diesel)	1 per extraction batch (up to 20 samples of similar matrix)	Must contain all aliphatic and aromatic compounds defined in method section 6.8.6; 40 - 140% recovery for all compounds except n-nonane @ > 25% (continued below)	Reanalyze, or re-extract/re-analyze plus associated samples if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) (non-#2 fuel/diesel)		RPDs for the aliphatic and aromatic carbon range concentrations (the sum of the individual compounds' concentrations within a carbon range) must be ≤ 25% (continued below).	Reanalyze, or re-extract/re-analyze plus associated samples if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer

Table 17 QAPP Worksheet All Matrices – NJDEP EPH Methodology
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) (fractionated samples)		Naphthalene & 2-methyl-naphthalene: concentration or each in aliphatic fraction < 5 % of total concentration	Reanalyze, or re-fractionate/re-analyze plus associated samples if necessary, qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Precision	A	Sample Duplicate (DUP)	5% of samples for each matrix from the site	Must be performed on a site sample, RPD ≤ 50%	Qualify data and narrate issues of non-conformance	Analyst/Data Reviewer
Accuracy	A	Surrogates	Every sample including QC	OTP and COD, 40 – 140 % recovery; samples undergoing fractionation: no COD in aromatic fraction and/or no OTP observed in aliphatic fraction	Reanalyze, if necessary or re-extract/re-analyze if necessary; re-fractionate and analyze if COD and/or OTP are in "wrong" fraction; qualify data	Analyst/Data Reviewer
Accuracy	A	Fractionating Surrogates	Every sample undergoing fractionation including QC	2-bromonaphthalene & 2-fluorobiphenyl 40 – 140 % recovery	Re-fractionate and reanalyze; note in non-conformance summary	Analyst/Data Reviewer
Accuracy	A	Initial Calibration (ICAL)	Initially and when CCAL fails	5-point calibration must contain all compounds and lowest standard ≤ RL; CFs established for each compound and, when fractionated, also for each aliphatic and aromatic carbon range; % RSD for all individual CFs ≤ 25% and when fractionated, also for each aliphatic and aromatic carbon range.	Recalibrate as required by method; analysis cannot proceed without a valid initial calibration	Analyst

Table 17 QAPP Worksheet All Matrices – NJDEP EPH Methodology
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy	A	Continuing Calibration (CCAL)	Prior to samples, every 20 samples or every 24 hours, whichever is more frequent, and at the end of the analytical sequence	Concentration level at mid-point of ICAL curve containing all compounds: %D ≤ 25% for total range, ≤ 30% any single compound; for samples undergoing fractionation: %D ≤ 25% for each carbon range, ≤ 30% any single compound in a range	Recalibrate as required by method; note outliers in narrative.	Analyst
Accuracy	A	Quantitation	Every sample	RL ≤ results ≤ upper calibration range on a sample-specific basis; average response factors generated from the ICAL must be used for quantitation and peak area, as used for ICAL, must be used for sample. Results reported between the MDL and RL qualified "J".	Perform dilution to bring analyte within linear range, qualify data	Analyst/Data Reviewer
Sensitivity	A	Reporting of Non-Detects	Every sample	Reported at the sample-specific RL which must meet site specific DQOs.	Potential data usability issue	Data Reviewer
Overall Precision & Representative-ness	S & A	Field Duplicate Samples [Site-specific QC]	5% field for fractionated and 5% field samples for non-fractionated analyses per matrix	RPD ≤ 30% for waters or RPD ≤ 50% for solids w/results > 2x RL; Professional judgment for results < 2xRL	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	Temperature Blank or other Cooler Temperature Reading	1 Temperature reading per cooler to be recorded upon receipt at lab	Cool to ≤ 6º C; allow for < 2º C if samples intact	Potential data usability issue	Data Reviewer
Accuracy (preservation)	S	pH for aqueous samples	Every field sample	pH < 2	Adjust pH as soon as possible; note outliers in narrative	Analyst/Data Reviewer

Table 17 QAPP Worksheet All Matrices – NJDEP EPH Methodology
Measurement Performance Criteria & QC Samples

Data Quality Indicator (DQI)	QC Measure for Sampling (S), Analytical (A), or both (S&A)	QC Sample or Activity	Frequency / Number	QC Acceptance Limits (Measurement Performance Criteria)	Corrective Action (CA)	Person(s) Responsible for CA
Accuracy/ Sensitivity	S & A	Holding Time (HT)	Every field sample	Samples extracted within 14 days of collection; extract analyzed within 40 days of extraction.	Potential data usability issue	Data Reviewer
Accuracy/ Sensitivity	S	Equipment Blank [Site-specific QC]	Not Required if using dedicated sampling equipment. If performing de-con, collect 1 EB per 20 field samples collected by the same method	Compounds < RL	Potential data usability issue	Data Reviewer
Data Completeness	S & A	Calculate from valid/usable data collected	Not applicable	≥ 90% Overall	Potential data usability / data gap issue	Data Reviewer/ Investigator
Comparability	S & A	Based on Method (SOP) and QAPP protocols/DQOs	Not applicable	Comparison between historical data for qualitative integrity of the data. Comparison between spatially similar samples.	Potential data usability issue	Data Reviewer/ Investigator

NOTES:
1. This table was prepared by NJDEP, April 2014 to be compliant with EPA Region 2 guidance, and meet the data quality needs of the Department.

2. Method reference = NJDEP Analysis of Extractable Petroleum Hydrocarbon Compounds (EPH) in Aqueous and Soil/Sediment/Sludge.

APPENDIX B

APPENDIX B

SUMMARY OF QUALITY CONTROL CHECKS AND SAMPLES

QC Sample or Activity used to Assess Measurement Performance	Frequency*	Measurement Performance Criteria
Field Duplicate	One in 20 samples per matrix for each parameter	See Appendix D-4
Site Specific Matrix Spike, Matrix Spike Duplicate (MS/MSD) Pair	One in 20 samples, one MS/MSD per matrix for each parameter	
Laboratory Control Sample, Laboratory Control Sample Duplicate (LCS/LCSD) Pair	One per batch of up to 20 samples per matrix	
Field Blank	Project specific	
Equipment Blank	One in 20 samples with non-dedicated equipment	
Trip Blank	One per cooler (VOCs only) per event for VOCs and volatile organic compounds	
Performance Evaluation Sample	Project specific	
Inter-Lab Split Samples	Project specific	
Methanol Trip Blank	Project specific	

*Frequency determined by method and/or project-specific requirements

APPENDIX C

APPENDIX C
TYPES OF INFORMATION USED TO EVALUATE PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, COMPLETENESS AND SENSITIVITY

QC Element	Laboratory Measures	Field Measures
Precision	Laboratory Control Sample/ Laboratory Control Sample Duplicate Pair	Field Duplicates
	Matrix Spike Duplicates	Matrix Spike/Matrix Spike Duplicates pairs (collect samples for) Matrix Duplicate (collect samples for)
	Historical Data Trends	Appropriate Sampling Procedure
Accuracy	Laboratory Control Samples	Matrix Spikes/Matrix Spike Duplicates (collect samples for)
	Matrix Spikes and Matrix Spike Duplicates	Inclusion of "Blind" Samples
	Internal Standards	Appropriate Sampling Procedures
	Surrogate Recovery	Appropriate Sample Containers
	Initial Calibration	Appropriate Sample Preservation
	Continuing Calibration	Handling & Holding Times
	Standard Reference Material	Equipment Blank/Field Blank
Representativeness	Laboratory Homogenization	Appropriate Sampling Procedures Appropriate Sample Containers
	Appropriate Sub-sampling	Appropriate Sample Preservation
	Appropriate Dilutions	Incorporation of Field Screening Data
	"As Received" Sample Preservation Meeting Hold Times	Appropriate Number of Samples
Comparability	Gas Chromatography/Mass Spectrometry Tuning	Comparison to Previous Data Points
	Calibration	Comparison to Similar Data Points
	Analytical Method Followed	Similar Methods of Analysis used
Completeness	Percent Sample Per Batch Analyzed and Reported	Percent Planned Samples Collected
	All Critical Samples Reported and Unqualified	All Critical Samples Collected
Sensitivity	Method Blanks	Equipment Blank/Field Blanks
	Instrument Blanks	Appropriate Sample Volume or Weight
	Reporting Limit (Lowest Calibration Standard)	
	Appropriate Analytical Method	

Adapted from Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup, *MCP Representativeness Evaluations and Data Usability Assessments, Policy #WSC-07-350*, September 19, 2007.

APPENDIX D

Laboratory Data Qualifiers

Qualifier	Description
B	Indicates the analyte was found in the associated method blank as well as in the sample.
C	Indicates analyte is a common laboratory contaminant
D	Indicates analyte was reported from diluted analysis
E	Identifies a compound concentration that exceeds the upper level of the calibration range of the instrument.
J	Indicates an estimated value. This flag is used when the concentration in the sample is below the Reporting Limit but above the Method Detection Limit or for qualification of tentatively identified compounds.
N	Presumptive evidence of a compound from the sue of GC/MS library search
U	Analyte included in the analysis, but not detected
X	Indicates samples analyzed for total and dissolved metals differ at <= 20% RPD
Z	Indicates internal standard failure. Sample results are either biased high or biased low.

APPENDIX E

Horiba U-52 Calibration Log

PEAK ENVIRONMENTAL LLC

Job Name: _____ Sampler / Analyst: _____

Date: _____

pH CALIBRATION					
Time	Initial Calibration			pH 7 Buffer Check	Post Calibration Value
	pH 4	pH 7	pH 10		

Initial pH 7 check must be within ±0.10 standards units; and within ±0.20 standards units afterwards

SPECIFIC CONDUCTANCE CALIBRATION		
Time	Meter Reading	Post Calibration Value
	Conductivity Standard (1.413 mS/cm)	

TURBIDITY CALIBRATION		
Time	Meter Reading	Post Calibration Value
	Turbidity Standard (100 NTU)	

DISSOLVED OXYGEN CALIBRATION			
Time	Meter Reading	Temperature (°C)	Post Calibration Value
	DO Standard (0.0 mg/L)		
Time	Air Saturated Water Reading from Table	Temperature (°C)	Post Calibration Value

pH 4 Buffer Solution Lot # and Expiration Date:	
pH 7 Buffer Solution Lot # and Expiration Date:	
pH 10 Buffer Solution Lot # and Expiration Date:	
Conductivity Standard Solution Lot # and Expiration Date:	
Turbidity Standard Solution Lot # and Expiration Date:	
DO Standard Solution Lot # and Expiration Date:	
Horiba U-52 Sensor Serial #:	
Horiba U-52 Display Serial #:	

Comments:

APPENDIX F

Quality Systems Manual

Alpha Analytical, Inc.

D/B/A

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Laboratory Technical Manager (Director) Air-Mansfield: Andy Rezendes, 508-844-4181

1 Mission Statement

The mission of Alpha Analytical is quite simply to provide our customers with the greatest value in analytical service available. For the 'greatest value' is not only found in the data that is delivered, it is also found in the services provided.

- Data must be of the highest integrity, accuracy and precision.
- Consultation and educational services must be provided to support the customer in establishing data quality objectives and interpretation of the final data package.
- Support services such as sample containers, courier service and electronic data deliverables must be available to the customer.

Alpha's mission continues with an established commitment to our community and environment. We must ensure that we do not produce any additional contamination to our environment or harm our neighbors and community in any way.

The value of Alpha's product is in the honesty and integrity with which each chemist, courier, login staff member, or office staff member performs their tasks. The customer or employee must always feel satisfied that they received the greatest value in their lab experience at Alpha.

Alpha Analytical will vigorously pursue its mission into the next millennium.

Mark Woelfel

President

2 Table of Contents

Section Description Page

3 Introduction

The Quality Systems Manual, referred to as Corporate Quality Systems Manual (CQSM) of Alpha Analytical describes the quality program in use at the laboratory for both Westboro and Mansfield facilities. This Quality Systems Manual provides employees, customers and accrediting agencies with the necessary information to become familiar with how the quality system operates within Alpha Analytical. The quality program includes quality assurance, quality control, and the laboratory systems including feedback mechanisms for the automated continuous improvement of the laboratory operations to meet customer needs.

Implementation of the laboratory operations is by documenting procedures, training personnel and reviewing operations for improvement. Written procedures are maintained as Standard Operating Procedures (SOPs). The SOPs are available to the staff as a controlled, electronic, secure copy. The provisions of the QSM are binding on all temporary and permanent personnel assigned responsibilities. All laboratory personnel must adhere strictly to the QSM and SOPs.

All policies and procedures have been structured in accordance with the NELAC Institute (TNI) Standards), DOD QSM 5.1 and applicable EPA requirements and standards.

Twenty-five (25) sections comprise the QSM. Related quality documentation including the listing of SOPs, forms, floor plan, equipment, personnel and laboratory qualifications are available. The QSM sections provide overview descriptions of objectives, policies, services and operations.

3.1 Scope

The QSM describes the requirements of the Laboratory to demonstrate competency in the operations for performing environmental tests for inorganic, organic, air and microbiological testing. The basis for the environmental tests is the methods found in documents published by the United States Environmental Protection Agency (EPA), ASTM, AOAC, APHA/AWWA/WEF, Standard Methods, and other procedures and techniques supplied by customers.

The QSM includes requirements and information for assessing competence and determining compliance by the laboratory to the quality system. When more stringent standards or requirements are included in a mandated test method, by regulation, or specified in a project plan the laboratory demonstrates achievement of the customer specified requirements through its documented processes.

The QSM is for use by Alpha Analytical for developing and implementing the quality system. Accrediting authorities and customers use the QSM for assessing the competence of Alpha Analytical. Alpha Analytical is committed to continually improving the quality system. Meeting customer needs, operating within regulatory requirements and adhering to Alpha's Data Integrity and Ethics policy are several of the mechanism used to continually improve the quality system.

3.2 Policy Statement

This Quality Systems Manual summarizes the policies, responsibilities and operational procedures associated with Alpha Analytical. This manual applies to all associates of the laboratory and is intended for use in the on-going operations at Alpha Analytical. Specific protocols for sample handling and storage, chain-of-custody, laboratory analyses, data reduction, corrective action, and reporting are described. All policies and procedures have been structured in accordance with the NELAC Institute (TNI) Standards, DOD QSM(which includes 17025 standards), applicable EPA requirements, regulations, guidance, and technical standards. This Quality Systems Manual, laboratory Standard Operating Procedures (SOPs), and related documentation describe the quality systems, policies and procedures for Alpha Analytical.

Alpha Analytical performs chemical analyses for inorganic and organic constituents in water, seawater, soil, sediment, oil, tissue and air matrices. Alpha Analytical's goal is to produce data that is scientifically valid, technically defensible, and of known and documented quality in accordance with standards developed by The NELAC Institute (TNI) Standards and any applicable state or EPA regulations or requirements. It is the commitment of the President, Operations Director, Laboratory Technical Manager and Quality Assurance Officer to work towards continuous improvement of the operation, and towards meeting our customer's needs, requirements, and intended data usage. This continued commitment is built into every activity of the laboratory. It is the responsibility of Senior Management and the Department Managers to ensure that all associates familiarize themselves with, and comply at all times with, the quality systems, procedures and policies set forth in this manual, laboratory SOPs, and related documentation.

Alpha Analytical analyzes Proficiency Test (PT) samples, in accordance with the NELAC Institute (TNI) Standards and other regulatory programs, from a National Institute of Standards and Technology (NIST)-approved PT provider for the analytes established by EPA for water samples, and for other analytes and matrices. The specific analytes and matrices analyzed are based on the current scope of the laboratory services as documented in the laboratory SOPs and state certifications.

The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. This includes a review of facilities and instrumentation, staffing, and any special QC or reporting requirements to ensure that analyses can be performed correctly and within the expected schedule. All measurements are made using published reference methods or methods developed by Alpha Analytical. Competence with all methods is demonstrated according to the procedure described in SOP/ 1739 prior to use.

Alpha Analytical has developed a proactive program for prevention and detection of improper, unethical or illegal actions. Components of this program include: internal proficiency testing, electronic data audits and post-analysis data review by the QA Officer; a program to improve employee vigilance and co-monitoring; and Ethics Training program identifying appropriate and inappropriate laboratory practices, instrument manipulation practices and consequences. Additionally, all associates are required to sign the Alpha Analytical *Ethics Agreement* form upon commencement of employment and each year following. This form clearly outlines the possible consequences of unethical or improper behavior, or data misrepresentation. All staff are required to report any suspected unethical conduct to management. Management will then investigate and determine if the situation was considered unethical and will take appropriate action as described in the Alpha Ethics policy.

It is the policy of the laboratory to discourage and reject all influence or inducements (whether commercial, financial or personal) offered either by customers or suppliers, which might adversely affect results or otherwise compromise the judgment or impartiality of the staff. It is the responsibility of the Operations Director and Laboratory Technical Manager to inform customers and suppliers of this policy when necessary.

In the event that any such influences or inducements are encountered, the staff is instructed to inform management immediately. It is the responsibility of the Operations Director and the Laboratory Technical Manager to take appropriate action to prevent recurrence.

3.3 References

External reference documents are available electronically in the Qualtrax system for staff to access the latest edition or version of the reference methods, regulations or national standards. The Quality Assurance Department maintains the electronic files in the Qualtrax system. Management purchases automated update services, where available, to provide the laboratory with the latest hardcopy edition, where electronic means is not available.

3.4 Definitions

Appendix A lists the definitions as adopted by the laboratory. The definitions are from the 2009 TNI standards.

4 Organization and Management

4.1 Legal Definition of Laboratory

Alpha Analytical is a full service analytical laboratory. Testing services include Drinking Water, Waste Water, Ground Water, Waste material and Air. Alpha Analytical is a privately held corporation incorporated in the state of Massachusetts. Alpha Analytical, Inc. does business as (D/B/A) Alpha Analytical.

Alpha Analytical has been in business since 1985. The types of businesses served include:

Consulting firms,
Engineering firms,
Waste Management Companies,
Industrial sites,
Municipal agencies
Department of Defense projects.

4.2 Organization

The laboratory operates a quality system approach to management in order to produce data of known quality. The laboratory organization provides effective communication and lines of authority to produce analytical data meeting customer specifications. The organizational design provides open communication while ensuring that pressures and day to day operating circumstances do not compromise the integrity of the reporting of the final data. See Appendix B for Organizational Chart.

The President is responsible for directing all areas of the company. The following job functions report to the President:

Operations Manager
Quality Assurance Officer
Marketing / Business Development / Sales
Financial Services
Human Resources

The Operations Manager is responsible for directing all laboratory operational areas of the company. The following job functions report to the Operations Manager:

Laboratory Technical Manager(s)

Customer Services Manager

Department Managers

The Laboratory Technical Manager(s) is(are) responsible for the laboratory data generated by the organics testing, inorganics testing and metals testing areas and the Air Technical Director is responsible for laboratory data generated by air analyses.

The Departmental Managers (Supervisors) have the following responsibilities:

The organics managers direct personnel in the organics extraction and instrumental laboratories.

The wet chemistry manager directs personnel and team leaders in the wet chemistry and/or microbiological testing areas.

The metals manager directs personnel and team leaders in the metals sample preparation and instrumental laboratories.

The Quality Assurance Officer is a member of the staff and reports directly to the President and has defined responsibility and authority for ensuring that the quality system is implemented and adhered to at all times. The Quality Assurance (QA) Officer is responsible for interacting and communicating certification requirements, implementing the Quality Systems Manual and reporting to the Laboratory Technical Manager and Senior Management the status of the quality program. The QAO oversees the Quality Systems Specialists and is responsible for oversight and/or review of quality control data and function independently from laboratory operations.

The Customer Services Manager is responsible for customer interactions, project coordination and laboratory personnel notification of project requirements.

The Marketing, Business Development and Sales personnel are responsible for increasing the volume of work from current customers and adding new customers to the base business of Alpha Analytical. The Marketing and Business Development personnel review all new work with the Laboratory Technical Manager, Operations Manager, President and/or Quality Assurance Officer before contractual commitment.

The CFO is responsible for maintaining and reporting on the financial status of the company. The CFO directs financial personnel on proper accounting procedures and maintaining the list of approved suppliers and subcontractors. The CFO reports directly to the President.

The Human Resource Director is responsible for personnel recruitment, hiring, performance reviews.

Personnel job descriptions define the operational function duties and responsibilities. Administration and Laboratory personnel assignments may include cross-functional training and work performance in multiple areas of the operations. Multiple function training ensures laboratory back up personnel during peak workloads.

During the absence of any staff member, assignment of alternative personnel occurs by memo or e-mail. The Manager or Supervisor authorizes the assignment. The naming of alternative personnel assures the continuing performance of critical tasks during the primary person's absence and ensures that lines of communication remain open for continued decision making. The deputy for the Laboratory Technical Manager is the Quality Assurance (QA) Officer. The deputies for the Quality Assurance (QA) Officer are the Quality Systems Specialists.

For the purposes of the NELAC Institute (TNI) Standards the Lead Laboratory Technical Manager is the Laboratory Technical Manager. The deputies for the Lead Technical Manager are the Quality Assurance (QA) Officer, and the Departmental Managers. The Laboratory Technical Manager meets the requirements specified in the Section 4.1.7.2 Volume 1, Module 2 of the 2009 TNI standards. If the Laboratory Technical Manager is absent for a period of time exceeding 15 consecutive calendar days, a full-time staff member meeting the qualifications of Laboratory Technical Manager will be designated to temporarily perform this function. The primary Accrediting Body shall be notified in writing if the Technical Manager's absence exceeds 35 consecutive calendar days.

4.3 Business Practices

Alpha maintains certification for the programs and analytes required by regulatory programs. The listing of qualifications from the various certifications, registrations and accreditation programs are available upon request. Alpha Analytical operates Monday to Friday from 7:30 a.m. to 5:30 p.m. Management prepares and posts the holiday schedule for the year indicating closed operations. Sample delivery occurs during normal operating hours unless arranged in advance.

Alpha's reputation depends upon timely reporting and quality data. The standard turnaround time for engineering and consulting firms is five business days from time of sample receipt. Standard turnaround for all other customers is ten business days from time of sample receipt. The time of sample receipt is when the verification of the chain of custody and samples meets the laboratory sample acceptance policy. Laboratory management must approve any special arrangements for rush or expedited turnaround time. The basis for data quality depends on customer, regulation and method performance criteria. Accuracy, precision, sensitivity and comparability are expressions of method performance criteria.

All work is performed in the strictest confidence. New and contract employees must review corporate policy and practice requirements for protecting customer confidentiality and proprietary rights. The review occurs during orientation and ethics training. It is the policy of the laboratory to release data to the customer authorized contact. Personnel assigned the duties of interacting with customers review project files and discuss data related only to the project. Personnel whose duties do not include routine customer contact must check with the customer service manager before discussing data with regulators or third parties

5 Quality System

Establishment, Audits, Essential Quality Controls and Data Verification

5.1 Establishment

The Mission Statement presents the policy and objectives for Alpha Analytical. The Quality Systems Manual provides the framework for the processes and operations to implement the Mission. The Quality Systems Manual and documentation controlled by the laboratory system detail the management authorized operations for achieving the objectives of the company.

The laboratory operates a quality system approach to management in order to produce data of known quality. Alpha Analytical is a full service laboratory designed to provide its customers with accurate, precise and reliable data within the best turn-around time and at the most reasonable prices. Alpha employs chemists of the highest training, ethics and caliber in the field of analytical chemistry. This and state-of-the-art instrumentation and automation combine to insure data of known and documented quality.

5.2 Quality Systems Manual

The QA Officer is responsible for the publication and distribution of the Quality Systems Manual and annual review. Management reviews and authorizes the manual. Implementation of major changes in the quality system occurs after revision of the appropriate Quality Systems Manual section and authorization by management.

The authorization of the Quality Systems Manual is documented electronically in Qualtrax. Updates of this manual occur at any time throughout the year. Document control procedures (SOP1729) apply to the distribution of the Quality Systems Manual. Controlled copies of the manual are maintained electronically within Qualtrax. Persons or organizations outside of Alpha Analytical may receive uncontrolled copies. Copies are distinctly indicated “Uncontrolled Documents” within the footer of each page.

5.3 Audits

Laboratory audits, both internal and external, review and examine the operations performed in the laboratory. Internal audits are conducted by qualified QA Specialists and external audits are reviews by external organizations to evaluate the ability of the laboratory to meet regulatory or project requirements. Internal audits are conducted on a frequency of bi-annually, method required and annually for DoD certified methods.

A QA designee schedules internal process audits to ensure the completion of the annual audit of each operational area. The process audits are a more detailed review of the operations. Personnel from areas other than the one audited perform process audits.

The internal system audit is a review of the implementation of the documented quality system. The system audit includes sample tracking from receipt to disposal, a data audit of a completed report, and all operations not audited during the process audit.

The purpose of the internal system audit is:

Verification that adequate written instructions are available for use;

Analytical practices performed in the laboratory are consistent with SOPs;

The quality control practices are applied during production;

Corrective actions are applied as necessary;

Deviations from approved protocols are occurring only with proper authorization and documentation;

Reported data is correct and acceptable for reporting;

SOPs, quality records, analytical records, electronic data files are maintained properly; and

Personnel training files and records are satisfactory and current.

Before a scheduled internal audit, the assigned auditor reviews checklists, if used, and/or the SOP specific to the area. The checklist may be from an external source or prepared by the auditor. . After the audit, the auditor submits a summary or notes from the audit to the Laboratory Technical Manager or QAO as part of the audit report. The summary identifies discrepancies found during the audit. Technical personnel are responsible for the inspection and monitoring of in-process and final data. Personnel independent of those having direct responsibility for the work performed audit the quality system and processes.

Representatives sent by customers and government or accrediting agencies often perform external audits. These audits are most often announced inspections, but sometimes are not announced. The Quality Assurance Officer, Laboratory Technical Manager or assigned deputy, and/or appropriate Department Manager accompany the external audit team through the laboratory. The auditors receive a brief overview of company objectives, activities, and facilities. Interviews with essential supervisory staff and technical staff are arranged, along with retrieval of any documentation pertinent to the audit. Auditors usually provide a report on their findings shortly after the audit. The QA Officer receives the audit report and copies are provided to laboratory personnel for review. Corrective actions are identified and distributed to responsible parties for implementation in response to any cited deficiencies.

5.4 Audit Review

Management reviews internal and external audit reports to evaluate system effectiveness at the annual management review meeting. Tracking of the audit findings occurs through the nonconformance action process. The management and staff work together to establish a time line for resolving the audit findings. The Quality Assurance team tracks the time line and reports to the Laboratory Technical Manager on any outstanding audit findings. Approved corrective actions for DoD that are not implemented or avoided may result in loss of DoD ELAP accreditation and may result in work being discontinued until implementation is verified by DOD ELAP AB.

5.5 Performance Audits

Alpha Analytical participates in inter-laboratory comparisons and proficiency test programs required by customers and certifying agencies. The performance audits provide information on the data comparability of results generated by the laboratory. Test samples received by the laboratory are handled following routine laboratory procedures. Proficiency test samples are unpacked, checked against the packing slip and examined for damage. Reporting requirements and deviations to routine practices are noted as would be required for any project.

Analysts demonstrate proficiency by analyzing either an external proficiency test sample, an internally prepared blind test sample or Initial Demonstration of Capability (IDC) before independent operation of a test method. The results of performance audits serve several purposes. The QA Officer may use performance audits for evaluating analyst proficiency, laboratory performance in a specified area to facilitate laboratory improvement efforts, and/or to provide information to an accrediting agency on correction of past performance of an external performance audit.

5.6 Corrective Actions/Preventative Actions (CAPA)

The corrective action process at Alpha Analytical is detailed in SOP 1736. The corrective action program at Alpha Analytical uses the Nonconformance workflow in Qualtrax to document and follow through the corrective action/preventative action process for three main areas: nonconformance's within the laboratory, customer complaints and failed PT studies. The process ensures continuous improvement of company performance by preventing the recurrence of quality problems.

Nonconformance reports are tracked for closure date and the type. Reports to management include the listing of open nonconformance reports and the frequency of the type of nonconformance occurring. A QA designee monitors the completeness of the forms, as well as verifies the actions are complete and acceptable.

Customers will be notified within 5 days of any question(s) regarding validity of results.

5.7 Managerial Review

The management review occurs at least once per year as part of the strategic planning process. Documentation of the management review meeting is by recording the meeting minutes and listing the attendees. The focus of the quality management review is the frequency of the type of nonconformance, closure status, audit progress and other quality assurance actions. Meetings include discussion and progress on quality system initiatives since the last meeting.

Prior to the meeting, an agenda is distributed to all personnel expected to be in attendance. The meeting is chaired by the President. Minutes are taken and distributed at the conclusion of the meeting by a QA designee. If action is necessary on any issue, a Summary Report is generated and distributed to responsible parties for implementation. Actions are monitored by the QAO or designee until completion.

5.8 Essential Quality Control Procedures

The following general quality control principles apply to all tests. The manner implemented is dependent on the type of test performed. The laboratory SOP presents the specific quality control checks undertaken to ensure precision, accuracy and sensitivity of each test method. Deviations from the existing SOP are allowed only upon approval of the deviation by the department manager and Quality Assurance Officer. This documentation must be either in form of written notice or email.

Alpha Analytical uses quality control samples to evaluate the following:

1. Adequate positive and negative controls to monitor blanks, spikes, reference toxicants, zero blanks;
2. Adequate tests to define the variability and/or reproducibility of laboratory results;
3. Measures to ensure the accuracy of the test data including sufficient calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples;
4. Measures to evaluate test performance, such as detection limits and quantitation limits or range of applicability such as linearity;
5. Selection of appropriate formulae to reduce raw data to final results such as linear regression, internal standards, or statistical packages;
6. Selection and use of reagents and standards of appropriate quality;

7. Measures to assure the selectivity of the test for its intended purpose;
8. Measures to assure constant and consistent test conditions for the method such as temperature, humidity, light, or specific instrument conditions.

   Note: All quality control samples are treated in the same manner as field samples.

All quality control measures are assessed and evaluated on an on-going basis, and quality control acceptance limits are used to determine the usability of the data. Control charts and/or calculated control limits monitor the long-term method performance by analyte, by instrument for water matrices. Routine evaluation and reporting of the control chart performance provides supervisors and management with additional performance measures to ensure data comparability. Control limits are recalculated when trends are observed.

Where no reference method or regulatory criteria exist, the laboratory specifies the acceptance/rejection criteria in the SOP. The test SOP specifies the QC samples performed per batch of samples. The quality control samples are categorized into the following, as appropriate to the method

- Method Blank
- Laboratory Duplicate
- Laboratory Control Sample (LCS)
- Laboratory Control Sample Duplicate (LCSD)
- Matrix Spike (MS)
- Matrix Spike Duplicate (MSD)

Selection of samples for Duplicate, Matrix Spike (MS) & Matrix Spike Duplicate (MSD)

2. Duplicate samples
   a. Samples will be selected if identified and requested by customer
   b. If no samples are identified by the customer then random samples will be analyzed within the batch as defined by the method, program or at a minimum batch of 20 samples.

3. Matrix Spike (MS) / Matrix Spike Duplicate (MSD) samples
   a. Samples will be selected if identified and requested by customer
   b. If no samples are identified by the customer then random samples will be selected and analyzed within the batch as defined by the method, program or at a minimum batch of 20 samples.
   c. If MS/MSD is not required, LCS/LCSD may be substituted for

precision and accuracy evaluation.
All DOD projects require MS/MSD.

The frequency is dependent on the reference method and test protocol. The following is the default requirement for quality control checks in lieu of any other guidance. The frequency for each quality control sample is generally one (1) per every 20 samples.

5.9 Data Reduction

After completion of the test procedure, the data reduction process begins.

Chromatography data may require the manual integration of peak areas or heights before reporting of results. The analyst must perform manual integration when software does not properly integrate or identify the peak. Manual integration must not occur for the purpose of achieving acceptable quality control or calibration. The analyst and reviewer sign and date the hardcopy of all manual integration. The analyst notes the rationale for performing the manual integration on the hardcopy printout and ensures the "TIC" marks from the software represent the integration area used for reporting the results. The analyst must minimize and avoid manual integration. The establishment of the proper integration parameters in the software reduces the number of manual integration occurrences.

The SOP for each test presents the formulas used for the specific test method. The formulas for the data calculations used throughout the laboratory are the following:

% Recovery (LCS)

$$\frac{MV}{TV} * 100 = \%R_{LCS}$$

where:
MV = Measured Value
TV = True Value

% Recovery (MS or MSD)

$$\frac{MV - SV}{TV} * 100 = \%R_{MS}$$

where:
MV = Measured Value
TV = True Value
SV = Amount found in sample

Average ($\overline{X}$)

$$\sum_{i-1}^{n} X_i \Big/ n = \overline{X}$$

where:
$\overline{X}$ = Average of all values
X = Result of each measurement
n = Number of values

Relative Percent Difference (% RPD)

$$\frac{R_1 - R_2}{(R_1 + R_2)/2} * 100 = \%RPD$$

where: R_1 = Larger of two observed values
R_2 = Smaller of two observed values

% Difference (%D)

$$\frac{X - \overline{X}}{\overline{X}} * 100 = \%D$$

where: $\overline{X}$ = Average of all values
X = Result of measurement

Standard Deviation of the sample (S_x)

$$\sqrt{\frac{\sum \left(X - \overline{X}\right)^2}{n-1}} = S_x$$

where: $\overline{X}$ = Average of all values
X = Result of each measurement
n = Number of values

Relative Standard Deviation (%RSD)

$$\frac{S_x}{\overline{X}} * 100 = \%RSD$$

where: $\overline{X}$ = Average of all values
Sx = Standard Deviation (n - 1)

Range of Logs (for microbiological enumeration analysis)

10% of routine samples are analyzed in duplicate and the range of logs is determined.

MDL (See 40CFR Part 136 for details)

$$\left[\sqrt{\frac{\sum_{i=1}^{n} x_i^2 - \left(\sum_{i=1}^{n} x_i\right)^2 \Big/ n}{n-1}}\right] * t_{0.99} = MDL$$

where: *MDL* = The method detection limit
X = Result of each measurement
n = Number of values
t(n-1,1 = .99) = The students' T value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom. (See Students t Test Table)

Reporting Limit (RL)

Lowest calibration standard or greater

Control Limits

Upper Control Limit: $\overline{X} + 3 * S_x = UCL$
Lower Control Limit: $\overline{X} - 3 * S_x = LCL$

Warning Limits

Upper Warning Limit: $\overline{X} + 2 * S_x = UWL$
Lower Warning Limit: $\overline{X} - 2 * S_x = UWL$

Method of Standard Additions (MSA): (See EPA 7000A for details)

The simplest version of this technique is the single-addition method, in which two identical aliquots of the sample solution, each of volume Vx, are taken. To the first (labeled A) is added a known volume Vs of a standard analyte solution of concentration Cs. To the second aliquot (labeled B) is added the same volume Vs of the solvent. The analytical signals of A and B are measured and corrected for non-analyte signals. The unknown sample concentration Cx is calculated:

$$C_x = \frac{SB\ V_S\ C_s}{(SA - SB)\ V_X}$$

where SA and SB are the analytical signals (corrected for the blank) of solutions A and B, respectively. V_S and C_s should be chosen so that SA is roughly twice SB on the average, avoiding excess dilution of the sample. If a separation or concentration step is used, the additions are best made first and carried through the entire procedure.

Improved results can be obtained by employing a series of standard additions. To equal volumes of the sample are added a series of standard solutions containing different known quantities of the analyte, and all solutions are diluted to the same final volume.

For example, addition 1 should be prepared so that the resulting concentration is approximately 50 percent of the expected absorbance from the endogenous analyte in the sample. Additions 2 and 3 should be prepared so that the concentrations are approximately 100 and 150 percent of the expected endogenous sample absorbance.

The absorbance of each solution is determined and then plotted on the vertical axis of a graph, with the concentrations of the known standards plotted on the horizontal axis. When the resulting line is extrapolated to zero absorbance, the point of interception of the abscissa is the endogenous concentration of the analyte in the sample. The abscissa on the left of the ordinate is scaled the same as on the right side, but in the opposite direction from the ordinate. A linear regression program may be used to obtain the intercept concentration.

5.10 Document Control

The Document Control Procedure (SOP/1729) describes the process for controlled and uncontrolled documents. The use of the revision number allows for the retention of a previous document for historical information purposes.

Every document is assigned a unique identification number, which is present on each page of the document. A master list of documents includes the unique identification. Each controlled copy includes the revision number, published date and page number.

Full document control includes the status of each document: active, inactive or superseded/archived. Inactive documents are procedures not currently requested, but may be in the future. Archived documents are procedures replaced with a later revision. Authorized personnel must review and approve each document and any subsequent revisions before use in the laboratory. Personnel authorized to review and approve a document have access to all necessary information on which to base their review and approval. The history section of the document in Qualtrax includes a description of the nature of the document change.

Standard Operating Procedures (SOPs) are instructions for repetitive or standard operations performed by the laboratory. The SOP author is the person familiar with the topic. The standard format for writing SOPs is set-up as a template for administration and technical SOPs. Each SOP is peer reviewed, authorized by management, and QA before final publication and implementation. Authorized signatories for controlled documentation include one or more of the following personnel: Company President, Quality Assurance Officer, Laboratory Technical Manager, Department Manager, Department Team Leader. Personnel acknowledge approved documents as read, understood and agreed to through electronic attestation forms associated with each document as SOP Attestation Tests which reside in Qualtrax.

SOPs must receive evaluation and input by laboratory supervisors and key technical personnel. The content of each SOP must conform to applicable requirements of analytical methods and certification agencies. Within these constraints, the content of a SOP meets the needs of a particular area of the laboratory. A new or revised SOP is needed when regulatory programs update or add methods, the scope of the existing method is extended, or when activities are being performed without adequate documentation.

Updating, modifying and changing SOPs, forms and the contents of this QSM are prompt and part of the routine practices. The prompt modification of these documents ensures the documents reflect the current practices and operations of the laboratory. During annual review of a document, (including but not limited to: SOPs, Ethics Policy, Quality Systems Manual), requested changes are reviewed and the document reissued using the information and a new revision number is assigned and published in Qualtrax.

The laboratory maintains control over the possession and distribution of all documents that directly affect the quality of data. This includes, but is not limited to, documents such as the Quality Systems Manual, Standard Operating Procedures, customer instructions, Laboratory Work Instructions, data sheets, check lists and forms.

5.11 Detection Limits

Detection Limits (DLs), previously referred to as Method Detection Limits (MDLs), are determined for all analytes as specified in the Institute (TNI) Standards. DLs are determined for all new instrumentation, whenever there is a change in the test method or instrumentation that affects performance or sensitivity of the analysis. From these, detection limits, Reporting Limits (RLs), are established. The RL is the minimum concentration of an analyte that can be identified and quantified within specified limits of precision and bias during routine and analytical operating conditions.

Laboratory reporting limits lie within the calibration range, at or above the RL. For methods that require only one standard, the reporting limit is no lower than the low-level check standard, which is designed to verify the integrity of the curve at lower levels. If reporting limits are required below the lower level of the calibration curve, RL, or low-level check standard, method modifications are required. Refer to DL/LOD/LOQ SOP/1732. Note: ”J” Estimated value: Upon customer request, the Target analyte concentration can be reported below the quantitation limit (RL), but above the Detection Limit (DL) with a “J” qualifier as long as there is a LOD study on file.

5.12 LOD/LOQ Studies

A. LOD (Limit of Detection) Verification

1. LOD (Limit of Detection) verification is required annually for each target analyte in which test results are to be reported below the lowest calibration standard (“J” values) for each instrument, matrix and prep procedure. LOD is required quarterly for all DOD projects.

2. All sample-processing steps of the analytical method shall be included in the determination of the LOD.

3. The validity of the LOD shall be confirmed by ***qualitative*** identification of the analyte(s) in a QC sample in each quality system matrix containing the analyte at no more than 2-3X the LOD for single analyte tests, and 2X up to 4X the LOD for multiple analyte tests. This verification must be performed on every instrument that is to be used for analysis of samples and reporting of data.

4. An LOD study is not required for any component for which spiking solutions or quality control samples are not available such as temperature. Where an LOD study is not performed, the laboratory may not report a value below the limit of quantitation.

B. LOQ (Limit of Quantitation) Verification

1. LOQ (Limit of Quantitation) verification is required annually for each target analyte that is not reported below the lowest calibration standard for each matrix and prep procedure. LOQ is not required if an annual LOD verification is performed.
2. The validity of the LOQ shall be confirmed by successful analysis of a QC sample containing the analytes of concern in each quality system matrix 1-2 times the claimed LOQ. A successful analysis is one where the recovery of each analyte is within the established test method acceptance criteria for accuracy. LOQ are required quarterly for all DOD projects.

The LOQ study is not required for any component or property for which spiking solutions or quality control samples are not commercially available or otherwise inappropriate (e.g., pH).

The LOQ acceptance criteria are based on the established acceptance criteria for Laboratory Control Samples.

Refer to DL/LOD/LOQ SOP/1732

5.13 Range of Logs – Precision of Quantitative Methods - Microbiology

A. Precision of duplicate analyses is calculated for samples examined by enumerative microbiological methods according to the following procedure:

   a. Perform duplicate analyses on first 15 positive samples.

   b. Record duplicate analyses as D1 and D2 and calculate the logarithm of each result.

   c. If either of a set of duplicate results is <1, add 1 to both values before calculating the logarithms.

   d. Calculate the range (R) for each pair of transformed duplicates as the mean of these ranges.

6 Personnel

6.1 Laboratory Management Responsibilities

Management is responsible for communicating the requirements of the quality system, customer specifications and regulatory needs to all personnel. Management job descriptions detail the responsibilities of each position.

The H.R. Director has job descriptions for all positions in the laboratory defining the level of qualifications, training, and experience and laboratory skills. During initial training, management provides access to documented operations procedures, observes personnel performance, and evaluates personnel proficiency. Management documents technical laboratory staff's proficiency initially and on a continuing basis through use of laboratory control samples and purchased proficiency evaluation standards.

Management is responsible for verification of proper sample management and all aspects of data reporting. The communication of the operating practices of the laboratory is through the document control and attestation process.

Either the Quality Assurance Officer, Operations Director and/or Technical Managers have the authority to stop work due to non-conformances and have the authority to resume work after it has been stopped.

6.2 Laboratory Staff Requirements

Recruitment is the responsibility of the Operations Manager and HR Department, with input from other personnel as required. The Training Program procedure SOP/1565 details the process for completing requirements and training to ensure personnel have adequate skills and competence for the job function. Initial training includes ethics training, Qualtrax Training, QA Basics, IT/LIMs including computer security.

A job description details the necessary requirements for each job and includes position title, minimum educational requirements, skills, responsibilities and reporting relationships and any supervisory responsibility.

Initial training of new employees and contract staff includes laboratory ethics and quality policies, signing the Employee Signature Log, as well as execution of an Ethics Agreement. Any employee found to knowingly violate the Ethics Policy Agreement, report data values, that are not actual values obtained or improperly manipulated, or intentionally report dates and times of data analyses that are not the actual dates and times of analysis, will lead to disciplinary action, including termination, as outlined in Section V.K of the Employee Handbook. Each employee must report personally or anonymously to the Laboratory Technical Manager, QA Officer and/or Ethics Team Member any accidental or suspected intentional reporting of non-authentic data by others for follow up action. The review of the laboratory ethics and ethics training occurs annually with all personnel.

(DOD) All inappropriate and prohibited laboratory practices, as detailed in the DOD WSM 5.2.7, will be reported to the appropriate accrediting body within 15 business days of discovery. Records of corrective actions or proposed will be submitted within 30 business days. Failure to notify the AB within 15 business days will result in suspension of the DOD ELAP accreditation.

The Ethics program consists of the following key components:

- Ethics Policy /Agreement (Appendix F)
- Initial and annual ethics training

- Internal audits conducted annually
- Adherence to Manual Integration SOP/1731
- Ethical or Data Integrity issues reported to Lab Managers, QAO or HR Director
- Anonymous reporting to HR Director - This is accomplished by writing a detailed description of the suspected ethics breach and submitting the information, anonymously, to the Human Resource Director.
- "No-fault" policy encouraging reporting of incidences without fear of retribution
- Electronic tracking and audit trails through LIMs and instruments enabled where available.

6.3 Training

The Quality Systems Manual and related documentation is available to all employees. Cross training, supervisory training and other related training takes place on a scheduled and as-needed basis. Training ensures the communication and understanding of all personnel in the laboratory-documented procedures and practices.

All personnel undertake orientation-training sessions upon initial employment. Orientation training includes laboratory business practices, employment specifications, Ethics Policy, Quality Systems Manual, Chemical Hygiene Plan, and all SOPs required for the job function.

Managers ensure the training for new employees and review the continuing training for current employees. Training includes on-site and off-site programs presented by staff members, contractors, equipment manufacturers, and institutions of higher learning.

Training of new personnel to any job assignment takes place on-site according to the Training Program procedure. Laboratory personnel may perform their assigned methods/protocols without supervision only after documentation of acceptable proficiency. Training records lists the current training status.

On-the-job training includes demonstration of skills during job performance, initial demonstration of proficiency, and review of SOPs. Health and Safety training takes place on an annual basis with careful introduction to new principles. Personnel have access to the Chemical Hygiene Plan and Material Safety Data Sheets. On-site training includes side-by-side hands-on training, formal classroom type instruction on the SOP or a meeting to discuss procedural changes or to address questions related to the laboratory operation. All training is documented via the Training Attestation Form, which is signed by all in attendance that they understood and will implement what was presented to them.

Training is an on-going opportunity to evaluate the laboratory operations. The updating of SOPs, Quality Systems Manual and other related information documents all changes to the quality system. Training is documented via the Training Attestation Form or in Qualtrax with training test records.

Off-site training takes place on an as-needed basis. Recommendations and suggestions regarding educational programs come from all levels of staff. It is the employee's responsibility to present a copy of any certificates or attendance information to the HR Director. The information is added to the individual's training record.

6.4 Records

The QA Department is responsible for maintaining training records. Certificates, demonstration of capability forms and other records of training are placed in the individual's training file.

Appropriate personnel are notified through email and/or Qualtrax or by the QA department when a revision is complete for the controlled version of a document. The manager of the area determines when a change is significant to require training.

Job descriptions are included in the training record files. The Human Resources Department reviews the job descriptions, Resumes and/or biosketches are kept on file with the Human Resources Department and the QA Department.

7 Physical Facilities – Accommodation and Environment

This laboratory facility has a total area of 25,000 square feet for each of the Westboro and Mansfield Facilities

The laboratory functional areas include:

Administration and offices
Sample receiving
Sample management
Air analysis (Mansfield Facility only)
Microbiological (Westboro Facility only)
General analytical chemistry
Metals sample preparation (Mansfield Facility only)
Organic sample preparation
Metals analysis (Mansfield Facility only)
Volatiles gas chromatography (GC)
Volatiles gas chromatography/mass spectrometry (GC/MS)
Volatiles air analysis (Mansfield Facility only)
Semivolatiles gas chromatography/mass spectrometry (GC/MS)
Semivolatiles gas chromatography (GC)
Miscellaneous facility mechanical and storage areas.

All chemicals are stored in appropriate cabinets and properly disposed of as required. All flammable solvents are stored in OSHA and NFPA approved cabinets. Acids are stored in OSHA acid cabinets. Separate waste areas houses the sample and chemical waste before pickup by a licensed waste hauler.

7.1 Environment

Lighting, noise, humidity, heating, ventilation and air conditioning satisfy the needs of the testing performed on the premises. The laboratory building design ensures regulated temperature control for analytical equipment. Air-handling systems minimize airborne contaminants that may jeopardize sample integrity or analytical performance.

The analytical instrumentation is in separate rooms from laboratory activities that involve the use of large quantities of organic solvents or inorganic acids. A separate room, in the Westboro facility, provides the facilities for the microbiological testing.

Standards and other materials requiring below 0°C storage temperatures are placed in freezers and separated from samples or potential contaminating materials. Refrigerators provide cooling needs for samples and materials with temperature requirements of below room temperature and greater than freezing. Sample and standard storage areas are monitored and controlled for temperature and recorded in the data logger system. Sample storage areas for volatiles are separated from other samples and monitored for any effects due to cross contamination.

Bulk hazardous waste containers are located away from the testing activities. Waste disposal uses lab pack procedures and those designated by the regulatory authorities. The Chemical Hygiene Plan and the Waste Management and Disposal SOPs (Westboro: SOP/1728 and Mansfield SOP/1797)) include the procedures for handling and disposing of chemicals used in the laboratory.

The working and storage environments are maintained in a safe and appropriate manner. A Chemical Hygiene Plan details the requirements for safety and chemical handling. Safety measures that protect property and personnel from injury or illness include: fume hoods, fire extinguishers, fire blankets, alarm systems, safety training, protective clothing, emergency showers, eyewashes, and spill control kits.

7.2 Work Areas

Good housekeeping is the responsibility of all personnel. Each person is responsible for assuring clean and uncluttered work areas. The job descriptions list specific housekeeping duties. Records, samples and waste materials are the common cause for clutter in the laboratory.

. Removal of administration and laboratory records to the record storage area occurs to reduce clutter and ensure traceability. The individual filling the laboratory record box, labels the box with a number, the contents, date and laboratory area. Authorized personnel assign and record into a permanent record the box number, discard date and box contents. Authorized personnel review the box label for number, discard date and contents. Boxes are stored onsite and off-site for the record retention period identified in the NELAC Institute (TNI) Standards and EPA regulations, whichever is more stringent.

Sample management personnel remove samples to the sample storage area after all data is correct and complete. Sample coolers are removed to a designated storage area for recycling. Samples are stored in the designated process storage areas until testing is complete. Sample removal from the process storage occurs after mailing of the final report. The sample management staff places the samples in the archive storage area for thirty days after report release. The archive sample storage area is not controlled or monitored. Based on customer specifications, samples are properly disposed or returned to the customer.

Waste materials, expired reagents, expired standards and materials are disposed of and not stored in the laboratory. Hazardous waste labeled accumulation containers in the laboratory collect designated waste streams for later bulk disposal. Laboratory personnel remove the less than five-gallon accumulation containers when full from the laboratory and place the containers in the bulk hazardous waste area. Refer to the Waste Management and Disposal SOPS for Westboro: SOP/1728 and Mansfield SOP/1797. Personnel identifying out of date reagents and standards remove the materials to the proper disposal area.

7.3 Security

Alpha Analytical provides a secure environment for our employees, guests, customers, samples and analytical data. Security procedures require that all exterior doors remain locked unless manned. Access to the laboratory is limited to employees and contractors. Visitors not under signed contract are required to sign the Visitors Log and must be accompanied by a laboratory employee at all times within the testing areas.

The defined high security area is the sample management area. Identification card locks on the internal doors control entry into the laboratory area.

All doors are locked after hours and require a key for entry. The security alarm continuously monitors for smoke and fire related heat. When the alarm is activated, the appropriate emergency response officers are notified. The local emergency offices have the emergency contact list for the laboratory.

8 Equipment and Reference Materials

8.1 Maintenance

The laboratory has a proactive equipment maintenance program. The laboratory maintains service contracts for most major equipment, which include routine preventative maintenance visits by the service provider. Technical personnel perform manufacturer's specified maintenance on a routine basis to ensure equipment operates at peak performance.

A brief summary of some common preventive maintenance procedures is provided in Appendix D. All instrument preventative and corrective maintenance is recorded in the maintenance logbook assigned to the equipment. After maintenance or repair, the instrument must successfully calibrate following the method SOP. Laboratory personnel must demonstrate quality control performance before sample analysis.

The laboratory maintains a stock of spare parts and consumables for analytical equipment. Backup instrumentation for some analytical equipment is available on site for use in case of major equipment failure. The person discovering or suspecting an equipment maintenance problem or failure tags the equipment with 'out of service' tag. If routine maintenance measures do not eliminate the problem, the Laboratory Technical Manager or Operations Director is notified and the appropriate equipment service provider is contacted.

All major laboratory equipment has individual and traceable maintenance logbooks in which to document manufacturer's recommended maintenance procedures, specific cleaning procedures, comments on calibration, replacement of small worn or damaged parts, and any work by outside contractors. The person performing routine or non-routine maintenance signs and dates the maintenance logbook. If an instrument is down for maintenance, a complete record of all steps taken to put it back into service is recorded including reference to the new calibration and quality control checks. Any equipment service providers working on the equipment are recorded in the logbook.

Record repetitive or on-going equipment problems other than normal maintenance requirements on nonconformance action forms. The nonconformance action form notifies management and the Quality Assurance Officer of a problem affecting the performance and data quality.

The laboratory groups some equipment into a single laboratory equipment maintenance logbook. Examples include: autopipets, thermometer calibration. The identity of each item is by serial number or a laboratory-designated item number. The same data recorded for major equipment applies to this documentation.

The maintenance records shall include:

Equipment name;

Manufacturer's name, type identification, serial number or other unique identification;

Date received, date put into service, condition when received;

Current location;

Details of past maintenance and future schedule;

A history of any damage, malfunction, modification or repair;

Dates and results of calibration or verification.

The maintenance logbook may include the reference to the location of the equipment operational and maintenance manuals. The logbook may include the reference to laboratory run logbook or data files for the calibration and quality checks of daily or frequent calibrations.

The Courier Supervisor ensures that maintenance and records for transportation vehicles are complete. The purchasing process is used for ordering garage maintenance, the garage work order is reviewed, and the vehicle checked for condition. The Controller receives all paperwork for completion of the maintenance process.

8.1.1 Microbiology General Equipment Maintenance

Optics of the Quebec colony counter and microscope are cleaned prior to each use. The stage of the microscope is also cleaned and the microscope is kept covered when not in use.

Glassware is checked for residual alkaline or acid residue utilizing bromothymol blue (BTB) on each day of media preparation.

8.2 Equipment Listing

A listing of the major equipment used for testing is available upon request. The equipment list details the unique identification number, equipment location, serial number, model number, and purchase date. The unique identification number is attached to the piece of equipment.

The laboratory performs analyses using state of the art equipment. In addition to the major equipment, the most common equipment used in the laboratory are: thermometers, balances, autopipets, water baths, hot plates, autoclaves, pH meters, conductivity meters and a variety of labware. The SOPs list the calibration and verification requirements for all laboratory equipment used in measurements.

8.3 Laboratory Water

Laboratory water is purified from central DI and RO water systems and piped to all laboratory areas. The QA Department samples the laboratory grade water and submits the samples for analysis by the lab to document the water meets the drinking water certification criteria. The Laboratory Water Logbook lists the daily conductivity checks and acceptance criteria for the laboratory water. The laboratory documents the daily, monthly and annual water quality checks. Please refer to Table 8-1 for tested parameters, monitoring frequency and control limits for each parameter (SOP/1738). Additional parameters may be tested for at the laboratory's discretion.

When additional treatment occurs in the test area, that test area records the water quality checks from the most frequently used tap. At a minimum the quality of the laboratory grade water is monitored daily by conductivity measurements. Records of the daily checks are found in the Laboratory Water Logbook. If out of specification results occur, a nonconformance action form is submitted.

TABLE 8-1

Parameter	Monitoring Frequency	Control Limits
Conductivity	Daily	<2 µmhos/cm @ 25°C
pH	Daily	5.5 - 7.5
Total Organic Carbon (Westboro only)	Monthly	< 1.0 mg/L
Total Residual Chlorine	Monthly	< detection limit
Ammonia Nitrogen (Westboro only)	Monthly	< 0.1 mg/L
Metals: Cd, Cr, Cu, Pb, Ni and Zn (Mansfield only)	Monthly (Required Annually)	< 0.05 mg/L
Total Metals (Mansfield only)	Monthly (Required Annually)	< 0.1 mg/L

Heterotrophic Plate Count (Westboro only)	Monthly	< 500 CFU/mL
Water Quality Test (Biosuitability) (Westboro only)	Annually	0.8 – 3.0 ratio

8.4 Reference Materials

Reference materials include: Class 1 weights, NIST thermometers and reference standards. Logbooks record the reference materials used for calibration and verification. The Department Manager or QA Department maintains any certificates received with the reference materials. Laboratory personnel record in the standards logbook the reference standards date received, unique identification number, expiration date and number of containers. Each laboratory area records the unique identifier on the reference standard certificate and the Department Manager maintains the certificate. The identifier allows traceability from the certificate to the analytical data.

9 Measurement Traceability and Calibration

9.1 General Requirements

All measuring operations and testing equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before put into service and on a continuing basis. The results are recorded in the instrument specific logbook. The laboratory has a program for the calibration and verification of its measuring and test equipment. The program includes all major equipment and minor equipment such as balances, thermometers and control standards. The Quality Systems Manual and method SOP describe the calibration records, frequency and personnel responsibilities.

9.2 Traceability of Calibration

The program of calibration and/or verification and validation of equipment is such that measurements are traceable to national standards, where available. Calibration certificates indicate the traceability to national standards, provide the results, and associated uncertainty of measurement and/or a statement of compliance with identified metrological specifications. A body that provides traceability to a national standard calibrates reference standards. The laboratory maintains a permanent file of all such certifications.

9.3 Reference Standards and Materials

Alpha Analytical has a program for calibration and verification of reference standards. The results and program are recorded in the appropriate instrument logbook. Required in-service checks between calibrations and verifications are described in method SOPs and are recorded in the appropriate instrument logbook.

Calibration standards are maintained within the area of consumption. A logbook of use is maintained and use is limited strictly to method required calibrations. Each calibration standard is identified as to test method used, date received, date opened, and expiration date. Calibrations are verified by using a second source or lot number of the calibration standard. Calibration check procedures are stated in applicable test method SOPs.

Preparation of standards must be performed using Class A glassware. Class A glassware must be used for all processes involving quantitative analyses.

Reference standards of measurement in the laboratory's possession (such as calibration weights or traceable thermometers) are used for calibration only and for no other purpose.

Standards and reagents are uniquely identified as outlined in Westboro SOP 1745 and Mansfield SOP 1816.

9.4 Calibration General Requirements

Each calibration record is dated and labeled with method, instrument, analysis date, analyst(s) and each analyte name, concentration and response. For electronic processing systems that compute the calibration curve, the equation for the curve and the correlation coefficient are recorded in the appropriate instrument logbook. This is also true for manually prepared curves. Calibrations are tagged to the specific instrument through use of the instrument logbook and or sequence file documentation.

Initial calibration requires a standard curve that brackets the expected sample concentration. Initial calibration generally uses three to five standards depending on the equipment and reference method specifications. Before the start of each analytical sequence, initial calibration is

verified by using a continuing calibration standard. Calibration verification or continuing calibration uses the same standard as the ICAL unless method specifies otherwise. The ICV is from a second source or lot number than that used for initial calibration. The acceptance criteria for the continuing calibration standard must meet acceptance criteria before analysis of any samples. When the acceptance criteria is not within limits, review maintenance protocols and perform any necessary maintenance before starting the initial calibration sequence.

9.5 Equipment Calibration

The SOP used for the analysis defines the instrument and equipment calibration required. The following defines the general practices for equipment calibration of selected equipment.

9.5.1 Gas Chromatography/Mass Spectrometry (GC/MS)

The GC/MS is hardware tuned before performing the initial and continuing calibrations. Results must meet the peak ratio specifications of the analytical methods. For volatiles analyses, bromofluorobenzene (BFB) is used, and for semivolatiles analyses, decafluorotriphenylphosphine (DFTPP) is used for instrument tuning.

The mass spectrometer response is calibrated by analyzing a set of five or more initial calibration solutions, as appropriate, for each GC/MS method. Each solution is analyzed once, unless the method or the customer requires multiple analyses. The relative response factor for each analyte is calculated for internal standard calibration. The calibration factor for external standard calibration is calculated using the expressions found in the laboratory method SOP. Calibration is acceptable when all acceptance criteria are within method criteria.

The initial calibration is verified through the analysis of a continuing calibration standard every 12 hours. The concentration of the continuing calibration standard is dependent on the requirements of the specific method. The relative response factors for all analytes of interest are calculated and verified against the initial calibration mean relative response factors. The percent difference (%D) for each analyte is calculated and must be less than the acceptance criteria stated in the method.

An acceptable continuing calibration run must have measured percent differences for the analytes within method specified ranges. If any criteria for an acceptable calibration are not met, either instrument maintenance must be performed until the continuing calibration analysis meets all criteria or a new initial calibration is established before any samples are analyzed. No samples may be analyzed unless the acceptance criteria are met for the initial and continuing calibration.

Additional quality control samples are part of the GC/MS analysis. These include internal standards, surrogates, method blanks, instrument blanks, laboratory control samples, matrix spikes and matrix spike duplicates. The frequency and control criteria are defined in the laboratory SOP.

9.5.2 Gas Chromatography (GC)

Internal standard calibration or external standard calibration is utilized for analysis by GC. The method-specified number of calibration standards is used. Each solution is analyzed once and the analyte relative response factors or calibration factors are calculated. The mean relative response factor for each analyte is then obtained by using the expression in the formula listed in the SOP. Integrated areas are utilized for these expressions.

For multiple response pesticides, PCBs or hydrocarbons the quantitation consists of the average of selected peaks or the integration of the area defined by a reference standard. The SOP details the integration criteria for each compound.

The initial calibration is verified through the analysis of a continuing calibration standard every 12 hours or 20 samples. The concentration of the continuing calibration standard is dependent on

the requirements of the specific method. The relative response factors for all analytes of interest are calculated and verified against the initial calibration mean relative response factors. The percent difference (%D) for each analyte is calculated. The percent drift (%d) may be calculated when calibration factors are used for quantitation.

An acceptable continuing calibration must have measured percent differences or percent drift for the analytes within method specified ranges. Should any criteria for an acceptable calibration not be met, either instrument maintenance is performed until the continuing calibration analysis meets all criteria, or a new calibration is established before any samples are analyzed. No samples may be analyzed unless the acceptance criteria are met for the initial and continuing calibration.

Other standard checks may be required for a specified reference method. Instrument performance checks specified in the reference method must be performed and be within the acceptance limits stated in the reference method. Additional quality control samples are part of the GC analysis. These include internal standards, surrogates, method blanks, instrument blanks, laboratory control samples, matrix spikes and matrix spike duplicates. The frequency and control criteria are defined in the laboratory SOP.

9.5.3 Cold Vapor Atomic Absorption Spectrophotometry (CVAA)

An initial calibration is performed daily with freshly prepared working standards that bracket the expected concentration range of the sample. A minimum of a three-point calibration curve is acquired which must have a correlation coefficient of 0.995 or better. The initial calibration is verified every 10 samples. The continuing calibration is required to be within method-defined criteria, depending on the analytical method employed. Continuing calibration blanks are run at the same frequency. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within ± 10% of the true value.

9.5.4 Inductively Coupled Plasma Emission Spectrophotometry-Mass Spectrometry (ICP-MS)

Initial calibration and instrument tune is performed daily, not to exceed 24 hours, and continuing calibrations are performed every 10 samples. Initial calibration consists of a minimum of three standards and a Blank that bracket the expected concentration range of the samples. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within method-defined criteria. The continuing calibration is required to be within method-defined criteria. Interference check standards are performed at the beginning of the sequence. Acceptance criteria are stated in the SOP.

9.5.5 Inductively Coupled Plasma Emission Spectrophotometry (ICP)

Initial calibration is performed daily, not to exceed 24 hours, and continuing calibrations are performed every 10 samples. Initial calibration consists of one standard and a Blank that bracket the expected concentration range of the samples. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within 5% of the true value for EPA Method 200.7 and 10% for SW846 6010 methods. The continuing calibration is required to be within 10% of the true value. Interference check standards are performed at the beginning and end of the sequence. Acceptance criteria are stated in the SOP.

9.5.6 Thermometers

Laboratory thermometers are checked annually for accuracy against certified, NIST traceable thermometers. Correction factors derived from the annual calibrations are applied to temperature readings where applicable. The analyst records the corrected temperature for all observations.

NIST traceable thermometers are calibrated professionally and re-certified every year. Records of thermometer calibrations are retained by the QA Department. All thermometers are tagged with the ID number, correction factor to be applied and the expiration of the calibration check.

NOTE: Electronic-based thermometers are calibrated on an annual basis. Thermometers are tagged with calibration information by the vendor, including the ID number, correction factor to be applied and the expiration of the calibration check. Certificates are kept on file in the QA Department.

Thermometers are not used past the calibration expiration date or if the thermometer is not reading properly. Replacement thermometers are calibrated and the maintenance logbook is updated when a change in the thermometer is required due to breakage, damage or expired calibration.

9.5.7 Balances

Calibration checks are performed for each day of use, for each balance. The calibration consists of a minimum of two weights, which bracket the weight to be measured. Additional calibration check procedures are performed on balances utilized in Microbiology laboratory. This additional procedure consists of a deflection test, which is performed to ensure that 100mg is detectable at a weight of 150 grams.

The balance logbook lists the acceptance criteria and performance criteria for the various balances used in the laboratory. Calibration weight measurements must meet the acceptance criteria listed on the record form.

Each balance is serviced and calibrated by a professional semi-annually. Balances are labeled with the balance number, date of service and the expiration date for the annual service check. The balance number used for any measurements requiring traceability is recorded with measurement data. Balances are not used past the expiration date or when the weight check is not within acceptable criteria. The accuracy of the calibration weights used by Alpha Analytical is verified annually by an accredited calibration service.

9.5.8 Mechanical volumetric pipettes

Delivery volumes for the mechanical volumetric pipettes (i.e. Eppendorf) are checked and recorded gravimetrically before use and on a quarterly basis. The verification is performed at the volume of use or bracketing the volume range of use. The check must be within the criteria stated in the laboratory logbook. Pipettes failing acceptance criteria are tagged and removed from service until repaired and the criteria are met, or discarded and replaced. Automatic pipettes are labeled with a unique ID number, volumes verified and expiration date.

9.5.9 Ion Chromatography

The ion chromatograph calibration is by analyzing a set of five or more initial calibration solutions, with concentrations of analytes appropriate to the analytical methods. The concentrations must bracket the expected concentration range of the samples analyzed. Procedures for verifying the calibration curve are method specific. The initial calibration is performed at the start of each day. The calibration curve is verified at least after every 20 samples.

9.5.10 pH Meters

pH meters are calibrated prior to use for each day of use. The meter is calibrated following the procedure for pH analysis. The records of the calibration are recorded in an instrument logbook or in the raw data for the analysis being performed. At least two buffer solutions that bracket the measurement range for the analysis are used for calibration. A second source check standard is used at the end of a run to verify meter stability. Buffer solutions used for calibration are NIST

certified. Standard buffer solutions are not retained or re-used. The lot number of the buffer solutions is recorded in the data record to ensure traceability of the measurement to NIST.

9.5.11 Conductivity Meters

Three calibration standards of potassium chloride (KCL) solutions are analyzed annually on each instrument range. The calibration standards are used to verify instrument performance. The acceptance criteria are defined in the test SOP. If unacceptable performance is found, the cell is cleaned and rechecked. The cell is not used until satisfactory performance is achieved.

A single KCL standard solution is used to calibrate each range of the instrument. A second standard is used to check the calibration each day the meter is used. The check standard is near the measurement range for the samples to be analyzed. The acceptance criterion is $\pm$ 20% of the true value. The meter is labeled with expiration date for the annual calibration. A check standard that is NIST traceable is used to allow traceability. The check standard is performed at the end of the analysis run or at least after every 20 samples.

9.5.12 Autoclave

The date, contents, sterilization time and temperature, total cycle time and analyst's initials are recorded each time the autoclave is used. Autoclave cycles must be completed within 45 minutes when a 15 minute sterilization time is used. Autoclave timing mechanisms are checked quarterly with a stopwatch to verify timing controls. A maximum temperature thermometer is used with each cycle to ensure the sterilization temperature is reached.

Spore strips or ampoules are used weekly to confirm sterilization. BTSure ampoules are utilized as follows: An indicator ampoule is placed in most challenging area of sterilizer. Load is processed according to standard operating instructions. Remove from sterilizer and allow to cool for a minimum of 10 minutes. (Chemical indicator on label changes from green to black when processed.) Place the autoclaved indicator and un-autoclaved control indicator in an upright position in the plastic crusher provided. Gently squeeze crusher to break glass ampoules. Incubate both indicators at 55-60^{o}C for 24 hours. Examine appearance for color change. Yellow color indicates bacterial growth. No color change indicates adequate sterilization.

Calibration is conducted and certified annually by an outside service provider and recorded. Certificates are kept on file. Routine maintenance includes cleaning the autoclave seal to ensure freedom of caramelized media and cleaning drain screens to remove any debris buildup. For the efficient operation of the unit, overcrowding is avoided.

10 Test Methods and Standard Operating Procedures

10.1 Methods Documentation

Analysis consists of setting up proper instrument operating conditions, executing acceptable calibrations, monitoring instrument performance tests, analyzing prepared samples, and collecting data from the analyses. The test method SOP describes the instrumental analysis procedures, quality control frequencies and acceptance criteria. EPA accepted methods, national recognized methods or customer-specified methods are the basis for performance criteria, instrument conditions and the steps of the procedure. The method performance requirements of the published methods are followed unless otherwise specified by the customer.

The reference methods define the instrument operating conditions. In many of the reference methods, a range or general guidance on the operating conditions is defined. Documented modifications to the operating conditions clarify the reference methods or improve the quality of the results. In all cases where the method modifications are adopted, the performance criteria from the reference method must be met. Modifications to the operating conditions are stated in the SOP. Changes in the operating conditions made at the time of the analysis are documented in the appropriate laboratory or sequence log. A revision to the SOP takes place, when a day to day change in the operating condition improves performance for all matrices.

The laboratory SOPs include the operation of measurement equipment. The SOPs contain the -following information, as applicable:

- The equipment used in the procedure, including equipment type
- Equipment calibration and process for obtaining the measurement from the calibration
- The step by step instructions to perform the measurement
- Acceptance criteria for the calibrations
- Corrective action for failed acceptance criteria, including assessment of previous calibration results
- The basis used for the calibration standards such as traceability to NIST or EPA or demonstration of comparability
- Frequency at which the equipment will be calibrated, adjusted and checked
- The records maintained to document the calibration and use of measurement equipment
- The calibration status for the equipment
- The environmental conditions necessary before measurement equipment may be calibrated or used for measurement
- Allowed adjustments to measurement equipment, including software, which will not invalidate the laboratory analysis
- Maintenance of the equipment and record keeping to track performance before and after maintenance is completed
- Define the standards, reagents and sample handling, interferences, preservation, and storage in order to assure measurement performance

10.2 Standard Operating Procedures (SOPs)

Alpha Analytical maintains SOPs that accurately reflect all phases of current laboratory activities such as assessing data integrity, nonconformance actions, handling customer complaints, sample receipt and storage, purchasing of all materials, and all test methods. These documents include equipment manuals provided by the manufacturer, internally written documents, and published methods with documented changes or modifications.

Copies of all SOPs are accessible to all personnel in electronic form through Qualtrax. Each SOP clearly indicates the published date of the document and the revision number.

10.3 Laboratory Method Manual (s)

All SOPs are posted as secure documents in the Alpha Qualtrax system. Directories are available for each laboratory area and administrative area in appropriate subfolders. Each SOP includes or references where applicable:

1) identification of the test method and where applicable;
2) applicable matrix or matrices;
3) method detection limit;
4) scope and application;
5) summary of method;
6) definitions;
7) interferences;
8) safety;
9) equipment and supplies
10) reagents and standards
11) sample collection, preservation, shipment and storage;
12) quality control;
13) calibration and standardization;
14) procedure;
15) calculations;
16) method performance;
17) pollution prevention;
18) data assessment and acceptance criteria for quality control measurements;
19) corrective actions for out-of-control data;
20) contingencies for handling out-of-control or unacceptable data;
21) waste management;
22) references; and
23) any tables, diagrams, flowcharts and validation data.

In cases where modifications to the published method have been made by the laboratory or where the referenced method is ambiguous or provides insufficient detail, these changes or clarifications are clearly described in the SOP.

10.4 Test Methods

The laboratory uses appropriate methods and procedures for all tests and related activities within its responsibility (including sampling, handling, transport and storage, preparation of items, estimation of uncertainty of measurement and analysis of test data). The method and procedures are consistent with the accuracy required, and with any standard specification relevant to the calibrations or tests concerned. When the use of mandated methods for a sample matrix is required, only those methods are used. Where methods are employed that are not required, the methods are fully documented and validated and are available to the customer and other recipients of the relevant reports.

The customer requests the reference method for sample analysis usually based on the regulatory program. The customer services staff may assist the customer with method selection when the customer specifies the regulatory program, but is unsure of the correct method required. The Laboratory Technical Manager or Quality Assurance Officer recommends methods for non-regulatory programs. In all cases, recommendation of methods is based on customer-defined method performance criteria. Customer services may recommend a procedure that meets the customer method performance criteria.

10.5 Method Validation/Initial Demonstration of Method Performance

Before acceptance and use of any method, satisfactory initial demonstration of method performance is required. In all cases, appropriate forms are completed and retained by the laboratory and made available upon request. All associated supporting data necessary to reproduce the analytical results is retained. Initial demonstration of method performance is completed each time there is a significant change in instrument type, personnel or method.

10.6 Sample Aliquots

The aliquot sampling process from a submitted sample is part of a test method. The laboratory uses documented and appropriate procedures and techniques to obtain representative sub-samples. Sample aliquots removed for analysis are homogenized and representative portions removed from the sample container. Personnel record observations made during aliquot sampling in the test method logbooks.

10.7 Data Verification

Calculations and data transfers are subject to appropriate checks which is a 3 tier approach. The initial analyst verifies all of his work, a secondary review of 100% of the initial is conducted by a an independent qualified analyst. A Customer Services representative reviews data for project and method performance requirements where applicable. A QA representative reviews data for project and method performance requirements when requested by a Customer. Final report review is performed by an authorized company signatory.

For drinking water suppliers, every effort is made to notify the Customer within 24-hours of obtaining valid data of any results that exceed any established maximum contaminant level or reportable concentration. Analyst or Department Supervisor notifies the Customer Services Department of the sample number(s), Customer name, analysis and sample results (preliminary or confirmed). The Customer Services Department notifies the customer.

The laboratory Report Generation and Approval SOP describes the practices to ensure that the reported data is free of transcription errors and calculation errors. Manually entered data into the LIMS is dual entered and checked by the LIMS to minimize transcription errors. The laboratory test method SOP describes the quality control measures used to assure method performance before reporting data.

10.8 Labeling of Standards and Reagents

The purchase, receipt and storage of consumable materials used for the technical operations of the laboratory include the following:

a) The laboratory retains records of manufacturer’s statement of purity, of the origin, purity and traceability of all chemical and physical standards.
b) Original reagent containers are labeled with the date opened and the expiration date.
c) Detailed records are maintained on reagent and standards preparation. These records indicate traceability to purchased stocks or neat compounds and include the date of preparation and preparer's initials.

d) Where calibrations do not include the generation of a calibration curve, records show the calibration date and type of calibration standard used.
e) All prepared reagents and standards are uniquely identified and the contents are clearly identified with preparation date, concentration and preparer's initials. These procedures are outlined in Westboro SOP/1745 and Mansfield SOP/1816.

10.9 Computers and Electronic Data Related Requirements

Computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of test data. The laboratory ensures that computer software is documented and adequate. The goals of the software development methodology, existing system validations and the change control system are to ensure that:

the software systems perform the required functions accurately,

the users understand how to use the system, and

auditors can assure themselves of the validity of the analytical data.

The computer systems used at Alpha Analytical are purchased. A coordinated effort is made with the supplier to assure the computer operations meet the laboratory requirements for data integrity. Alpha Analytical has a formal validation program of its computer systems. The validation program is a comprehensive program to ensure data transmitted, reported or manipulated by electronic means is correct and free of errors. The validation and verification approach is separated into three areas.

1. New software is developed and validated using test data. Records of validation include the test data report, date and initials. Where formulas are part of the program, documentation includes manual verification of the final calculated values. New software includes the development of macros for spreadsheets and other tools using commercial software packages.

2. Reasons for changes to software are identified through flaws in existing documentation or the need to improve system processes and are documented on the Nonconformance Report. Final implementation of the change is documented on the nonconformance action form. The tracking and timelines of making the change is readily available. This process also provides the complete documentation of all software and electronic data reporting problems. All nonconformance identified with electronic data process result in corrective action that are reported to management before or at the bi-weekly executive meeting. Customers will be notified prior to any changes to software or hardware that will adversely affect customer electronic data. This information is provided by IT department to QA and Project Managers to be communicated to appropriate customers.

Verification of system integrity is through routine maintenance, protection from unauthorized access and electronic verification programs. Routine maintenance including system backups are performed on a scheduled basis. The backup process and password and access protections are defined in the Computer System Backup Control SOP/1562 and Computer Security SOP/1563. Electronic verification may be used to assure the commercially purchased software is performing at its original specifications. This includes virus checking of all network operation at least once per week. Documentation of all verification and maintenance operations is retained.

11 Sample Handling, Sample Acceptance Policy and Sample Receipt

The Sample Login and Custody procedures define the process for sample management from sample receipt through analysis and to disposal. These procedures detail the process for sample receipt, records and storage pending analysis.

Customers or Alpha's Couriers deliver samples to the laboratory during normal business hours. Sample receiving occurs in the sample management area.

Customer service personnel place bottle orders. The orders are filled following the bottle order instruction form. Blanks are prepared as needed with minimal storage. All glass containers are packed to minimize or prevent breakage. The containers are placed in plastic coolers or shipping packages and Chain-of Custody forms, seals (if requested) and labels enclosed. The bottle order is shipped by third party, picked up by the customer or customer representative or delivered by Alpha courier to the customer.

11.1 Sampling Supplies

11.1.1 Sample Containers

Sample containers provided by Alpha Analytical include labels, preservatives and a blank chain of custody form. Preservatives and containers are lot controlled and verified as appropriate for the indicated type of analysis.

Each lot of containers used for the collection of samples for microbiological analysis is checked for sterility prior to distribution. Sterility checks are performed by Microbiology staff and results recorded in Microbiology Sample Container Sterility Log.

Sample Containers for collecting Air samples (TO-15) are cleaned and prepared according to SOP 2190 "Cleaning and Preparation Procedures for Equipment used to collect Air sample for analytis of Volatile Organic Compounds".

11.1.2 Chain of Custody

Chain of custody forms must accompany all samples received by Alpha personnel. The chain of custody form indicates the sample origin and arrival at the laboratory and identifies the analyses requested.

11.1.3 Reagent Water

Alpha Analytical supplies laboratory pure water for field QC blanks. Water used for volatile organics must be free of volatile compounds below the method detection limit. The quality of the laboratory water is monitored for conductivity once per day. Additional water quality criteria may be monitored based on customer specific requests. The water quality in the laboratory is monitored for chemical parameters as required by the EPA certification manual for drinking water (Water Quality Monitoring SOP/1738).

11.2 Sample Tracking

Alpha Analytical uses an internal chain-of-custody in LIMs for sample tracking control purposes. When requested or required by regulation a legal custody program is used in addition to the routine laboratory practices. Legal custody practices must be arranged at the time of contractual commitment.

For legal custody the process must include complete and continuous records of the physical possession, storage, and disposal of sample containers, collected samples, sample aliquots, and sample extracts or digestates. For legal custody a sample is in someone's custody if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is in one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

The routine sample handling and tracking process includes unique identification of all sample containers, initials of the person removing the sample from the sample management area and documentation of the date of sample removal for disposal.

Samples are assigned a unique identification number from the LIMS program. Each sample container label includes a unique identifier for the container. The person handling the sample is recorded along with the unique identifier in the container tracking records in LIMS.

ALPHA ANALYTICAL utilizes a custom designed Laboratory Information Management System (LIMS) to uniquely identify and track samples and analytical data throughout the facility. The LIMS log-in, is initiated by the Sample Custodian when the following information is entered into the computer:

- Quote number (unique to the project if requested)
- Project name or description
- Analyses requested (per matrices received)
- Sample number (unique to this sample)
- Sample descriptions (customer ID, including number of received containers)
- Date received
- Date(s) and time(s) collected
- Date analytical results are due

11.2.1 Chain of Custody

Chain of custody forms must accompany all samples received by Alpha personnel. The chain of custody form indicates the sample origin and arrival at the laboratory and identifies the analyses requested.

- Customer's name and address
- Notation of special handling instructions
- Additional comments or instruction for the laboratory
- Purchase order number(s), if applicable

Alpha Job Numbers (Process for assigning numbers)

Alpha Job Numbers are unique #'s automatically designated by our LIMS computer system for every individual customer project.

There are 3 parts to this number:

- All numbers start with the letter "L"
- The next two numbers are the last two numbers of the current year.
- The last five numbers are pulled sequentially by the LIMS as each Login personnel requests a new number for a job.

  For example…. L0904165 ---- Year 2009 and 4,165th job to be logged in this year.

  The Alpha Job Number then may contain as many extensions as there are individual samples in a job. L0904165-01 is the first sample, L0904165-02 is the second and so on. Each sample may contain as many as 26 containers as the containers are designated with the letters of the Alphabet, and each container receives its own bar-coded label. For example, L0904165-09A is the first container of the 9th sample listed on a customer's Chain of Custody.

Each container is labeled with a unique identifier, a label with a unique identifier number is placed on each sample container. Once labeled, the sample containers are placed in the appropriate storage area.

11.3 Sample Acceptance Policy

The sample management personnel check for proper sample labeling, preservation and handling at the time of arrival at the laboratory. The customer and customer services manager specifies the proper sample preservation, containers, cooling and other criteria on the project review form and in the LIMS. Sample management staff record all observations and immediate notify customer services of any discrepancies or questions arising during sample receipt.

It is possible for samples or sample containers to be lost, damaged, or determined to be unsuitable, for whatever reason, after initial receipt at Alpha Analytical. The problem is brought to the attention of a customer services manager who reports it to the customer. Plans for disposition of the affected samples or container are agreed upon with the customer, carried out, and recorded in the project records. Sample hold times and preservations are listed on the Alpha website (www.alphalab.com) under Support Services "Sampling Reference Guide".

11.4 Sample Receipt Protocols

The sample management staff receives all samples. A unique job number is assigned to each shipment of samples received from a customer. The in-house records for the incoming job, including the internal Chain-of -Custody, are initiated with a Sample Delivery Group (SDG) form. The customer, and Alpha courier and/or the sample management personnel sign the sample custody form at the time of receipt at the laboratory. Samples received via overnight courier are signed on the bill of lading. The bill of lading, SDG form and the sample custody form are completed for external courier delivered samples.

The sample management staff examines the shipping containers, their contents, and accompanying customer documentation. Information about the sample identification, the location, date and time of collection, collector's name, preservation type, sample type, presence and condition of custody seals, the state of preservation of the samples and other required information is noted on the SDG form. Any discrepancies in documentation or problems with sample condition such as appropriate sample containers, thermal preservation variation, holding times and adequate sample volumes are noted and brought to the attention of the customer via the

nonconformance action form, The login staff or project manager contacts the client via email or or by phone. The Customer Services Manager provides clarification or further instruction to the sample management staff on the processing of the samples that are incomplete or missing required information.

The sample management staff logs the samples in the LIMs and a durable label for each container is printed. The custodian attaches each label to the appropriate sample container. The following information is recorded for tracking internal custody: laboratory sample ID, customer sample ID, sample matrix and storage location. Sample receipt and log-in specifically requires: date and time of laboratory receipt of sample(s); sample collection date; unique laboratory ID code; field ID code supplied by sample submitter; requested analyses; signature or initials of data logger; comments from inspection for sample acceptance or rejection and in some cases, sample bottle codes.

11.5 Storage Conditions

Alpha Analytical stores samples under proper environmental conditions to ensure their integrity and security. Samples are stored at temperatures that meet specifications of the methodology, regulatory agencies and customer directives. Refrigerators are monitored and controlled to be within 4 ± 2°C. Chemical, temperature, holding times and container storage requirements are listed in the LIMS project database.

Customer Quality Assurance Project Plans may list preservation requirements differing from the laboratory. The sample management staff reviews project information for projects specific handling. Addition of chemical preservative to sample containers normally is done in the field at the time of sampling. Chemical preservation and temperature preservation checks at the time of receipt are recorded except for volatile organic compounds, bacteria, sulfite, and dissolved oxygen preservation. Any differences from laboratory or customer specific requirements are recorded on nonconformance action forms and contact made with the customer by the Customer Services Manager or designee.

Sample storage facilities are located within the sample management area, walk-in custody refrigerator or in designated sample storage areas within the analytical departments. Internal chain-of-custody procedures and documentation pertaining to sample possession, removal from storage, and transfer are outlined in the sample custody procedure. Samples are returned to the sample storage area after the sample portion is removed for analysis. Extracts and digestates are tracked and follow the same internal custody operation. Extracts and digestates are removed to the waste disposal area after analysis for proper disposal.

Sample storage precautions are used to ensure that cross contamination does not occur during sample storage. Refrigerator storage blanks are monitored bi-weekly for volatile compounds.. The storage blank information allows the assessment of potential cross contamination in the sample storage refrigerator.

Temperatures of cold storage areas are recorded continuously in the data logger system. Corrective action is done as necessary when temperatures are not within the control criteria. In both the Westboro and Mansfield facilities, Automated Data loggers are linked to thermocouples in custody refrigerators and freezers in the Sample Storage areas as well as department standards/storage refrigerators and freezers. The Data logger is calibrated and certified by an outside vendor annually and on a quarterly basis for DOD standards/storage refrigerators and freezers. If there is a catastrophic failure of custody refrigerators, a record of all samples affected and customers associated with such samples are notified of any samples affected by the failure. Refrigerators and/or freezers not connected to the Data Logger system have temperatures measured with NIST traceable thermometers. Temperature records indicate the thermometer or sensor (Data logger) used for obtaining the measurement.

11.6 Sample Disposal

Samples are held for 21 calendar days after the report is released to the customer. Upon written customer request samples may be held longer in an uncontrolled area. Requests for controlled sample storage must be arranged at the time of contractual commitment. Air canister samples are held for 3 days after the report is released to the customer.

An authorized waste carrier is contracted to pick up waste as needed and dispose of it, in accordance with all regulatory requirements. Post-analysis disposition of samples is dependent upon project specific requests. Remaining sample material may be returned to the customer, safely discarded, or archived for a specific time prior to disposal. The waste disposal SOP 1797 defines the specific requirements for sample disposal and other waste disposal operations.

The sample management staff are responsible for the archival and disposal of raw samples, extracts and digestates. Raw and prepared samples may not be archived or disposed until all of the designated analyses are complete and resultant analytical data is sent to customers. Samples in storage are retained a minimum of 21 calendar days after reporting the results to the customer. Any samples requiring more than 21 calendar days are archived. Air canister samples requiring storage more than 3 business days require prior approval.

When a customer has requested the return of samples, the sample management staff prepares and ships the samples according to the same custody procedures in which the samples were received and following any customer specified requirements. Protection of the samples during delivery is ensured by the implementation of special packaging procedures. Packages are delivered by a commercial carrier whose procedures for protecting the samples are not within the control of this laboratory. Customers are informed that a commercial carrier will deliver their samples if required.

12 Records

Alpha Analytical has a record system that produces accurate records, which document all laboratory activities. The laboratory retains records of all original observations, calculations and derived data, calibration records and a copy of the test for ten years minimum. The system retains records longer than the minimum upon the request of authorized customers, agencies or another regulator. Note: Ohio VAP requires notification before disposal of any VAP records.

12.1 Record Keeping System and Design

The record keeping system allows reconstruction of laboratory processes that produced the analytical data of the sample.

a) The records include the names of personnel involved in sampling, preparation, calibration or testing.

b) Information relating to laboratory facilities equipment, analytical methods, and activities such as sample receipt, preparation, or data verification are documented.

c) The record keeping system provides retrieval of working files and archived records for inspection and verification purposes.

d) Documentation entries are signed or initialed by responsible staff.

e) Generated data requiring operator logging on appropriate logsheets or logbooks are recorded directly and legibly in permanent ink

f) Entries in records are not obliterated by any method. Corrections to errors are made by one line marked through the error. The person making the correction signs and dates the correction.

g) Data entry is minimized by electronic data transfer and ensuring the number of manual data transcriptions is reduced.

12.2 Records Management and Storage

1. Records including calibration and test equipment, certificates and reports are safely stored, held secure and in confidence to the customer.
2. The laboratory maintains hardware and software necessary for reconstruction of data.
3. Records that are stored or generated by computers have hard copy or write-protected backup copies.
4. Alpha Analytical has established a record management system, for control of hard copy laboratory notebooks.

5. Access to archived information is carefully controlled and is limited to authorized personnel. These records are protected against fire, theft, loss, environmental deterioration, vermin, and in the case of electronic records, electronic or magnetic sources.
6. In the event that Alpha Analytical transfers ownership or goes out of business, there is a plan to ensure that the records are maintained or transferred according to the customer's instructions. A plan will be developed to maintain continuity of our record keeping systems as requested and/or required by both state and federal laws.

Alpha Analytical retains all original hard copy or electronic raw data for calibrations, samples, and quality control measures for ten years, including:

1. Analysts work sheets and data output records,
2. Reference to the specific method,
3. Calculation steps including definition of symbols to reduce observations to a reportable value,
4. Copies of all final reports
5. Archived SOPs,
6. Correspondence relating to laboratory activities for a specific project,
7. All nonconformance action reports, audits and audit responses,
8. Proficiency test results and raw data,
9. Data review and cross checking.

The basic information to tie together analysis and peripherals such as strip charts, printouts, computer files, analytical notebooks and run logs for Alpha Analytical includes:

1. Unique ID code for each Laboratory sample or QC sample;
2. Date of analysis;
3. Instrument identification and operating conditions;
4. SOP reference and version;
5. Calculations;
6. Analyst or operator's initials/signature.

In addition, Alpha Analytical maintains records of:

1. Personnel qualifications, experience and training
2. Initial and continuing demonstration of proficiency for each analyst
3. A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory records. Use of electronic signatures has been approved by regulatory agencies.

12.3 Laboratory Sample Tracking

A record of all procedures to which a sample is subjected while in the possession of the laboratory is maintained. These include but are not limited to records pertaining to:

a) Sample preservation including appropriate sample container and compliance with holding time requirement; If the time of the sample collection is not provided, the laboratory must assume the most conservative time of day (i.e., earliest).

b) Sample identification, receipt, acceptance or rejection and log-in;

c) Sample storage and tracking including shipping receipts, transmittal forms, and internal routing and assignment records; this includes inter-laboratory transfers of samples, extracts and digestates.

d) Sample preparation including cleanup and separation protocols, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;

e) Sample analysis;

f) Standard and reagent origin, receipt, preparation, and use;

g) Equipment receipt, use, specification, operating conditions and preventative maintenance;

h) Calibration criteria, frequency and acceptance criteria;

i) Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;

j) Method performance criteria including expected quality control requirements;

k) Quality control protocols and assessment;

l) Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries;

m) Automated sample handling systems;

n) Records storage and retention; and

o) Disposal of hazardous samples including the date of sample or sub-sample disposal and the name of the responsible person.

p) The COC records account for all time periods associated with the samples.

q) The COC records include signatures of all individuals who had access to individual samples. Signatures (written or electronic) of all personnel who physically handle the samples. Time of day and calendar date of each transfer or handling procedure.

r) Common carrier documents.

13 Laboratory Report Format and Contents

The Process Planning and Control Procedure details the recording and reporting of data as required by the customer and in accordance with relevant environmental regulations.

Customers specify the report delivery and deliverables required for the work submitted. Report delivery includes standard turnaround and rush turnaround. Customers specify the delivery address or multiple addresses and method of delivery such as U.S. Mail, facsimile or electronic at the start of the project. Alpha Analytical provides data deliverables in hardcopy or electronic format. At the start of any project, the electronic deliverable formats required must be received before sample arrival. Affidavits are required with each report or series of reports generated for a particular project for Ohio VAP reports.

Reporting packages are available for routine regulatory reporting requirements. Regulatory reporting packages include only the information requested by the regulatory agency. In addition to regulatory report packages, Alpha Analytical prepares a standard report format. The standard report format includes:

1. Title: “Certification of Analysis”
2. Name and address of the laboratory
3. Laboratory Job Number, page number and total number of pages included in the report.
4. Name and address of the customer
5. Alpha sample number, Customer identification, Sample location
6. Samples identified that do not meet the sample acceptance requirements for project.
7. Date of sample receipt, sample collection, preparation or extraction date and time (if applicable), analysis date and time, report date and analyst
8. Identification of data reported by subcontractors
9. Test name and reference method number
10. Delivery method and sampling procedures when collected by lab personnel
11. Deviations or modifications that affect data quality and/or data integrity. These deviations or modifications are included in narrative statements and/or data merger files.
12. Statement that results relate only to the sample tested
13. Statement that report must be copied in full unless the laboratory provides written permission for partial copies
14. Glossary, References and limits of liability
15. Units of measure and reporting detection limit
16. Quality control data for: % Recovery surrogates, % Recovery of LCS, % RPD of LCSD, Blank analysis, % Recovery Matrix Spike, %RPD of Laboratory Duplicates, as applicable
17. Signature, title and date of report

18. A "Certificate/Approval Program Summary" page is included at the end of the report that identifies analytes for which Alpha Analytical holds certification and for those analytes reported that it does not. This summary also includes the certification numbers for either NELAP certified states, State certifications (e.g. Massachusetts laboratory certification identification number)..
19. Alpha Analytical does not accept samples from private residents for drinking water analysis and therefore maximum contaminant levels are not necessary. If Alpha were to change its policy and report drinking water samples, MCLs would be included with the report.

Results transmitted by facsimile or other electronic means include a statement of confidentiality and return of the materials at the laboratory's expense.

The laboratory notifies the customer in writing of any circumstance that causes doubt on the validity of the results. The amended or modified report lists the change, reason for the change, affected page numbers, date of the amendment and authorized signature. The customer will be notified prior to changes in LIMs software or hardware configurations that will adversely affect customer electronic data.

13.1 Data Qualifiers

The following data qualifiers are used in conjunction with analytical results depending on the definition, state or regulatory program and report type.

Note: "J" Estimated value: Upon customer request, the Target analyte concentration can be reported below the quantitation limit (RL), but above the Method Detection Limit (DL) with a "J" qualifier as long as there is a LOD study on file. (See section 5.11)

Data Qualifier	Qualifier Information	Regulatory Requirement
A	Spectra identified as "Aldol Condensation Product".	CT RCP, NC
B	The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at <5x the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than 10x the concentration found in the blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone) For DOD related projects, flag applies to detectable concentration of target analyte in the blank that exceeds ½ the LOG or is greater than 1/10 the concentration in the field sample	EPA Functional Guidelines 'MassDEP MCP, CT RCP, NJ-TO15/LL-TO15; NJ Tech Guidance 2014, DOD QSM 5.1
C	Co-elution: target analyte co-elutes with a known lab standard (i.e. surrogates, internal standards, etc.) for co-extracted analyses.	
D	Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.	NJ-TO15/LL-TO15 - Air only EPA Functional Guidelines; EPA Region 2,5
DL	Same was re-analyzed at a dilution. Qualifier applied to sample number.	

E		Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.	EPA Region 2,5 CT RCP, NJ-TO15/LL-TO15
G		The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.	In-house/Forensics.
H		The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.	THE NELAC INSTITUTE (TNI) STANDARDS
I		The lower value for the two columns has been reported due to obvious interference.	In-house.
J		Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).	CT RCP (for TICs),
JN (NJ)		Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.	EPA Functional Guidelines 'NJ-TO15-LL
ND	DU-J	Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for same-related analysis	In-house
P	All DU	The RPD between the results for the two columns exceeds the method-specified criteria.	MassDEP MCP, CT RCP
Q	All DU	The quality control sample exceeds the associated acceptance criteria. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)	
R	All DU	Analytical results are from sample re-analysis	Customer-specific

RE	All DU	Analytical results are from sample re-extraction.	Customer-specific
S		Analytical results are from modified screening analysis	

13.2 Compound Summation for Organic Analyses

In order to be compliant with regulations from certain states, Alpha Analytical has created the following Summation Rules to cover reporting "Total Analytes". The following are an example of several compounds that can be reported as "Totals":

Volatiles:	
1,3-Dichloropropene, Total	cis + trans isomers
Xylenes, Total	m/p + o isomers
1,2-Dichloroethene, Total	cis + trans isomers
Trihalomethanes, Total	Chloroform + Bromoform +
	Dibromochloromethane +
	Dichlorobromomethane
PCBs:	
PCBs, Total	Sum of reportable Aroclors
	(all Aroclors reported for the project)

The following are the summation rules that the LIMs uses to calculate the Total values:

Summation Rules:		
H + H = H		Key:
H + J = J		H = Hit (above RL)
J + J = J		J = J-flagged value
H + ND = H		ND = U-flagged value
J + ND = J		
ND + ND = ND		

The ND values are considered "0" during the calculations.
The "E" flagged values (over the calibration) are ignored and not utilized during the calculations.
Any "N" flagged values (do not report) are ignored and not utilized during the calculations.
For dual-column analysis, the Total is reported as part of column "A" data, unless all individuals are reported from "B" column.

For analytical group summations, the Total is reported based on the associated "Reporting List".
For example, if only 7 Aroclors are requested, then the Total is based on 7 Aroclors, not 9.

The RL and MDL for Totals will always be the lowest of the individual compounds used in the summation.

For each Total summation, two values are calculated: TOTALH (calculated from all associated hits above the R L– used in DU reporting formats) and TOTALJ (calculated from all associated hits and J flagged values – used in DJQL reporting formats). Total concentrations are calculated for all samples and QC samples (however, recoveries are not calculated since they are only calculated for the compounds spiked)

If a Total summation is requested, the individual compounds must also be reported.

14 Outside Support Services and Supplies

When Alpha Analytical purchases outside services and supplies in support of tests, the laboratory uses only those outside services and supplies that are of adequate quality to maintain confidence in the tests. Differences between Request/Tender and Contracts must be resolved before work commences.

The Purchasing SOP/1726 describes approval and monitoring of all suppliers and subcontractors used by the laboratory. Where no independent assurance of the quality of outside support services or supplies is available, the laboratory ensures that purchased equipment, materials, and services comply with specifications by evaluating method performance before routine use.

The laboratory checks shipments upon receipt as complying with purchase specifications. The use of purchased equipment and consumables is only after the evaluation and compliance to the specifications is complete. The Purchasing SOP/1726 describes the details for receipt and inspection of purchased product.

The Purchasing SOP describes the process for raising, review and placement of purchase orders. It is company policy to purchase from third party certified suppliers and subcontractors wherever possible. Purchases must be from suppliers approved by the Laboratory. Laboratory or sampling subcontractors specified by the customer are noted as “Trial” on the purchase order. This identifies the subcontractor as a non-approved subcontractor. All DoD work that is subcontracted must comply with Alpha’s management system and must comply with the QSM standard and is subject to DoD customer approval.

The laboratory maintains list of approved vendors (Form 18302) and subcontractors from whom it obtains support services or supplies required for tests.

14.1 Subcontracting Analytical Samples

Customers are advised, verbally and/or in writing, if any analyses will be subcontracted to another laboratory. Any testing covered under the NELAC Institute (TNI) Standards that requires subcontracting, will be subcontracted to another THE NELAC Institute (TNI) Standard accredited laboratory for the tests to be performed. The laboratory approves testing and sampling subcontractors by review of current state, national or other external parties’ certifications or approvals. This document must indicate current approval for the subcontracted work. Any sample(s) needing special reports (*i.e.*, MCL exceedance) will be identified on the chain of custody when the laboratory subcontracts with another laboratory. Subcontractor Laboratory Certifications are located in Qualtrax under Customer Services folder

The Sample Receipt and Login Procedure describes the process for sample handling when subcontracting samples. The quotation form lists the subcontractor in order to notify the customer of any subcontracted work. Customer notification of subcontracted work is in writing before releasing samples to the subcontractor.

The review of subcontractor documents for completeness and meeting the specifications defined for the project follows the laboratory process for reporting and verification of process data. The person responsible for receiving the order reviews the information supplied by the subcontractor instead of the Department Supervisor.

15 Customer Relations

15.1 Customer Service

The majority of the customer services occur from personnel in the administration, sample receiving and sampling areas. Customer service involves inquiries into services offered, technical consulting, placing orders, and receiving orders, providing updates on the status of orders and completing orders. Personnel interacting with customers must document and review customer specific project requirements. Call Tracker is used to document communications with customers (SOP/1723). Personnel must document customer interactions following the appropriate laboratory procedures. Each person must communicate deviations, modifications and customer requests following the laboratory defined procedures.

15.2 Project Management

During staff meetings the laboratory management reviews requests for new work. The Operations Director and/or Laboratory Technical Manager address all capacity and capability issues. Where conflicts in workload arise, customer notification is immediate. The Project Communication Form (PCF) contains the documentation of all project information. Cooperation between laboratory and customer services staff allows direct communication and scheduling. Management arranges complex scheduling and coordination between departmental areas. Documentation of approval for waivers from the DoD QSM requirements must be documented on a project specific waiver. This documentation needs to be in writing and readily available for review.

15.3 Complaint Processing

The laboratory staff documents all customers or other parties' complaints or concerns regarding the data quality or laboratory operations. The Nonconformance Report records complaints, correcting the concern, and resolving the concern with the customer or other party. The process uses the same form and process as the nonconformance action process. Where repetitive corrective actions indicate a problem, an audit of the area, Customer Inquiry and Complaint SOP/1722 is immediate to ensure the corrective action has effectively solved the concern.

16 Appendix A – Definitions/References

The following definitions are from Section 3.0 of the 2009 TNI Standard. The laboratory adopts these definitions for all work performed in the laboratory.

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. (TNI)

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (TNI)

Aliquot: A discrete, measured, representative portion of a sample taken for analysis. (EPA QAD glossary)

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (TNI)

Analyte: The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family, and which are analyzed together. (EPA Risk Assessment Guide for Superfund; OSHA Glossary)

Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation. (TNI)

Assessment (Clarification): The evaluation process used to measure the performance or effectiveness of a system and its elements against specific criteria.

Assessment Criteria: the measures established by The NELAC Institute (TNI) Standards and applied in establishing the extent to which an applicant is in conformance with the NELAC Institute (TNI) Standards requirements.

Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI).

Batch: Environmental samples, which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A

preparation batch is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates), which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples. (TNI)

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). (TNI)

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (TNI)

Blanks include:

Equipment Blank: a sample of analyte-free media, which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

Field Blank: blank prepared in the field by filling a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)

Instrument Blank: a clean sample (e.g. distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses, (TNI)

Reagent Blank: (method reagent blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst or laboratory's proficiency in the execution of the measurement process.

Calibration: set of operations which establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or

measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of Reference Standards that are traceable to the International System of Units (SI).

2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the Laboratory with a certificate of analysis or purity, or prepared by the Laboratory using support equipment that has been calibrated verified to meet specifications.

Calibration Range: The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.

Calibration Curve: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

Calibration Method: A defined technical procedure for performing a calibration.

Calibration Standard: A substance or reference material used to calibrate an instrument. (TNI)

Certified Reference Material (CRM): Reference material, accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI)

Chain of Custody Form: Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. See also Legal Chain of Custody Protocols (TNI)

Clean Air Act: the enabling legislation in 42 U.S.C. 7401 *et seq*., Public Law 91-604, 84 Stat. 1676 Pub.L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and to enforce them.

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors, or Additional cleanup procedures (TNI)

Customer: Any individual or organization for which items or services are furnished or work performed in response to defined requirements and expectations. (ANSI/ASQ E4-2004)

Congener: A member of a class of related chemical compounds (e.g., PCBs, PCDDs)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund): the enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites.

Conformance: an affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Consensus Standard: A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof. (ANSI/ASQ ANSI/ASQ E4-2004)

Continuing calibration verification: The verification of the initial calibration that is required during the course of analysis at periodic intervals. Continuing calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. (IDQTF)

Corrective Action: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Completeness: the percentage of measurements judged to be valid compared to the total number of measurements made for a specific sample matrix and analysis.

Data Quality Objectives (DQO):

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (TNI)

Definitive Data: Analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Suitable for final decision-making. (UFP-QAPP)

Demonstration of Capability: a procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

Detection Limit: (previously referred to as Method Detection Limit –MDL) the lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit.

Detection Limit (DL) (Clarification): The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level of confidence. At the DL, the false positive rate (Type I error) is 1%.

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC)

Environmental Data: Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology. (ANSI/ASQ E4-2004)

False Negative: An analyte incorrectly reported as absent from the sample, resulting in potential risks from their presence.

False Positive: An item incorrectly identified as present in the sample, resulting in a high reporting value for the analyte of concern.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA): the enabling legislation under 7 U.S.C. 135 *et seq*., as amended, that empowers the EPA to register insecticides, fungicides, and rodenticides.

Federal Water Pollution Control Act (Clean Water Act, CWA): the enabling legislation under 33 U.S.C 1251 et seq., Public Law 92-50086 Stat. 8.16, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance.

Field Measurement: The determination of physical, biological, or radiological properties, or chemical constituents; that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation. (TNI)

Finding: an assessment conclusion, referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. (TNI)

Finding (Clarification): An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative and is normally accompanied by specific examples of the observed condition (ANSI/ASQ E4-2004).

Holding Times: The maximum time that can elapse between two (2) specified activities. (TNI)

The maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR part 136)

Inspection: An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified

requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQC E4-1994)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (TNI)

Isomer: One of two or more compounds, radicals, or ions that contain the same number of atoms of the same elements but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.

Laboratory: Body that calibrates and/or tests. (ISO 25)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank or QC check sample): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (TNI).

Laboratory Duplicate: aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.

Legal Chain of Custody Protocols: procedures employed to record the possession of samples from the time of sampling until analysis and are performed at the special request of the customer. These protocols include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory. (TNI)

Limit of Detection (LOD): A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. (TNI)

Limit of Detection (Clarification): The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

Limits of Quantitation (LOQ): The minimum levels, concentrations, or quantities of a target variable (e.g. target analyte) that can be reported with a specified degree of confidence. (TNI) For DOD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.

Limit of Quantitation (Clarification): The lowest concentration that produces a quantitative result within specified limits of precision and bias.

Management: Those individuals directly responsible and accountable for planning, implementing, and assessing work. (ANSI/ASQ E4-2004)

Management System: System to establish policy and objectives and to achieve those objectives (ISO 9000).

Matrix: The substrate of a test sample. (TNI)

Matrix Spike (spiked sample, fortified sample): A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of Target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (TNI).

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (TNI).

Measurement System: A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). (TNI)

Method: A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed. (TNI)

Method Detection Limit: (now referred to as Detection Limit) one way to establish a Detection Limit, defined as the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

Method Detection Limit (MDL) (Clarification): The MDL is one way to establish a Detection Limit, not a Limit of Detection.

Method of Standard Additions: A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration. (This process is often called spiking the sample.) (Modified Skoog, Holler, and Nieman. Principles of Instrumental Analysis. 1998)

Mobile Laboratory: A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans and skid-mounted structures configured to house testing equipment and personnel. (TNI)

National Institute of Standards and Technology (NIST): A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute. (NMI). (TNI)

National Environmental Laboratory Accreditation Program (NELAP): The overall National Environmental Laboratory Accreditation Program of which TNI is a part.

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI).

Preservation: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

Procedure: A specified way to carry out an activity or a process. Procedures can be documented or not. (TNI)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (TNI).

Protocol: A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (TNI)

Quality Assurance: An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is the type and quality needed and expected by the customer. (TNI)

Quality Assurance [Project] Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EPA-QAD)

Quality Control: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements or quality; also the system of activities and checks used to ensure

that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality. (TNI)

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking intended to demonstrate that a measurement system or activity is in control. (TNI)

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, the ensure the quality of its product and the utility of its product to the users. (TNI)

Quality Manual Clarification: Alpha Analytical refers to Quality Manual as Corporate Quality Systems Manual (CQSM). (Alpha)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC) activities. (TNI)

Quality System Matrix: These matrix definitions are to be used for purposes of batch and quality control requirements: (TNI)

Air and Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.

Aqueous: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, ground water effluents, and TCLP or other extracts.

Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.

Non-Aqueous Liquid: Any organic liquid with <15% settleable solids.

Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Solids: Includes soils, sediments, sludges and other matrices with >15% settleable solids.

Raw Data: The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

Reference Material: Material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

Reference Standard: Standard used for the calibration of working measurement standards in a given organization or at a given location. (TNI)

Representativeness: the degree to which the sample represents the properties of the particular sample being analyzed.

Resource Conservation and Recovery Act (RCRA): the enabling legislation under 42 USC 321 *et seq.* (1976), that gives EPA the authority to control hazardous waste from the "cradle-to-grave", including its generation, transportation, treatment, storage and disposal.

Safe Drinking Water Act (SDWA): the enabling legislation, 42 USC 300f *et seq.* (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

Sample Tracking: procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.

Sampling: Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure. (TNI)**Second source calibration verification (ICV):** A standard obtained or prepared from a source independent of the source of standards for the initial calibration. Its concentration should be at or near the middle of the calibration range. It is done after the initial calibration.

Selectivity: The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent. (TNI)

Sensitivity: The capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

Signal to Noise Ratio: The signal carries information about the analyte, while noise is made up of extraneous information that is unwanted because it degrades the accuracy and precision of an analysis and also places a lower limit on the amount of analyte that can be detected. In most measurements, the average strength of the noise is constant and independent of the magnitude of the signal. Thus, the

effect of noise on the relative error of a measurement becomes greater and greater as the quantity being measured (producing the signal) decreases in magnitude. (Skoog, Holler, and Nieman. Principles of Instrumental Analysis. 1998)

Signatures, Electronic: A technology that allows a person to electronically affix a signature or its equivalent to an electronic document. The electronic signature links the signature to the signer's identity and to the time the document was signed. Alpha approves the use of electronic signatures for signing and initializing any laboratory record including, by not limited to: analytical reports, controlled documents, workflows and purchasing requests.

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)

Standard Operating Procedures (SOPs): A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (TNI)

Standard Method: a test method issued by an organization generally recognized as competent to do so.

Standardized Reference Material (SRM): a certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method.

Surrogate: a substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Technology: a specific arrangement of analytical instruments, detection systems, and/or preparation techniques. (TNI)

Test: A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2 - 12.1, amended)

Tentatively Identified Compound (TIC): A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. Tentatively Identified Compounds, if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported.

Test Method: An adoption of a scientific technique for performing a specific measurement, as documented in a laboratory SOP or as published by a recognized authority.

Toxic Substances Control Act (TSCA): the enabling legislation in 15 USC 2601 et seq. (1976), the provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture.

Traceability: The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

Tuning: A check and/or adjustment of instrument performance for mass spectrometry as required by the method.

United States Environmental Protection Agency (EPA): the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e. the air, water and land) upon which human life depends. (US-EPA)

Validation: the confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

Verification: confirmation by examination and provision of evidence that specified requirements have been met. (TNI)

NOTE - In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustments, or to repair, or to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring

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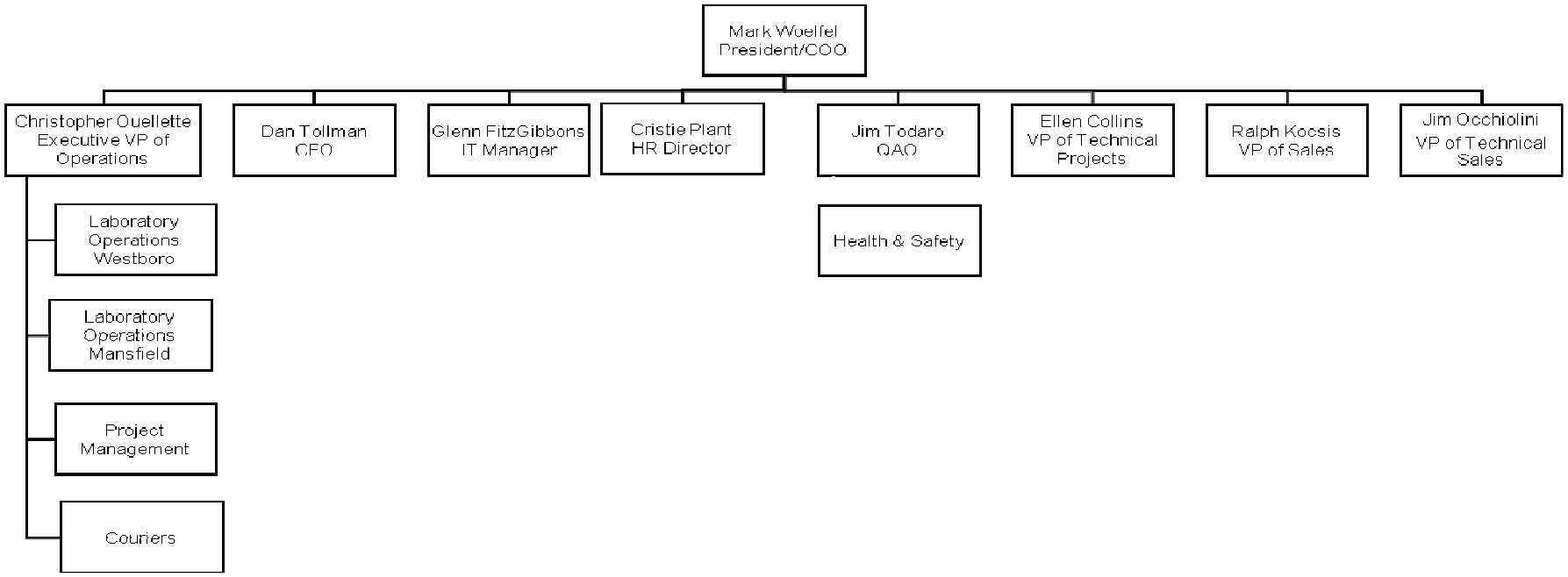
17 Appendix B – Organization Charts

The following charts provide an overview of the organizational structure of Alpha Analytical. The chart also identifies the key personnel responsible for the listed positions. For the various laboratory areas, the individual departmental supervisors are noted. For a listing of all current key personnel, please refer to Section 18, Appendix C.

Updated 09/28/2017

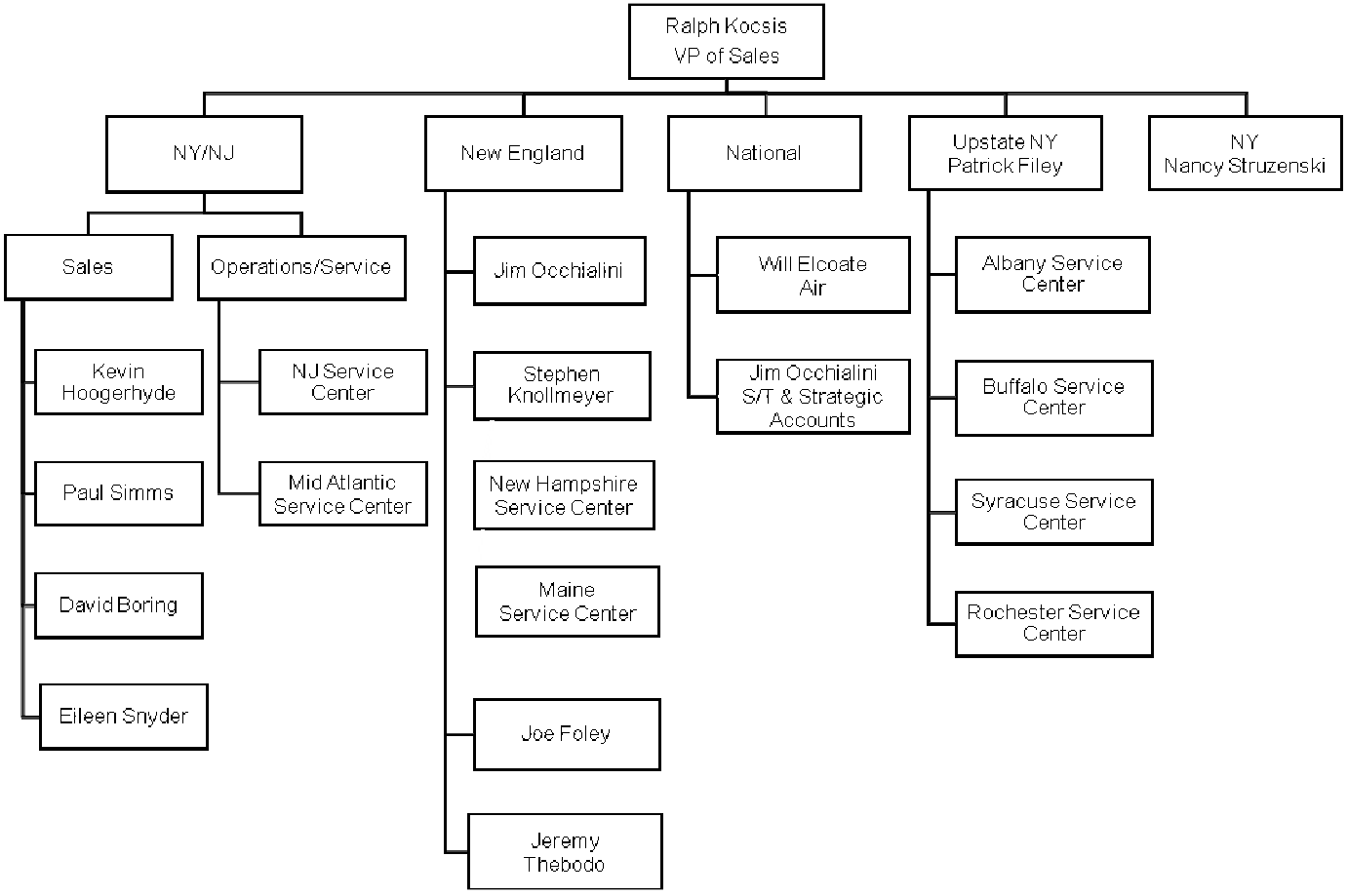
Alpha Analytical
Company Organizational Chart



Updated 09/28/2017

Alpha Analytical

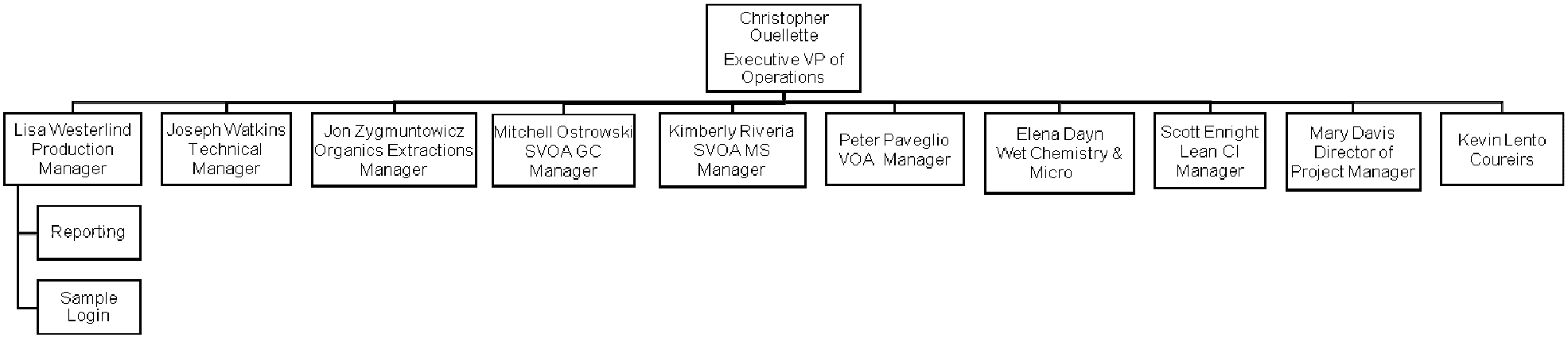
Sales Organizational Chart



Updated 09/28/2017

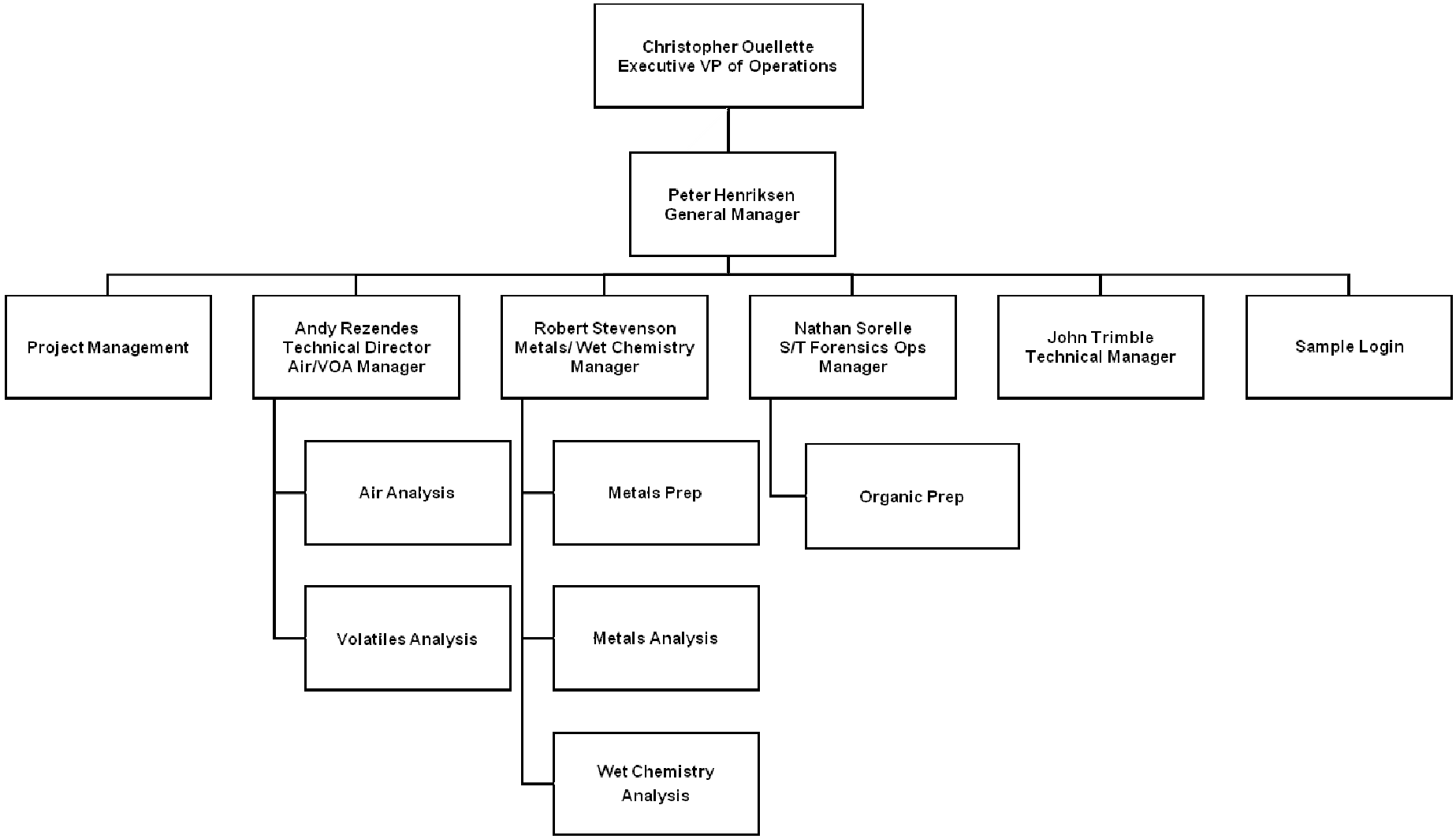
Westboro Facility

Organizational Chart



Updated 09/28/2017

Mansfield Facility Organizational Chart



18 Appendix C – List of Key Personnel

The following is a listing of all current key personnel. If role is specific to a facility it is denoted by either Westboro or Mansfield following the position title. **Updated 09/2017.**

President / COO: Mark Woelfel

Executive VP of Operations: Christopher Ouellette

CFO: Dan Tollman

Laboratory Technical Manager - Westboro: Joseph Watkins

Laboratory Technical Manager - Mansfield: John Trimble

Laboratory Technical Manager- Air, Volatiles Manager - Mansfield: Andy Rezendes

Quality Assurance Officer/Health & Safety Manager: James C. Todaro

VP, Technical Projects: Ellen Collins

VP of Sales: Ralph Kocsis

VP, Technical Sales: James Occhialini, Pat Filey, Kevin Hoogerhyde, Steven Knollmeyer, Nancy Struzenski

Technical Sales Reps: Paul Simms, David Boring, Joe Foley, Jeremy Thebodo

General Manager, Mansfield: Peter Henriksen

Director of Project Management: Mary Davis

National Air Account Manager: Will Elcoate

Information Technology Manager: Glenn Fitzgibbons

Human Resources Director: Cristie Plant

Health & Safety Officer: James Todaro

Forensic & S/T Operations Manager, Mansfield: Nathan Sorelle

SVOA GC Manager, Westboro: Mitchell Ostrowski

SVOA GC/MS Manager, Westboro: Kimberly Rivera

Extractions Manager, Westboro: John Zygmuntowicz

VOA Department Manager, Westboro: Peter Paveglio

Wet Chemistry Department Manager, Westboro: Elena Dayn

Metals Department Manager, Mansfield: Robert Stevenson

Login Manager/ Reporting Manager, Westboro Lisa Westerlind

Quality Systems Specialists: Amy Rice, Rene Bennett, Jason Hebert, Blake Buckalew

Purchasing: David Peak

Logistics Manager: Kevin Lento

Equipment Specialist: Syzmon Sus

19 Appendix D – Preventive Maintenance Procedures

Optimized Service-Calibration Intervals		
Equipment	**Frequency**	**Type of Calibration or Maintenance**
Balances	semiannually daily	cleaning & operations check by service technician (external) calibration verification using Class S-1 certified weights
COD Reactor	annually annually	complete operations check by service technician (external) reaction temperature verification
Conductivity Bridge	annually each use	verification of cell constant complete operations check by service technician (external) calibration verification
DI Water System	as needed monthly annually daily	complete operations check by service technician (external) Residual Chlorine check Biosuitability testing (external) pH and Conductivity check
DO Meter	annually each use	complete operations check by service technician (external) calibration against air as specified by manufacturer
Emergency/Safety Equipment	annually monthly	fire extinguishers and emergency exit lighting check eye washes, showers, fire blanket and first aid kits checked
Freezers	daily	temperature verification
Gas Chromatographs	as needed as needed beginning and end of batch and 10 to 20 samples as per method	injection port preparation; cleaning of detectors initial multi-point calibration continuing calibration verification (CCV) against initial calibration
ICP	Every other day Daily Annually Annually As needed	Change pump tubing Calibration, profile Complete operations check by service technician (external), Linear Dynamic Range determination Clean torch, clean nebulizer, clean spray chamber
Lachat analyzer	Daily As needed	Calibration, clean lines Change tubing, change O-rings
Mass Spectrometers (GC & ICP)	bi-annually as needed 12 hour or daily	change of mechanical pump oil by service technician (external) cleaning of source BFB, DFTPP or ICP-MS tune analysis followed by ICAL or CCV
Mercury Analyzer	monthly each use	clean cell and change pump windings calibration using multi-point curve
Auto-pipettes	Monthly Annually	verification of accuracy verification of precision
Microwave	Quarterly Annually	power and temperature verification RPM verification
Ovens	annually daily	complete operations check by service technician (external) temperature verification
pH Meters	annually each use	complete operations check by service technician (external) calibration using certified buffers
Refrigerators (General Use)	daily	temperature verification
Refrigerators (Sample Management)	daily	temperature verification
Spectrophotometer	Semi-annually Semi-annually daily	cleaning & operations check by service technician (external) wavelength verification (external) continuing calibration verification (CCV) against initial calibration
TCLP Rotator	annually	RPM verification
Thermometers (Mercury/Alcohol)	annually	calibration against NIST traceable thermometer (internal)
Thermometers (digital)	Quarterly	calibration against NIST traceable thermometer (external)
Thermometer (NIST Traceable)	annually	calibration and certification of conformance (external)
Turbidity meter	annually each use	cleaning & operations check by service technician (external) calibration using formazin
Weights (Class S-1)	annually	service/calibration and certification of conformance (external)

20 Appendix E – Alpha Code of Ethics Agreement

Alpha Analytical, Inc.
Ethical Conduct and Data Integrity Agreement

A. ***Personal Pledge:*** I understand that I am charged with meeting the highest degree of ethical standards in performing all of my duties and responsibilities and pledge to only report data, test results and conclusions that are accurate, precise and of the highest quality.

B. ***Protocol Pledges:*** I agree to adhere to the following protocols and principles of ethical conduct in fulfilling my work assignments at Alpha:

1. All work assigned to me will be performed using Standard Operating Procedures (SOPs) that are based on EPA approved methods or Alpha methods.

2. I will only report results or data that match the actual results observed or measured.

3. I will not intentionally nor improperly manipulate or falsify data in any manner, including both sample and QC data. Furthermore, I will not modify data values unless the modification can be technically justified through a measurable analytical process or method acceptable to Alpha. All such modifications will be clearly and thoroughly documented in the appropriate laboratory notebooks and raw data and include my initials or signature and date.

4. I will not intentionally report dates and times of analyses that are not the actual dates and times the analyses were conducted.

5. I will not intentionally represent another individual's work as my own or represent my work as someone else's.

6. I will not make false statements to, or seek to otherwise deceive Alpha staff, leaders or customers. I will not, through acts of commission, omission, erasure or destruction, improperly report measurements, standards results, data, test results or conclusions.

C. ***Guardian Pledge:***

1. I will not condone any accidental or intentional reporting of unauthentic data by other Alpha staff and will immediately report such occurrences to my supervisor, the QA Officer, the Laboratory Technical Manager or corporate leadership. I understand that failure to report such occurrences may subject me to immediate discipline, including termination.

2. If a supervisor or other member of the Alpha leadership group requests me to engage in, or perform an activity that I feel is compromising data validity or quality, I have the right to not comply with the request and appeal this action through Alpha's QA Officer, senior leadership or corporate officers, including the President of the company.

3. I understand that, if my job includes supervisory responsibilities, then I will not instruct, request or direct any subordinate to perform any laboratory practice that is unethical or improper. Also, I will not discourage, intimidate or inhibit a staff member who may

choose to appropriately appeal my supervisory instruction, request or directive that may be perceived to be improper, nor retaliate against those who do so.

D. ***Agreement Signature:*** I have read and fully understand all provisions of the *Alpha Analytical Ethical Conduct and Data Integrity Agreement*. I further realize and acknowledge my responsibility as an Alpha staff member to follow these standards. I clearly understand that adherence to these standards is a requirement of continued employment at Alpha.

_____
Employee Signature

_____
Printed Name

_____
Date

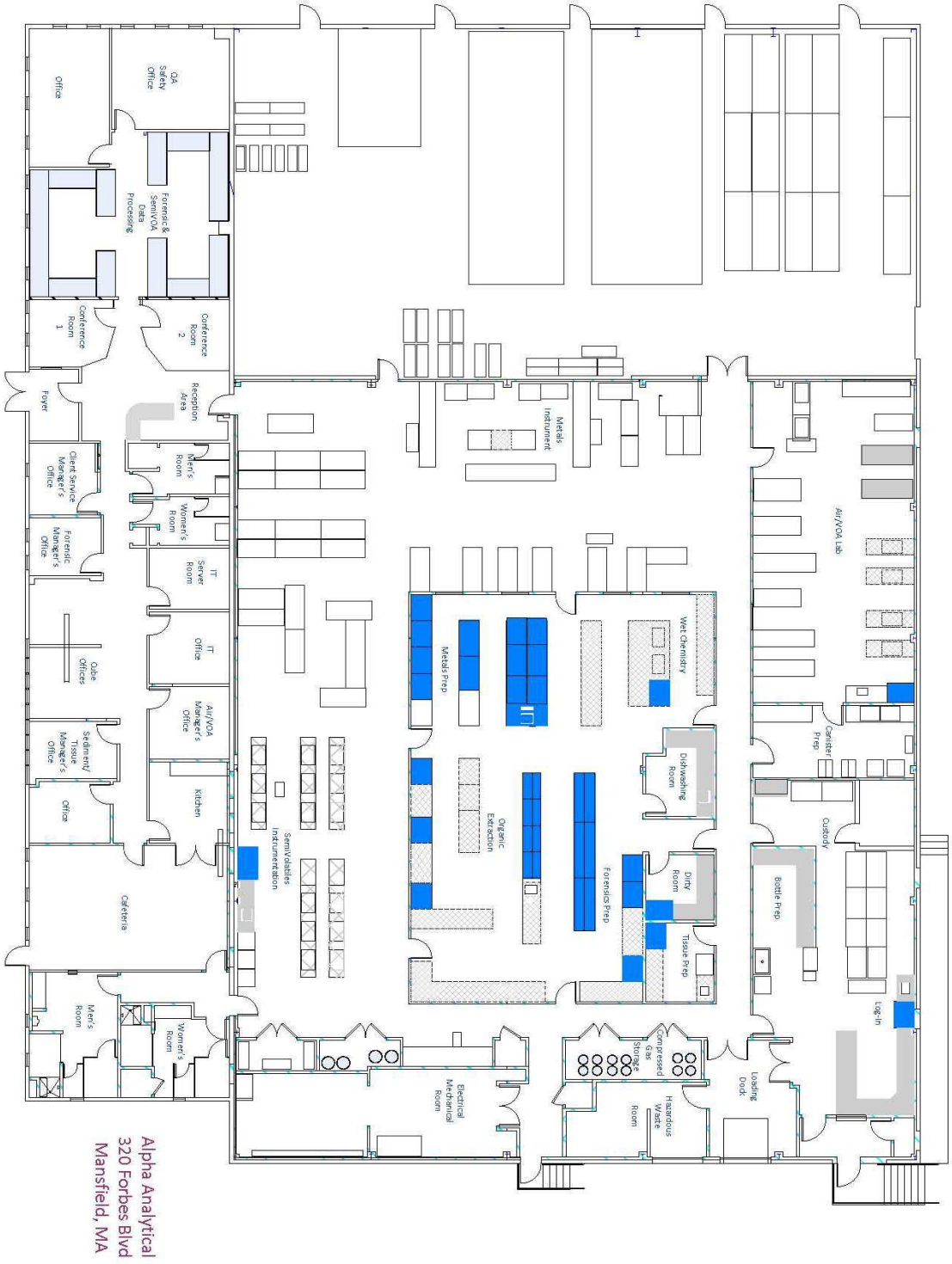
Review Requirements
The *Ethical Conduct and Data Integrity Agreement* must be signed at the time of hire (or within 2 weeks of a staff member's receipt of this policy). Furthermore, each staff member will be required to review and sign this agreement every year. Such signature is a condition of continued employment at Alpha. Failure to comply with these requirements will result in immediate discharge from Alpha employment. This agreement is not an employment contract and does not modify in any manner the company's *Employment-at-Will* Agreement.

21 Appendix F – Floor Plan Westboro Facility

Fire Alarm Zones & Coverage

Zone 1	Manual Pull Stations, Heat & Smoke Detectors
Zone 2	Sprinklers, Tamper & Flow Switches
Zone 3	Duct Smoke Detectors
Zone 4	Smoke, Manual Pull Station, Fire suppression systems

22 Appendix G– Floor Plan Mansfield Facility



23 Appendix H – Job Titles and Requirements

TITLE*	REQUIRED EDUCATION**	MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE	MINIMUM REQUIRED SKILLS***
Technical Manager (Director) Organic Laboratory	BS or BA in Chemical, Environmental, or Biological Science; including minimum 24 credit hours in Chemistry. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience.	Two (2) years with the analysis of organic analytes in an environmental laboratory	1. Advanced technical knowledge of all analytical methods performed by the lab 2. Advanced technical instrumentation/lab systems knowledge 3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols 4. Experience with and understanding of LIMS 5. Experience with method development and implementation 6. Experience monitoring standards of performance in Quality Control and Quality Assurance
Technical Manager (Director) Inorganic Laboratory	BS or BA in Chemical, Environmental, or Biological Science; including minimum 16 credit hours in Chemistry. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience.	Two (2) years with the analysis of inorganic analytes in an environmental laboratory	1. Advanced technical knowledge of all analytical methods performed by the lab 2. Advanced technical instrumentation/lab systems knowledge 3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols 4. Experience with and understanding of LIMS 5. Experience with method development and implementation 6. Experience monitoring standards of performance in Quality Control and Quality Assurance
Technical Manager (Director) Microbiology Laboratory	BS or BA in Chemical, Environmental, or Biological Science; including minimum 16 credit hours in the Biological Sciences, including at least one course having microbiology as a major component. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience.	Two (2) years with the analysis of microbiological analytes in an environmental laboratory	1. Advanced technical knowledge of all analytical methods performed by the lab 2. Advanced technical instrumentation/lab systems knowledge 3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols 4. Experience with and understanding of LIMS 5. Experience with method development and implementation 6. Experience monitoring standards of performance in Quality Control and Quality Assurance
Quality Assurance Officer	BS/BA in Chemistry, Biology, Environmental or related Science	Two (2) years Environmental Laboratory Experience	1. Advanced technical knowledge of all analytical methods performed by the lab 2. Knowledgeable in Federal, State Programs (THE NELAC INSTITUTE (TNI) STANDARDS, etc.) 3. Able to develop QA/QC policies and certification requirements 4. Able to develop training programs for quality procedures 5. Documented training and/or experience in QA and QA procedures 6. Knowledge of safe laboratory practices and emergency protocols

TITLE*	REQUIRED EDUCATION**	MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE	MINIMUM REQUIRED SKILLS***
Laboratory Coordinator	High School Diploma; Associates or BS/BA in Chemistry, Biology or Environmental or related Science preferred	1 year +	1. Knowledge of safe laboratory practices and emergency protocols 2. Proficient in all methods and SOP's within their department 3. Experience with and understanding of LIMS 4. Proven ability to meet TAT (turnaround times)
Quality Systems Specialist	BS/BA Chemistry	2 years +	1. General knowledge of laboratory methods 2. Experience with and understanding of LIMS 3. Strong attention to detail 4. Strong oral/written communication and organizational skills 5. Knowledge of QA/QC policies and certification requirements
EH&S Coordinator	High School or Equivalent	2 years +	1. General knowledge of lab operations 2. Detailed knowledge of safe lab practices and emergency protocols 3. Hazardous Waste Management and RCRA Regulation Training 4. DOT Hazardous Materials Regulations Training 5. OSHA Compliance Training 6. Able to develop and deliver new hire and ongoing safety training programs
Lab Technician I	HS or Equivalent	0-1 years. 1+ years preferred.	1. Knowledge of safe laboratory practices 2. Able to follow direction and Standard Operating Procedures (SOP's) 3. Familiarity with standard and reagent preparation 4. Knowledgeable in using volumetric pipettes and glassware 5. Strong oral/written communication and organizational skills
Lab Technician II	HS or Equivalent	2-4 years	1. All skills of Lab Technician I 2. Trained in majority of technician skills relative to department
Lab Technician III	HS or Equivalent	5 years +	1. All skills of Lab Technician II 2. Experienced in training staff
Lab Technician/Chemist I	BS/BA in Chemistry, Biology, Environmental or related Science	0-1 years	1. Knowledge of safe laboratory practices 2. Able to follow direction and Standard Operating Procedures (SOP's) 3. Familiarity with standard and reagent preparation 4. Knowledgeable in using volumetric pipettes and glassware 5. Strong oral/written communication and organizational skills
Lab Technician/Chemist II	BS/BA in Chemistry, Biology, Environmental or related Science	2-4 years	1. All skills of Chemist I 2. Trained in majority of department methods

TITLE*	REQUIRED EDUCATION**	MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE	MINIMUM REQUIRED SKILLS***
Lab Technician/Chemist III	BS/BA in Chemistry, Biology, Environmental or related Science	5 years +	1. All skills of Chemist II 2. Experienced in training staff
Analyst I	HS or Equivalent	0-1 years	1. Knowledge of safe laboratory practices 2. Able to follow direction and Standard Operating Procedures (SOP's) 3. Experienced with sample handling, preparation and/or extraction
Analyst II	HS or Equivalent	2-4 years	1. All skills of Analyst I 2. Experienced in machine operation, maintenance and troubleshooting
Analyst III	HS or Equivalent	5 years +	1. All skills of Analyst II 2. Experienced in data review and reporting 3. Experienced in training staff
Analytical Chemist I	BS/BA in Chemistry, Biology, Environmental or related Science	6 mos-1 year	1. Knowledge of safe laboratory practices 2. Able to follow direction and Standard Operating Procedures (SOP's) 3. Experienced with sample handling, preparation and/or extraction
Analytical Chemist II	BS/BA in Chemistry, Biology, Environmental or related Science	2-4 years	1. All skills of Analytical Chemist I 2. Experienced in machine operation, maintenance and troubleshooting
Analytical Chemist III	BS/BA in Chemistry, Biology, or Environmental or related Science	5 years +	1. All skills of Analytical Chemist II 2. Experienced in data review and reporting 3. Experienced in training staff
Data Deliverable Specialist I	HS Diploma, BS/BA or Associates preferred	0-1 years	1. Introductory knowledge of laboratory methods 2.Able to follow direction and Standard Operating Procedures (SOP's) 3. Working knowledge of Adobe Acrobat, Microsoft Word, Excel 4. Good writing and typing skills
Data Deliverable Specialist II	HS Diploma, BS/BA or Associates preferred	2-4 years	1. All skills of Data Deliverable Specialist I 2. General knowledge of laboratory methods 3. Understanding of data review/ data reporting process 4. Experience with and understanding of LIMS and electronic data deliverables

TITLE*	REQUIRED EDUCATION**	MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE	MINIMUM REQUIRED SKILLS***
Data Deliverable Specialist III	HS Diploma, BS/BA or Associates preferred	5 years +	1. All skills of Data Deliverable Specialist II 2. Intermediate/advanced knowledge of laboratory methods 3. Able to perform report review 4. Experience with and understanding of LIMS and electronic data deliverables 5. Able to initiate re-work where necessary
Laboratory Intern	2 Semesters of Chemistry, Biology or Environmental Science	None; Lab work study experience preferred	1. Knowledge of safe laboratory practices 2. Able to follow direction and Standard Operating Procedures

KEY

* Internal terms only. Full title would have "Environmental Laboratory" and specific department preceding it.

** Substitutions: Equivalent knowledge may be substituted for a degree in some instances.

*** Not meant to be an exhaustive list of skill requirements. For full list of skills consult the "Laboratory Skills" list. Actual Job Duties and Responsibilities can be found within job descriptions for each position.

24 Appendix I – Standard Operating Procedures

WESTBORO SOP #	Title
1728	Waste Management and Disposal
1730	Balance Calibration Check
1733	Thermometer Calibration
1735	Analytical Guidelines for Method Validation
1737	Inorganics Glassware Cleaning and Handling
1738	Water Quality Monitoring
1745	Reagent, Solvent and Standard Control
1948	Separatory Funnel Liquid-Liquid Extraction – EPA 3510C
1953	Organic Extraction Glassware Cleaning & Handling
1954	Soxhlet Extraction – EPA 3540C
1955	Sulfur Cleanup – EPA 3660A
1956	Oil and Waste Dilution – EPA 3580A
1959	Microwave Extraction – EPA 3546
1960	Sulfuric Acid Cleanup – EPA 3665A
1962	Florisil Cleanup
1963	Fractionation Cleanup
1964	Preparation of Samples for Chlorinated Herbicides
2022	Volatile Organic Compounds – EPA 624
2107	Volatile Organic Compounds – EPA 524.2
2108	Volatile Organic Compounds – EPA 8260C
2109	Polynuclear Aromatic Hydrocarbons (PAHs) by SIM – EPA 8270D (modified)
2110	Semivolatile Organics by GC/MS – EPA 625
2111	Semivolatile Organics by GC/MS – EPA 8270D
2112	TCLP/SPLP Extraction - Volatile Organics SW-846 Method 1311/1312
2113	EDB & DBCP in Water by Microextraction & Gas Chromatography – EPA 504.1, 8011
2116	Organochlorine Pesticides by Capillary Column GC – EPA 8081B
2119	Extractable Petroleum Hydrocarbons – MADEP
2120	Volatile Petroleum Hydrocarbons – MADEP
2122	Organochlorine Pesticides & PCBs by Capillary Column GC – EPA 608
2123	Polychlorinated Biphenyls in Oil – EPA 600/4-81-045
2125	TPH-Diesel Range Organics, Maine 4.1.25, EPA 8015C (Modified)
2126	TPH- Gasoline Range Organics, Maine 4.2.17, EPA 8015C (Modified)
2127	CT-ETPH
2128	Herbicides by 8151A

WESTBORO SOP #	Title
2129	PCBs by Capillary Column Gas Chromatography - EPA 8082A
2131	New Jersey EPH Method
2133	TCLP Extraction Metals and Semi-Volatile Organics – SW-846 Method 1311
2135	SPLP Extraction Inorganics and Semivolatile Organics, EPA 1312
2161	Fecal Coliform by Membrane Filtration – SM 9222D
2163	Fecal Coliform by Multiple Tube Fermentation – SM 9221E
2191	Heterotrophic Plate Count – SM 9215B
2192	Total Coliform/E.Coli – Presence/Absence (Colilert) – SM 9223B
2193	Total Coliform by Membrane Filtration – SM 9222B
2194	Total Coliform by Multiple Tube Fermentation – SM 9221B
2195	Chlorophyll A – SM 10200H
2196	E. Coli – Membrane Filtration
2197	Chlorophyll A – EPA 446
2198	Air Density Monitoring
2199	Inhibitory Residue Test
2200	Enterococcus – MF
2201	Total Coliform, E.Coli & Enterococcus by Quantification Methods (Quanti Tray)
2202	pH, Liquid Samples
2203	pH, Soil & Waste Samples
2204	Hexavalent Chromium
2205	Biological Oxygen Demand
2206	Ammonia Nitrogen
2207	Total Kjeldahl Nitrogen
2208	Chemical Oxygen Demand
2209	Oil & Grease by n-Hexane Extraction Method & Gravimetry
2210	Cyanide, Total
2211	Phenol, Total
2212	Sulfate, Turbidimetric Method
2213	Alkalinity, Titration Method –SM 2320B
2214	Determination of Inorganic Anions by Ion Chromatography – EPA 300.0
2215	Total Organic Carbon/Dissolved Organic Carbon
2216	Chloride – SM 4500Cl-E, EPA 9251
2217	Nitrate, Nitrite and Nitrate/Nitrite Nitrogen – EPA 353.2, SM 4500NO_3-F
2218	Total Solids (Dried @ 103-105^o) and TVS – SM 2540B, SM 2540E
2219	Total Dissolved Solids – SM 2540C
2220	Total Suspended Solids – SM 2540D
2221	Total Sulfide – SM 4500S2-AD, EPA 9030B
2222	MBAS, Anionic Surfactants – SM 5540C

WESTBORO SOP #	Title
2223	Fluoride, Electrode Method – SM 4500F-BC
2224	Turbidity, Nephelometric Method – EPA 180.1, SM 2130B
2225	Orthophosphate, Colorimetric Single Reagent Method – SM 4500P-E
2226	Total Phosphorous, Colorimetric Combined Reagent Method – SM 4500P-E
2227	Flashpoint – EPA 1010
2228	Reactivity – EPA Chapter 7.3
2229	Total Solids (Dried @ 103-105^{o}) – SM 2540G
2230	Specific Conductance and Salinity
2231	True and Apparent Color, Visual Comparison Method
2232	Acidity, Titration Method
2233	Determination of Formaldehyde by HPLC, EPA 8315A
2234	Sulfite, Iodometric
2235	Ferrous Iron
2236	Residual Chlorine
2237	ORP
2238	Ignitability of Solids EPA 1030
2239	Physiologically Available Cyanide (PAC)
2240	Total Settleable Solids SM 2540 F
2241	Fixed and Volatile Solids in Solid and Semisolid Samples – SM 2540G
2242	Tannin & Lignin
2243	Nitrite - Manual Colorimetric Method
2244	Paint Filter Liquids Test
2245	Odor, Threshold Odor Test
2249	Dissolved Oxygen
2251	Perchlorate by IC/MS/MS
3743	Free Cyanide
9177	Total Phenol - SEAL Method
9733	Oil & Grease and TPH in Soil
10807	Percent Organic Matter in Soil
12838	Buchi Concentration
17972	Extractable Organic Halides (EOX)
18236	Chloropicrin and Carbon Tetrachloride by EPA 8011
19332	DI Water Extraction ASTM D3987

MANSFIELD SOP #	Title
1753	Glassware Cleaning
1754	Balance Calibration
1755	Pipette Checks
1796	Sample Management - Forensics
1797	Haz Waste
1816	Reagent Solvent Standard Control
2134	Hot Block Digestion for Aqueous Samples EPA 3005A
2137	ICP-MS EPA 6020A
2138	Mercury Aqueous 7470A
2139	Mercury Soil 7471B
2140	AVS SEM
2141	Hydride Generation
2142	Mercury Aqueous 1631E
2143	Mercury Soil 7474
2148	Metals Soil Digestion 3050
2150	Metals Microwave 3015
2151	Metals Acid Digestion 3020
2152	Seawater Extraction of Metals
2154	TCLP 1311
2155	EPA 8270D
2157	PAH by SIM
2158	EPA 8081B
2160	EPA 8082A Aroclors/Congeners by GC and TO-10A
2162	Pesticides/PCB Aroclors/Congeners by GC/MS SIM
2164	1,4-Dioxane GC/MS SIM
2165	Separatory Funnel Extraction EPA 3510C
2166	Tissue Prep
2167	GPC
2168	Sulfur Cleanup 3660
2169	Sulfuric Acid Cleanup 3665
2170	Silica Gel Cleanup
2171	% Lipids
2172	Microscale Solvent Extraction EPA 3570
2173	Soxhlet Extraction EPA 3540C
2174	Soxhlet Extraction of PUFs
2175	% Total Solids
2182	TOC by Lloyd Kahn
2183	Particle Size Determination
2184	Particulates in Air PM-10

MANSFIELD SOP #	Title
2186	TO-15
2187	APH
2188	Air PIANO
2189	Dissolved Gases
2190	Can Cleaning
2246	TPH and SHC
2247	Alkylated PAH
2248	Organic Lead
2252	Fixed Gases
2253	TO-11A
2255	PIANO Volatiles
2256	Ethanol in Oil
2257	Whole Oil Analysis
2259	Density Determination of Oils
2260	Alumina Cleanup
2261	Shaker Table
2263	Gravimetric Determination
2264	Tissue Extraction
2265	Organic Waste Dilution
2267	Client SOP: SGC - Manual Method
2268	Client SOP: DCM Extractable Method
4246	PAHs by SPME
6398	TO-17
6438	Mercury in Sorbent Tubes by CVAA
7900	Mercury 1631E Using Cetac-M-8000 Analyzer
9077	Porewater Generation
9480	EPA-TO-12
12863	EPA 8270D GC/MS Full Scan TO-13A
13091	HPAH
13406	Particulate Organic Carbon
14500	Lead in Particulate Matter
17452	TOC by EPA 9060A
17456	Moisture, Ash and Organic Matter
18086	Total Suspended Solids (TSS) SM 2540D
17829	Specific Gravity of Soil
17830	Liquid Limit, Plastic Limit and Plasticity Index of Soils
17940	1,4-Dioxane in Drinking Water by EPA 522
18705	PCB Congeners by GC/MS-SIM EPA 8270D
18710	Trace Elements in Waters and Wastes by ICP-MS EPA 200.8

MANSFIELD SOP #	Title
18711	Metals by ICP EPA 200.7
18714	Metals by ICP EPA 6010C
18715	Mercury in Water (CVAA) EPA 245.1
18716	Hot Block Digestion for Aqueous Samples EPA 3005A
18717	Microwave Assisted Acid Digestion of TCLP Extracts EPA 3015
18718	Microwave Assisted Acid Digestion for Metals EPA 3015A/3051A
18817	Alcohols by FID- Aqueous Direct Injection EPA 8015D
19625	Glycols by GC-FID EPA 8015D
19971	Air Drying Samples for PCBs and Metals Analysis
19978	Density of Soil
22132	Data Review – Ohio VAP
23511	PFAS by LC/MS/MS by EPA 537
23528	PFAS by LC/MS/MS Isotope Dilution by EPA 537(M)
24454	Acetonitrile Extraction for Unknown Compounds via GCFID

CORPORATE SOP #	Title
1559	Sample Receipt and Login
1560	Sample Custody and Tracking
1561	Bottle Order Preparation
1562	Computer System Backup/Control
1563	Computer and Network Security
1564	Software Validation and Control
1565	Training Program
1566	Report Generation and Approval
1567	Organics Data Deliverable Package Review
1722	Customer Inquiry and Complaint Procedures
1723	Customer Service
1724	Quote/Contract Procedure
1725	Project Communication Form Generation
1726	Procedure
1727	Accounts Payable Invoice Processing
1729	Document Control
1731	Manual Integration and Compound Rejection
1732	DL LOD LOQ Generation
1734	Control Limit Generation
1736	Corrective and Preventative Actions
1739	Demonstration of Capability (DOC) Generation
1740	Internal Audit Procedure

CORPORATE SOP #	Title
1741	Data Review – Organics
1742	Calculating Measurement Uncertainty
1743	Annual Management Review
1744	Sample Compositing Procedure
1746	Nonconformance Planning/Procedures
1747	Temperature Datalogger Operation
2274	Data Validation Package
17553	Lab Supply Transfer Procedure
18821	Weights Verification
18909	PT Corrective and Preventive Action Process

APPENDIX G

Data Quality Assessment (DQA) Process

	Task	Comp. Y/N?	Initials
1	Review the DKQ conformance/nonconformance summary Questionnaire to determine if DKQP Status has been attained		
	○ Questions 1, 1A and 1B answered "No"? If so then DKQP Status not attained. (Data may still be usable depending on end result).		
	○ Question 4 most often answered as "No" – indicates nonconformances exist		
2	Review QC nonconformers narrative		
3	Review entire report for any QC failures that may not be documented in the narratives		
	○ Chain-of-Custody Evaluation		
	▪ Was handling time met? ▪ Were samples appropriately preserved/refrigerated/iced? ▪ Were samples received by the lab at an appropriate temperature (4°C±2)?		
	○ Sample Result Evaluation		
	▪ Determine that reporting limits were noted ▪ Verify that concentrations greater than RL were reported ▪ Verify that concentrations reported below the RLs are qualified "J" ▪ Verify soil and sediment results were reported in mg/kg on a dry weight basis ▪ Verify that aqueous results were reported in ug/L ▪ Verify that air vapor samples were reported in ug/m^3 ▪ Check dilution factor to see if a dilution was performed and if so, the RL adjusted accordingly ▪ Determine that RLs are less than, or equal to the regulatory criteria ▪ Determine if sample results are provided for each requested analysis		
	○ Sample Preservation and Holding Times Evaluation		
	▪ Review Chain-of-Custody and or narratives to determine if the samples were preserved in accordance with the requirements of the DKQ Method reported ▪ Review Chain-of-Custody for other sample/method-specific QA (e.g. vacuum readings on vapor canisters) ▪ Review narrative to determine if holding time specified in the DKQ Method was met		
	○ Method, Field or Trip Blank Evaluation		
	▪ Review all blank data and narratives for possible contamination		
	○ Field Duplicates and Laboratory Duplicates		
	▪ Review all duplicate sample information		
	○ Laboratory Control Sample (LCS) Evaluation		

	▪ Review the narrative to determine if nonconformances were noted		
	○ Surrogate Results Evaluation		
	▪ Review the narrative to determine if nonconformances were noted		
	○ Matrix Spike/Matrix Spike Duplicate Results Evaluation		
	▪ Review narrative to determine if nonconformances were noted		
4	○ Document all nonconformances to be used to perform the Data Usability Evaluation (DUE), Worksheet 1 and 2 should be filled out.		
5	○ **Has the data attained a DKQP and free of nonconformances? No DUE necessary, data can be used to make decisions with no qualifications.**		
6	○ **If nonconformances have been identified perform the DUE**		

APPENDIX H

PAGE __ OF __ PROJECT:				FILE NUMBER:		
LABORATORYWORK ORDER:				REVIEWER:		DATE:
BLANKS		**Compound**	**Compound**	**Compound**	**Compound**	**Notes**
Method Blank, VOCs	>RL?					
Method Blank, SVOCs	>RL?					
Method Blank, VPH	>RL?					
Method Blank, EPH	>RL?					
Method Blank, PCBS	>RL?					
Method Blank, Pest	>RL?					
Method Blank, Metals	>RL?					
Method Blank, Total Cyanide	>RL?					
Method Blank, ETPH	>RL?					
Method Blank Hex Chrome	>RL?					
Field Blank	>RL?					
Trip Blank	>RL?					
VPH Blank (methanol)	>RL?					
Blank Soil VOCs (methanol)	>RL?					
Blank Soil VOCs (water/bisulfate) circle	>RL?					
LCS	**SV**	**Low Bias**	**High Bias**	**Compound**	**Compound**	**Notes**
VOCs	<10%	> 10% & < LCL	>UCL			
SVOCs	<10%	> 10% & < LCL	>UCL			
VPH	<10%	> 10% & < LCL	>UCL			
EPH	<10%	> 10% & < LCL	>UCL			
PCB	<10%	> 10% & < LCL	>UCL			
PEST	<10%	> 10% & < LCL	>UCL			
Hex Chrome	<70%	> 70 % & <LCL	> UCL			
Metals	<10%	> 10% & < LCL	>UCL			
Total Cyanide	<10%	> 10% & < LCL	>UCL			
ETPH	<10%	> 10% & < LCL	>UCL			
SURROGATES	**SV**	**Low Bias**	**High Bias**	**Compound**	**Compound**	**Notes**
VOCs	<10%	> 10% & < LCL	>UCL			
SVOCs	<10%	> 10% & < LCL	>UCL			
VPH	<10%	> 10% & < LCL	>UCL			
EPH	<10%	> 10% & < LCL	>UCL			
PCB	<10%	> 10% & < LCL	>UCL			
PEST	<10%	> 10% & < LCL	>UCL			
MS/MSDS	**SV**	**Low Bias**	**High Bias**	**QC Source**	**RPDS**	**Notes**
VOCs	<10%	> 10% & < LCL	>UCL	Batch? Site?		
SVOCs	<10%	> 10% & < LCL	>UCL	Batch? Site?		
EPH	<10%	> 10% & < LCL	>UCL	Batch? Site?		
PCB	<10%	> 10% & < LCL	>UCL	Batch? Site?		
PEST	<10%	> 10% & < LCL	>UCL	Batch? Site?		
Hex Chrome	<50%	> 50% & < LCL	>UCL	Batch?		
Metals	<10%	> 10% & < LCL	>UCL	Batch? Site?		
Total Cyanide	<10%	> 10% & < LCL	>UCL	Batch? Site?		
ETPH	<10%	> 10% & < LCL	>UCL	Batch? Site?		
FIELD DUPLICATES RPDS		**Soil**	**Water**	**Compound**	**Compound**	**Notes**
VOCs		RPD > 50%	RPD > 30%			
SVOCs		RPD > 50%	RPD > 30%			
VPH		RPD > 50%	RPD > 30%			
EPH		RPD > 50%	RPD > 30%			
PCB		RPD > 50%	RPD > 30%			
PEST		RPD > 50%	RPD > 30%			
Metals		RPD > 50%	RPD > 30%			
Total Cyanide		RPD > 50%	RPD > 30%			
EPH		RPD > 50%	RPD > 30%			
LAB DUPLICATES RPDS		**Soil**	**Water**	**Compound**	**Compound**	**Notes**
		RPD > 50%	RPD > 30%	Batch? Site?		
Hex Chrome		RPD >20%	RPD >20%	Batch		

Reasonable Confidence Achieved? Y/N Significant QC Variances Noted? Y/N Requested Reporting Limits Achieved? Y/N

Preservation Requirements Met? Y/N Holding Time Requirements Met? Y/N

Abbreviations: RL = Reporting Limit; LCS = Laboratory Control Sample; SV = Significant QC Variance; LCL= RCP Lower Control Limit; UCL= RCP Upper Control Limit; RPD = Relative Percent Difference; VOCs = Volatile Organic Compounds; SVOCs = Semivolatile Organic Compounds; VPH = Volatile Petroleum Hydrocarbons; EPH = Extractable Petroleum Hydrocarbons; PCBs = Polychlorinated Biphenyls; Pest = Pesticides; ETPH Extractable Total Petroleum Hydrocarbons

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Site Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample
Method 6010 Trace Metals Inductively Coupled Plasma-Atomic Emission Spectrometry	Aqueous soil, sediment, and high concentration waste samples, 180 days. Mercury 28 days.	Target analytes must be < RL.	Percent recovery limits must be between 75-125%. If MS/MSD run, for aqueous samples, if concentration > 5x the RL, RPD < 20%. If concentration < 5x RL, difference ± RL; for solids, if concentration > 5x RL, RPD < 35%. If concentration < 5x RL, difference ± 2x RL.	LCS recoveries ± 20% for aqueous samples and within vendor control (95% confidence limits) for solids.
Method 6020 Trace Metals Inductively Coupled Plasma-Mass Spectrometry	Aqueous, soil, sediment, and high concentration waste samples, 180 days. Mercury 28 days.	Target analytes must be < RL.	Percent recovery limits must be between 75-125%. If MS/MSD run, for aqueous samples, if concentration > 5x the RL, RPD <20%. If concentration < 5x RL, difference ± RL; for solids, if concentration > 5x RL, RPD < 35%. If concentration < 5x RL, difference ± 2x RL.	LCS recoveries ± 20% for aqueous samples and within vendor control (95% confidence limits) for solids.
Method 7000 Series Metals (Flame and Graphite Furnace Atomic Absorption Spectroscopy)	Aqueous, soil, sediment, and high concentration waste samples, 180 days.	Target analytes must be < RL.	Percent recovery limits must be between 75-125%. If MS/MSD run, for aqueous samples, if concentration > 5x the RL, RPD ± 20%, if concentration < 5x RL, difference ± RL; for solids, if concentration > 5x RL, RPD ±35%. If concentration < 5x RL, difference ± 2x RL.	LCS recoveries ± 20% for aqueous samples and within vendor control (95% confidence limits) for solids.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Site-Specific Matrix Spike/Matrix Spike Duplicate	Site-Specific Matrix Spike/ Matrix Spike Duplicate (Aqueous Only)	Site-Specific Sample Matrix Duplicate	Site-Specific Soluble and Insoluble Cr6+ Matrix Spike (Solid Only)	Laboratory Control Sample
Method 7196 Hexavalent Chromium	Aqueous 24 hours; Soil/sediment samples, digest within 30 days. Analyze digestate within 7 days of preparation. High concentration waste samples Digest within 30 days. Analyze digestate within 7 days of preparation. Soil/sediment pH and ORP 24 hours of sample preparation. Soil/sediment, ferrous iron and sulfide 7 days	Cr6+ must be < RL	(Not Applicable	(Matrix spike only for Hexavalent Chromium, not MS/MSD pair) Percent recovery limits must be between 75-125%.	Must be performed on a Site field sample. Aqueous/ Soil/Sediment: RPD ≤ 20%; a control limit of ± RL if original or duplicate is < 4 times the RL.	Percent recovery limits must be between 75-125%.	LCS recoveries ±20% for aqueous samples and within vendor control (95% confidence limits) for solids or the NIST 2701 control limits.
Method 7470/7471 Mercury Cold Vapor Atomic Absorption Spectroscopy	Aqueous, soil, sediment, and high concentration waste samples, 28 days.	Mercury must be <RL	Percent recovery limits must be between 75-125%.	Not applicable	For aqueous samples RPD ± 20% if conc. >5x the RL. If conc. < 5x RL, the limit is ± RL. For solids RPD ±35% if conc. >5x the RL. If conc. < 5x the RL, limit is ± the RL.	Not applicable	LCS recoveries ±20% for aqueous samples and within vendor control (95% confidence limits) for solids.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Surrogates	Site-Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample	Endrin and DDT Breakdown Standard
Method 8021 Volatile Organic Com-pounds	Aqueous 14 days (2) Soil/sediment, 14 days if preserved. 48 hours if unpreserved (Note 3). High concentration waste samples, 14 days.	Target analytes must be < RL except for common lab contaminants which must be < 3x the RL (contaminants are acetone, methylene chloride, and 2-butanone).	Laboratory determined percent recoveries must be between 70-130% for individual surrogate compounds. Laboratory determined recovery limits may be outside 70-130 % limits for difficult matrices (e.g. waste, sludges, etc.).	Laboratory determined percent recoveries should be between 70-130 % for target compounds. RPD's should be ≤ 30%.	Laboratory determined percent recoveries must be between 70-130% for target compounds.	Not applicable
Method 8081 Pesticides	Aqueous, 7 days to extraction. 40 days from extraction to analysis. Soil/sediment samples, 14 days to extraction. 40 days from extraction to analysis. Up to one year for samples frozen within 48 hours of collection (Note 1). High concentration waste samples 14 days to extraction. 40 days from extraction to analysis.	Target analytes must be < RL.	Recovery limits lab generated and within maximum range of 30-150% for both compounds on both columns. Labs must develop own in-house limits, which fall within 30-150% limits.	Laboratory determined percent recovery limits must be between 30-150% RPD's ≤ 20% for water and ≤ 30% for solids	Laboratory determined percent recovery limits must be between 40-140% except for difficult analytes, which must be between 30-140% recovery.	Breakdown must be ≤ 15% for each compound.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Surrogates	Site Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample
Method 8151 Chlorinated Herbicides	Aqueous 7 days to extraction, 40 days from extraction to analysis Soil/Sediment, 14 days to extraction. 40 days from extraction to analysis. Up to one year for samples frozen within 48 hours of collection. (Note 4) High concentration waste samples, 14 days to extraction. 40 days from extraction to analysis	Target analytes must be <RL.	Recovery limits lab generated and within 30-150% for both compounds on both columns. Labs must develop own in-house limits that fall within 30-150% limits. If surrogate exceeds limits on one column and herbicide concentrations reported at > RL but dual column precision not acceptable (RPD > 40%), re-extract and reanalyze samples.	Laboratory determined percent recovery limits must be between 30-150%, RPDs ≤ 20% waters and ≤ 30% solids.	Laboratory determined percent recovery limits must be between 40-140% except in-house limits for Dinoseb. Labs expected to develop own in-house control limits that meet or exceed limits listed above.
Method 8082 Polychlori-nated Biphenyls	Aqueous 7 days to extraction, 40 days from extraction to analysis. Soil/Sediment 14 days to extraction. 40 days from extraction to analysis. Up to one year for samples frozen within 48 hours of collection. (Note 4) High concentration waste samples, excluding transformer oils, 14 days to extraction. 40 days from extraction to analysis. Transformer/Waste Oils, 1 yr	Target analytes must be <RL.	Recovery limits lab generated and within maximum range of 30-150% for both compounds on both columns. Labs must develop own in-house limits that fall within 30-150% limits.	Laboratory determined percent recovery limits for AR-1016/1260 must be between 40-140%. Recoveries for all Aroclors or Congeners 40-140% Congeners must contain all target congeners. RPD's ≤ 20% for waters and ≤ 30% for solids.	Laboratory determined percent recovery limits must be between 40-140%. Labs are required to develop own in-house limits that meet or exceed limits listed above.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Surrogates	Site Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample
Method 8260 Volatile Organic Com-pounds	Aqueous, 14 days, 7 days if unpreserved (2) Soil/Sediment, 14 days if preserved. 48 hours if unpreserved. (Note 3). High concentration waste samples, 14 days.	Target analytes must be <RL except for common lab contaminants which must be <3x the RL (Contaminants are acetone, methylene chloride, and 2-butanone).	Laboratory determined percent recoveries must be between 70-130% for individual surrogate compounds. Laboratory determined recovery limits may be outside 70-130% limits for difficult matrices (e.g. waste, sludges, etc.).	Laboratory determined percent recoveries should be between 70-130% for target compounds. RPDs should be ≤ 30%	Laboratory determined percent recoveries must be between 70-130% for target compounds. Can also be used as CCAL. Lab may have difficult compounds out of criteria as long as within 40-160% recovery.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Surrogates	Site Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample
Method 8270 Semivolatile Organic Compounds	Aqueous, 7 days to extraction. 40 days from extraction to analysis Soil/sediment, 14 days to extraction. 40 days from extraction to analysis. Up to one year for samples frozen within 48 hours of collection. (Note 4) High concentration waste samples 14 days to extraction. 40 days from extraction to analysis.	Target analytes must be < RL except for common lab contaminants which must be < 5x the RL (Contaminants are phthalates).	Soil recovery limits lab generated and within 30-130%. Water recovery limits lab generated and within 30-130% for base-neutrals, 15-110% for acid compounds.	Laboratory determined percent recovery limits must be between 70-130% except 20-160% for difficult compounds. RPD's ≤ 20% for waters and ≤ 30% for soils.	Laboratory determined percent recovery limits must be between 70-130% except 20-160% for difficult compounds.
Method 9010/9012/9014 Total Cyanide	Aqueous, soil, sediment and high concentration waste samples: Cyanide 14 days from collection to analysis, (from date when thawed if solid samples frozen). Can maintain samples up to 1 year if frozen	Cyanide must be < RL.	Not applicable	Percent recovery limits must be between 75-125%. For aqueous samples RPD ≤ 20% For solids RPD ≤ 35%	LCS recoveries ±20% for aqueous samples and within vendor control (95% confidence limits) for solids.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

QC Parameter	Holding Time (1)	Method Blank	Surrogates	Site Specific Matrix Spike/Matrix Spike Duplicate	Laboratory Control Sample	Fractionation Check Standard
NJDEP Extractable Petroleum Hydrocarbons (EPH)	Aqueous, soil, and sediments, samples must be extracted within 14 days of collection. Extracts must be analyzed within 40 days of extraction.	All components should be < 5 times their respective MDLs.	Labs develops own in-house limits which must be within 40-140% for each surrogate. Sample recoveries and must be within 40-140%. Conc. of fractionating surrogates naphthalene and 2-methylnaphthalene in aliphatic fraction < 5% total conc. of those 2 compounds (in the batch-related LCS or LCSD)	Lab develops own in-house recovery range but percent recoveries should be: Fractionated = between 40 and 140% for each carbon range. Non-Fractionated = between 40 and 140% for each compound RPDs should be ≤ 50% for waters and soils/sediments if MSD is performed.	Percent recoveries between 40 and 140% for all compounds in the LCS; n-nonane must be between 25-140%. If #2 fuel used as the LCS, percent recoveries must be between 40 and 140% for the #2-fuel Retention times of surrogates in LCS must be within retention time windows	Every lot of silica gel/SPE cartridges checked. Percent recoveries between 40 and 140% for each compound, except for n-nonane which must be between 25-140%.

APPENDIX H

SUMMARY OF DKQ ACCEPTANCE CRITERIA

Notes:

Not all method QA/QC deliverables are listed here. .

(1) See the Method for specific preservation requirement for each method.
(2) If aqueous samples effervesce upon addition of hydrochloric acid, samples must be collected unpreserved and stored at 4 ± 2º Celsius. Holding time is 7-days from collection.
(3) Samples should be collected and stored according to N.J.A.C. 7:26E-2.1(a)8.
(4) If the freezing option is selected, the sample must be frozen within 48 hours of collection. The holding time recommences when thawing begins. The total holding time is calculated from the time of collection to freezing plus the time allowed for thawing. The total elapsed time must be less than 14 days. Although the USEPA removed the holding time requirements for PCBs, NJDEP still requires the method – specified holding times to be followed.

Abbreviations:
CCAL Continuing Calibration
Cr Chromium
EPA United States Environmental Protection Agency
EPH Extractable Petroleum Hydrocarbons
LCS Laboratory Control Sample
LCSD Laboratory Control Sample Duplicate
ORP Oxidation Reduction Potential
RPD Relative Percent Difference
RL Reporting Limit
YR Year

APPENDIX I

DATA USABILITY EVALUATIONWORKSHEET

Project Name: _____
Laboratory: _____
Sample Delivery Group: _____
Sample Delivery Group Number: _____
Date Samples Collected: _____
Reviewer: _____

Describe intended use of the data:

Nonconformance DQA Review Elements	**Briefly Summarize DQA Nonconformances**
Laboratory Report Inspection	
Reasonable Confidence Evaluation	
Chain of Custody Evaluation	
Sample Result Evaluation	
Sample Preservation and Holding Time Evaluation	
Blank Evaluation	
Laboratory Control Samples	
Surrogates	
Site Specific Matrix Spikes and Matrix Spike Duplicates	
Tentatively Identified Compounds	
Other QC data	

APPENDIX J

APPENDIX J

DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
Chain of Custody	Chain broken, incomplete, or not kept	Missing signatures, missing seals, missing dates or times, type of analysis requested not listed	Completeness	If confirmed that sample set is complete and samples not compromised, data are usable.
Sample labeling	Sample labels unreadable, missing, or not attached to containers	Failure to protect label from moisture, failure to use appropriate marker or labels, improper standard operating procedure (SOP)	Representative-ness Completeness	If the sample can be unambiguously identified, then samples are usable.
Sample labeling	Samples mislabeled or labeled incompletely	Sampler error Improper SOP	Representative-ness	If the sample can be unambiguously identified, then samples are usable.
Sample containers	Plastic containers for organic analytes	Samplers unaware of container requirements, improper SOP, failure to read SOP, SOP incorrect, insufficient quantity of correct containers samplers used containers on-hand	Representative-ness Accuracy Completeness	Possible phthalate interference and/or volatile loss may be present.
Sample containers	Glass containers for metals	Samplers unaware of container requirements, improper SOP, failure to read SOP, SOP incorrect, insufficient containers	Representative-ness Accuracy Completeness	Possible inorganic contamination may be present.
Headspace	Bubbles in water inside volatile organic chemical (VOC) vial	Poor sampling technique, caps not sealed tightly, septum caps not used, water vials not completely filled, improper	Representative-ness Accuracy Completeness	Loss of volatiles may occur.

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
		SOP		
Preservation – soil and sediment samples	VOC soil or sediment samples not properly preserved	Varies	Accuracy Representative-ness Completeness Comparability	Loss of volatiles may occur.
Preservation – aqueous samples	No preservative or wrong pH	No preservative added or improper amount of preservative added	Representative-ness Accuracy Completeness	This is an analyte- and method-dependent issue. Loss of analytes may occur.
Preservation – aqueous samples	Wrong preservative	Improper SOP, failure to read SOP, SOP incorrect, correct preservative unavailable	Representative-ness Accuracy Completeness	This is an analyte- and method-dependent issue. Loss of analytes may occur
Preservation	Improper temperature (temperature outside 4 ± 2° C Note (4)	Insufficient ice, samples too cold, shipping container inadequately insulated, samples adequately cooled at time of sampling and during shipping, transit time too long or too short for samples to reach temperature	Representative-ness Accuracy Completeness	Loss of analytes may occur if temperature is too high. If temperature is too low, check container for integrity.

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
NJDEP certification status	Laboratory not certified or approved for specific analytes by NJDEP.	Varies	All may be affected	Except in limited circumstances, data should not be used.
Handling or Holding times	Handling and/or Holding times exceeded	Excessive analysis time; tardy ship date; inappropriate shipping method; slow laboratory turn-around time.	Representative-ness Accuracy Completeness	Loss of analytes may occur. (Note 5)
Analysis method	Wrong method used to analyze samples	Incorrect laboratory method specified on chain of custody form; laboratory/analyst unaware of requirement; failure to read SOP; SOP incorrect.	Representative-ness Comparability Completeness Accuracy Sensitivity	Except in limited circumstances, data should not be used.
Reporting Limit (RL)	RL too high	Insufficient measures to combat interferences (i.e., cleanup, background correction); insufficient sample; high dilution factor; wrong or inappropriate method.	Comparability Completeness Sensitivity	If the RL for site-specific compounds of concern > the standards/screening levels, then NDs cannot be used to determine compliance. If a compound is detected and the RL is elevated, the data are usable.
Method blank (MB)	Method blank absent (Note 6)	Improper SOP	Representative-ness Accuracy Completeness	Data may contain false positives and in some circumstances, data should not be used.
Method blank (MB)	Contamination	Contaminated reagents, gases, glassware; ambient contamination; poor laboratory technique.	Representative-ness Accuracy Completeness	Data may contain false positives and/or high bias
Equipment blank (EB) or Rinsate blank	Contamination	Improper decontamination of field sampling equipment; contaminated rinsate water,	Representative-ness Accuracy	Data may contain false positives and/or high bias

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
		containers, or preservatives.	Completeness	
Trip blank (TB) for analysis of VOCs	Trip blank absent	TB not included; Improper SOP; TB broken during shipment; TB lost during shipment.	Representative-ness Accuracy Completeness	Data may contain false positives and/or high bias.
Trip blank for analysis of VOCs	Contamination	Cross-contamination during shipment or storage; contaminated reagent water, glassware, or preservatives	Representative-ness Accuracy Completeness	Data may contain false positives and/or high bias.
Laboratory Control Sample (LCS)	LCS absent (Note 7)	Improper laboratory SOP	Accuracy Completeness Comparability	Complete evaluation of the data may not be possible.
LCS, Laboratory Control Sample Duplicate (LCSD), blank spike (BS), blank spike duplicate (BSD)	Low recoveries	Method failure; improper spiking; degraded spiking solution; failed spiking device.	Accuracy Completeness Comparability	Data may contain false negatives and/or low bias
LCS, LCSD, BS, BSD	High recoveries	Method failure; improper spiking; degraded spiking solution; failed spiking device; contaminated reagents, gases, glassware, etc.	Accuracy Completeness Comparability	Data may contain false positives and/or high bias
LCS, LCSDs	High RPDs	Method failure; improper spiking; failed spiking device; contaminated reagents, gases, glassware, etc.	Representative-ness Precision Completeness. Comparability	Poor precision exists in the analytical procedure.
Surrogates in MB, LCS, LCSD, BS, BSD	Low recoveries	Method failure; improper spiking; degraded spiking solution; failed spiking device.	Accuracy Completeness	Laboratory performance should be questioned.

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
Surrogates in MB, LCS, LCSD, BS, BSD	High recoveries	Method failure; improper spiking; degraded spiking solution; failed spiking device; contaminated reagents, gases, glassware. etc.	Accuracy Completeness	Laboratory performance should be questioned
Surrogates in samples	Low recoveries	Matrix effects; inappropriate method; method failure; improper spiking; degraded spiking solution; failed spiking device.	Accuracy Completeness	Data may contain false negatives and/or low bias.
Surrogates in samples	High recoveries	Matrix effects; inappropriate method; method failure; improper spiking; degraded spiking solution; failed spiking device; contaminated reagents, gases, glassware, etc.	Accuracy Completeness	Data may contain false positives and/or high bias.
MS, MSD (Note 8)	Low recoveries (Note 9)	Matrix effects; inappropriate method; method failure; inadequate cleanup; inadequate background correction; failure to use method of standard additions; improper spiking; degraded spiking solution; failed spiking device.	Accuracy	Data may contain false negatives and/or low bias.
MS, MSD (Note 8)	High recoveries (Note 9)	Matrix effects; inappropriate method; method failure; inadequate cleanup; inadequate background correction; failure to use method of standard additions; improper spiking; degraded	Accuracy	Data may contain false positives and/or high bias. Qualify sample results greater than the RL (i.e., possible matrix effects).

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Quality Control Element (Sample Type, Analysis, Condition or Characteristic)	Type of Nonconformance	Possible Causes	Major PARCCS Parameters Affected (Note 2)	Possible Effects on Data Usability (Note 3)
		spiking solution; failed spiking device; contaminated reagents, gases, glassware, etc.		
MS, MSD (Note 8)	High Relative Percent Difference	Sample heterogeneity; inadequate sample mixing for non-voc samples in the laboratory or the field; samples misidentified; method failure; improper spiking; failed spiking device, duplicate spiking of a sample, contaminated reagents, gases, glassware, etc.	Representative-ness Precision	The sample itself may be heterogeneous leading to poor precision (high variability).
Dilution factors	Extremely high dilution factors	High concentrations of interferences or analytes; inappropriate analytical method used or selected	Accuracy Comparability Completeness	Samples with high RLs may not meet DQO and RLs may become greater than regulatory criteria.
Field Duplicates	Field duplicates are not comparable within DQOs	Sample inhomogeneity; insufficient mixing in field; samples not split but collocated (Note 10); insufficient mixing in laboratory.	Representative-ness Precision	The sample itself may be heterogeneous leading to poor precision (high variability). The sample may not be representative of site conditions.

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

This table was adapted from US Army Corps of Engineers, Environmental Quality Assurance for HTRW Projects, Engineer Manual. October 10, 1997, EM 200 1-6, table 3-1.

APPENDIX J (CONTINUED)

RANGE OF DATA USABILITY OUTCOMES[1]

Notes:

(1) Entries in the Possible Causes, PARCCS Parameters Affected, Effect on Data, and Possible Data Evaluation columns assume only one type of failure occurring at any one time. The cumulative or synergistic effects of more than one failure type occurring simultaneously make data usability evaluation more complex. Data usability evaluations involving multiple failure types are beyond the scope of this table. Not all possible QC failures and outcomes are illustrated on this table.
(2) The PARCCS parameters most affected are listed. All of the PARCCS parameters may affected in some cases. Any failure that results in invalid data affects Completeness.
(3) All data usability evaluations are subject to discretion of the investigator taking into account project DQOs, and the intended use of the analytical data. The DQA and DUE thought process must be documented in the report using the data.
(4) Refrigeration not required for trace metals (excluding mercury).
(5) Exceeding holding times on some analyses can produce false positives (i.e., carbonates, dissolved oxygen, etc.) and high bias (i.e., pH, carbonates, dissolved oxygen, etc.). High bias and false positives can also occur when degradation products of contaminants are also themselves analytes, i.e., when 4,4'-DDT is present and holding times are exceeded, high bias and false positives for the degradation products 4,4 DDD, 4,4 DDE, 4,4 DDT, 2,4 DDD, 2,4 DDE, 4,4'-DDT can occur.
(6) Method blanks are not appropriate for all analyses, i.e. pH, conductivity, % solids, etc.
(7) Laboratory control samples are not appropriate for all analyses, i.e. pH, conductivity, % solids, etc.
(8) Matrix spike and matrix spike duplicates are performed at the request of the investigator and may not be present.
(9) Note that when the native sample concentrations are significantly greater than the effective spike concentration that the conclusion of the matrix effect is only tentative. As a general rule of thumb, the native sample concentration should be no more than four times higher than the effective matrix spike concentration of for the matrix effect to be considered probably present.
(10) Conventional sampling protocols for some analyte classes (i.e., VOCs) prohibit sample mixing and splitting because it results in the loss of analytes. Field and QC samples for these analytes are more appropriately collected as sample pairs.

Appendix C

SITE SPECIFIC HEALTH AND SAFETY PLAN

5 Westchester Plaza
5 Westchester Plaza
Elmsford, New York, 10523

April 2021

Peak Project #
2847

NYSDEC#
C360205

Prepared for:
Mack-Cali CW Realty Associates L.L.C.
120 Hudson St., Suite 400,
Jersey City, NJ 07311

Prepared by:
Peak Environmental LLC
26 Kennedy Boulevard
Suite A
East Brunswick, NJ 08816

TABLE OF CONTENTS

1 SITE SPECIFIC HEALTH AND SAFETY PLAN

1.1 General Information

Site Name: 5 Westchester Plaza

Site Location: 5 Westchester Plaza, Elmsford, New York, 10523

Information and assistance can be obtained in an emergency by calling the following telephone numbers:

General	911
Peak Environmental LLC	(732) 326-1010
Client Contact: Gary Wagner	[Client Phone]
Pocantico Hills Fire Department	(914) 831-2710
White Plains Hospital	(914) 681-0600
Ambulance Service	911

Prepared by: Grace Billy

Reviewed by: Michael Stopen

Directions to the nearest hospital and an Accident Form are found inside the front cover of this Health and Safety Plan.

Background Information:

Sub-slab vapor impacts were identified at the Site, and are likely associated with a previous operator at the building. The investigation will include collection of sub-slab vapor, indoor air, and soil samples.

Purpose of Health and Safety Plan:

To provide workers with an awareness of and means to safeguard them from potential hazards that may be encountered during investigative and remedial activities at this site. Such activities may include test pit and boring installations and soil and/or groundwater sampling. Potential equipment that may be used includes a backhoe, drill rig, pumps, generators, and manual and power sampling augers.

Overall Hazard Summary:

This HASP is based upon relevant analytical data and / or anticipated conditions which were reviewed by the Senior Project Manager (Sr. PM)/Project Manager (PM) and if requested, may have also been reviewed by the Corporate Health Safety Manager (CHSM), and/or a contracted Certified Industrial Hygienist (CIH)/Certified Safety Professional (CSP).

The contaminants of concern (COCs) that have been identified include Tetrachloroethene and Trichloroethene.

The Chain of Command for Responsible Individuals at the site in ascending order is:

1. Site Safety Officer (SSO) - Grace Billy, (732) 326-1010
2 Project Manager (PM) - Michael Stopen, (732) 326-1010
3 Senior Project Manager (Sr.PM) - Matthew Bruno, (732) 326-1010
4. Corporate Health and Safety Manager (CHSM) - Bob Barnes, (732) 326-1010
5. Qualified Environmental Professional (QEP)/Partner in Charge (PIC) - Rob Edgar, (732) 326-1010

2 LIMITATIONS

This Health and Safety Plan is provided as a general guideline of the procedures to be followed during the course of work activities. This document is not intended to be all encompassing, nor is it provided to serve as a final plan. It is a living document that will be subject to review/revision by the designated on-site, Site Safety Officer (SSO) as any site-specific health and safety issues arise.

3 INTRODUCTION

This site specific health and safety plan ("HASP") details the Standard Operating Procedures (SOPs) to be employed while conducting specific operations at the Site during the execution of field tasks associated with this project and is intended to maximize the protection of onsite personnel and subcontractors from potential physical and environmental hazards. This HASP is not a comprehensive training manual nor details all procedures that may be utilized on site but is intended to be a guidance manual for specific operations. Detailed information and guidance on materials covered in this plan is provided by Peak Environmental LLC. (“Peak”).

The SSO will be responsible for the implementation of and the conformance with this HASP by all applicable personnel entering the site and is responsible for the following:

- Conducting daily health and safety meetings prior to the start of each workday, when changing tasks and/or when weather or site conditions change. Daily health and safety meetings will be documented on the Tailgate Safety Meeting / Job Safety Analysis Form (Appendix A).
- To review the applicable aspects of the HASP, tasks to be performed and the current site conditions (the daily health and safety meetings may also be conducted by the PM, Sr. PM, CHSM and/or QEP).
- Monitoring site safety performance.
- Confirming that all onsite personnel and subcontractors have received the appropriate training in the procedures described in the HASP.
- Stopping work if there is perceived to be an immediate threat to life, health, or safety or if unexplained/unexpected dangerous conditions arise.
- Preparing accident/incident reports.

The PM and SSO, and if requested, the CHSM and or CSP or CIH, are responsible for the following:

- Identifying and evaluating potential hazards, which may include evaluating chemical hazard information and modifying the HASP as needed to protect workers from those potential hazards.
- Selecting the personal protection levels and necessary protective clothing/equipment.

4 KEY PERSONNEL

The following sections define the lines of authority at the site.

4.1 Senior Project Manager / Project Manager

The PM Michael Stopen for 5 Westchester Plaza will work with the SSO and if needed and requested, the CHSM, Robert Barnes to address the responsibilities listed below:

- Monitoring and maintenance of the Peak Health and Safety Plan;
- Determine the level and nature of training required by employees for each task assigned;
- Health and safety orientation for new employees on site.

4.2 Corporate Health and Safety Manager

If requested by the Sr. PM or PM, the CHSM, Robert Barnes can help with the following tasks:

- Monitoring and maintenance of the Peak Health and Safety Plan;
- Determining the level and nature of training required by employees for each task assigned;
- Health and safety orientation for new employees on site.

4.3 Site Safety Officer

The Sr. PM/PM will assign a qualified SSO for each Peak field project. The SSO will report to the PM and will direct the health and safety activities at each work site.

A SSO is defined by OSHA as “an individual who is located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements” (29 CFR 19010.120(a)(3)). Under some circumstances, the designated SSO may be required to have eight hours of additional supervisory training beyond the initial 40-hour HAZWOPER training and the annual 8-hour refresher HAZWOPER training.

The primary responsibilities of the SSO are:

- Implement the site-specific HASP;
- Perform on-site health and safety monitoring (e.g., air monitoring, personnel monitoring);
- Write, implement and maintain job safety analysis;
- Supervise and maintain safe work practices during field work;
- Conduct air monitoring (where applicable) and ensure the health and safety monitoring equipment (e.g., PID, FID) is in good working condition;
- Verify that the site-specific HASP and program specific templates address site-specific health and safety concerns and recommend changes to the Sr. PM/PM and CHSM, as necessary;
- Investigate and report accidents, illnesses, and incidents occurring on a project-related site;

- Conduct daily health and safety meetings and ensure that site-specific training is conducted (where necessary) for onsite personnel;
- Transport field personnel with non-life threatening situations to the hospital, as necessary;
- Call emergency personnel for field personnel with life-threatening situations;
- Order shut down of any project-related site activities upon determination of an imminent health or safety hazard; and
- Accompany OSHA and other government agency personnel visiting the site in response to health and safety issues, as necessary.

4.4 Subcontractors and Visitors

Visitors (who are simply observers from Peak or other outside entities) are required to report to the SSO prior to entering the defined work zones. The SSO will document decisions regarding access to the site. If granted limited access, visitors must provide the SSO with proper documentation that shows compliance with the training and medical requirements of the HASP, compliance with other applicable sections, and satisfy additional conditions placed on them as deemed appropriate by the SSO to ensure visitor safety. The SSO will provide site briefing information to all site personnel and visitors. At some job sites/areas, it may be appropriate for visitors to sign in and out (daily) under the SSO's direction for the duration of their approved visit. At some job sites/areas, it may be appropriate for trained personnel to escort all visitors throughout the site.

It is important for site personnel to be informed of the applicable project hazards and protective measures. The following items will be included in but not limited to, the site orientation. The SSO will review the HASP, highlighting the following information to subcontractors and visitors and document the orientation for the project files.

- Acute and chronic health effects of contaminants of concern, hazard communication program;
- Physical and mechanical hazards;
- Personal hygiene procedures;
- Work zones;
- Required Personal Protective Equipment (PPE);
- Evacuation plan and assembly area;
- Air monitoring program; and,
- Hazard recognition, reporting, and site safety.

5 DESCRIPTION OF POTENTIAL SITE SPECIFIC HAZARDS

Below is a listing of some of the known, suspected and potential site-specific hazards that may be associated with the tasks being performed at this site.

Potential Hazards (check boxes that apply to the site):

	Visible soil contamination		Open lagoons		Underground tanks		Air stack emissions
	Observed free product		Visible leachate		Surface tanks		Visible onsite releases
	Underground utilities	X	Odors		Observed tanks		Visible offsite releases
	Building contamination	X	Dust		Confined spaces		Visible onsite erosion

☐	Onsite surface water contamination	☐	Open pits	☐	Excess debris	☐	Overhead electric lines
☐	Offsite surface water contamination	☐	No hazards	☐	High traffic issues	☐	Corroded containers

List Other COVID-19

5.1 Chemicals/Contaminants

The following is a tabulated list of contaminants that could be encountered on-site during the performance of a project related task:

Contaminant Name	CAS #	§TLV/PEL (ppm)	Max Conc in Soil (mg/kg)	Max Conc in Soil Vapor (ug/m³)	Health Hazards/ Comments
Tetrachloroethene (PCE)	127-18-4	25/100 TWA	0.0048	13,000	Irritation to eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Trichloroethene (TCE)	79-01-6	50/100 TWA	ND	470	Irritation to eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting, dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

§Please note TLV value is for an 8-hour TWA (Time Waited Average)

5.1.1 *Pathways to Worker Exposure*

The pathways to exposure include Ingestion, Injection, Skin and/or Eye Contact, Skin Absorption, Inhalation of vapors, fumes or dusts.

5.1.2 *Health Effects and Medical Monitoring*

Health effects include irritation. Infection may result from skin and/or eye contact or skin absorption. Nausea and possibly severe illness may result from ingestion, injection or inhalation. Consult a physician if medical attention is considered necessary.

5.1.3 *Steps to Take if Exposed*

- Inhalation – Receive respiratory support.
- Absorption –
    - Skin Contact – Soap wash promptly.

- Eye Contact – Irrigate eyes immediately.

- Injection – Receive medical attention immediately.
- Ingestion – Receive medical attention immediately.

5.2 Weather Related Hazards

Daily and seasonal weather changes may occur during the implementation of this HASP. Workers should be aware of predicted weather changes, dress accordingly and bring extra clothing as/if needed. If during an event the weather conditions change (i.e lightning, snow, ice, rain, high winds, etc.) a brief meeting should be conducted to evaluate any new potential hazards and what preventative measures should be taken to keep safe.

Workers wearing protective clothing on warm or hot days will be susceptible to heat stress and need to be briefed on the signs, symptoms, and treatment of heat exposure. If anticipated, further details regarding exposure to cold and heat stress hazards should be inserted below.

All field workers, even those not wearing protective equipment, should be monitored for heat stress by monitoring a radial (wrist) pulse, body temperature, or visual observations in regions where ambient temperatures reach or exceed 95°F.

1. Pulse Rate

Team members pulse rates should be monitored at the beginning of a rest period. The radial (wrist) pulse will be counted during a 30-second period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one third.

2. Body Temperature

Body temperature should also be monitored at the beginning of the rest period, before drinking.

- If the oral temperature exceeds 99.6°F, shorten the next work cycle by one third without changing the rest period.
- If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by one third.

No one should wear semi-permeable or impermeable garments when his/her oral temperature exceeds 100.6°F.

Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Temperature	Normal Work Clothing	Impermeable Work Clothing
90°F or above	after each 45 minutes of work	after each 15 minutes of work
87.5°F to 90°F	after each 60 minutes of work	after each 30 minutes of work
82.5°F to 87.5°F	after each 90 minutes of work	after each 60 minutes of work
77.5°F to 82.5°F	after each 120 minutes of work	after each 90 minutes of work`

72.5°F to 77.5°F	after each 150 minutes of work	after each 120 minutes of work

Please note that there can be situations where normal work clothing is worn (for example, in a manner necessary to prevent biological hazards - tick bites, etc) where more frequent monitoring is appropriate.

Taking the following steps can avert heat stress illnesses:

1. Adjust work schedules:
   Mandate work slowdowns, as necessary,
   Rotate personnel,
   Perform work during cooler hours of day (early morning or late afternoon).
2. Provide shelter, such as air-conditioned vehicles or shaded areas, to allow workers to rest.
3. DRINK FLUIDS!!! Daily fluid intake shall equal body water lost through perspiration. The normal thirst mechanism is not sensitive enough to ensure enough water will be ingested to replace lost body fluids. When heavy sweating occurs, gradually drink liquids such as Gatorade or similar electrolytic beverages.
4. Provide cooling devices to aid natural body heat exchange.

Apparent Temperature (°F)											
Air Temperature (°F)	125	123	141								
	120	116	130	148							
	115	111	120	135	151						
	110	105	112	123	137	150					
	105	100	105	113	123	135	149				
	100	95	99	104	110	120	132	144			
	95	90	93	96	101	107	114	124	136		
	90	85	87	90	93	96	100	106	113	122	
	85	80	82	84	86	88	90	93	97	102	108
	80	75	77	78	79	81	82	85	86	88	91
	75	70	72	73	74	75	76	77	78	79	80
	70	65	66	67	68	69	70	70	71	71	72
	%	10	20	30	40	50	60	70	80	90	100
	Percent Humidity										

Exposure to cold is common during winter months when workers do not adequately protect themselves from the elements. Situations of concern that may arise include, but are not limited to, prolonged exposure to cold weather, moisture, and wind (wind chill) without proper protection. It is important to dress properly to avoid injury. Wear several layers of thick, loose-fitting clothing to insulate your body by trapping warm, dry air inside. Loosely woven cotton and wool cloths best trap air and resists dampness. The head and neck lose heat faster than any other part of the body. Your cheeks, ears, and nose are the most prone to frostbite. Wear a hat, scarf, and turtleneck sweater to protect these areas.

Symptoms:

- Pale, cool skin

- Slow, weak pulse
- Lethargy, drowsiness, lack of muscular co-ordination
- Uncommunicative, poor judgment
- Shivering

First Aid:

- Warm slowly by adding additional clothing, heating source, body heat
- If wet, initially warm the casualty, then change clothing
- When partially recovered, give warm fluids
- When able to stand, encourage mild exercise

Frost Bite

The extent of frostbite is difficult to judge until several hours after thawing.

Symptoms:

- Superficial frostbite is characterized by gray, yellow or white patches on the affected areas. The skin remains soft and pliable, but becomes red and flaky after thawing.
- Deep frostbite is characterized by waxy and pale skin, the affected parts feel cold, hard, and solid which may turn blue or purple upon thawing. Large blisters may also appear after the skin regains its warmth.

First Aid:

- Move the victim to a warm place immediately.
- Remove any constrictive clothing that could impair circulation.
- If you notice signs of frostbite, seek medical attention immediately.
- If a body part is partially thawed, place frostbitten part in warm water (102 to 106 degrees Fahrenheit). If a thermometer is not available, test the water first to see if it is warm. Normal body temperature usually returns within 20 to 40 minutes during warming or until tissues soften.
- DO NOT rub or massage the frostbite area.
-

Hypothermia

Hypothermia is a potentially fatal condition that especially affects the elderly. The body's core temperature is lowered to the extent that brain function is impaired and the heart's activity may be compromised. Urgent first aid intervention is required.

Symptoms:

- Pale, cold skin - no capillary return when fingernails are pressed
- Slow pulse, sometimes skipping a beat
- Slow, shallow respiration
- Blurred, or double vision
- Casualty is silent, appears asleep, difficult to rouse; or unconscious
- Casualty experiences a sense of 'well-being'
- Absence of shivering
- If very cold, may have non-reacting pupils and appear 'death-like'

First Aid:

- Urgent ambulance transport
- Warm casualty slowly, wrap in 'space blanket' or similar
- If wet, leave less bulky clothing on and warm slowly
- Once casualty commences shivering, reassess heating
- Nothing by mouth until fully recovered
- Be prepared for sudden collapse and resuscitation

5.3 Slip, Trip and Fall Hazards

Personnel shall be cognizant of slipping, tripping and falling hazards. The potential hazards may result from ongoing construction, loose soft soils, open pits, uneven surfaces and debris, equipment and materials, vegetation, muddy or icy conditions or a variety of other reasons. Although not all inclusive, the following procedures are recommended to mitigate slipping, tripping and falling hazards: maintaining a safe distance (at least 15 feet) from open excavations, removing obvious surface debris (must be equipped with appropriate personal protection equipment beforehand), maintaining an organized work area, removing or controlling excessive vegetative growth (permits will be required if in certain wetland areas), refraining from performing site activities during inclement weather (e.g., precipitation events) or when surface conditions are unfavorable, modifying surface conditions (e.g. placing salt or sand on ice, crushed stone in muddy areas, clearing overgrown vegetation) and inspecting protective footwear for loss of integrity.

5.4 Manual Handling

Be cautious and plan ahead to mobilize heavy equipment and supplies yourself especially to/from a vehicle trunk/flatbed. Manual handling of various soil analysis and drill boring equipment, instruments, bending below the waist and above the shoulders raise the risk of Muscular Skeletal Disorders (MSDs). MSDs can occur suddenly, often from an awkward or sudden movement, such as crouching for hours and then straining your back when you get up and reach for something heavy on a high shelf. MSD related injuries can also develop gradually, such as pain and cramping in the hands when tendons in the wrist become inflamed.

Biological agents may be viral, fungal, bacterial, or of higher orders: insects (including ticks and stinging insects), wild animals (especially snakes) and domesticated animals. Any mammal encountered on-site should be considered potentially rabid. In many parts of the northeast United States, tick-borne diseases pose a significant health risk during warm months (see Attachment J, Ticks and Tick-Borne Diseases). Field personnel are encouraged to use insect repellents before donning PPE. To avoid snake bites, check for snakes before walking through grassy or debris strewn areas. The presence of medical waste suggests the possibility that pathogenic micro-organisms may be present. A fully-stocked first aid kit, insect and tick repellent must be available for use in the field.

Coronavirus Disease 2019 (COVID-19)

Steps to protect yourself during field activities:

1. Plan your work event to incorporate the following steps and communicate that plan electronically to project Team members.

i.) If the site is active and/or occupied, communicate with property representatives to share relevant information regarding protection of occupants and our staff, as well as property protocols you need to be aware of. These measures should be implemented regardless of whether work is interior or exterior.

ii.) Communicate protection steps with other site personnel on arrival and during tailgate meetings (keep 6 feet of distance between yourself and others).

2. Eliminate non-essential travel and stops for supplies (if needed, bring ice from the office, coffee and/or lunch from home to avoid stopping and potential exposure in store);
3. Wear nitrile gloves and avoid direct contact (for example, shaking hands) with people and recently obtained laboratory and/or rental equipment and supplies);
4. Practice "social distancing" by putting at least 6 feet of distance between yourself and other people;
   a.) Do not drive with others. One person per vehicle.
   b.) Arrange inspections at times that minimize interaction with others, and best allow for the implementation of the above referenced steps to protect yourself.
   c.) Avoid touching objects used by others or wear protective gloves when doing so. When this can't be avoided (like driving a company vehicle) decontaminate by wiping down surfaces with disinfectant wipes before use.
   d.) Bring your own food/beverages
5. Wash your hands often and thoroughly with soap and water for at least 20 seconds after you have been in a public place, or after blowing your nose, coughing, or sneezing;
   a.) If soap and water are not available, use a hand sanitizer or hand rub that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry.
4. Avoid touching your eyes, nose, and mouth with unwashed hands;
5. Cover your mouth and nose if you need to cough or sneeze, also known as "respiratory etiquette";
6. Decontaminate/Wipe down vehicle steering wheels, control knobs/buttons, mirrors, door handles, etc. and any equipment used with disinfectant wipes before and after use;
7. Discard wipes, tissues, and disposable PPE to avoid cross contamination.

Background

Coronaviruses are a large family of viruses that are common in humans and many different species of animals. Current symptoms reported for patients with COVID-19 have included mild to severe respiratory illness with fever, cough, and difficulty breathing. As this is a newly discovered virus information is evolving. Here is a Center for Disease Control (CDC) link to help identify COVID-19 Symptoms (if you are reading hard copy use: https://www.cdc.gov/coronavirus/2019-ncov/about/symptoms.html). The OSHA Guidance on Preparing Workplaces for COVID-19 can be found here (if you are reading hard copy use: https://www.osha.gov/Publications/OSHA3990.pdf).

There is currently no vaccine to prevent coronavirus disease 2019 (COVID-19). The best way to prevent illness is to avoid being exposed to the virus. The virus is thought to spread mainly from person-to-person.

•Between people who are in close contact with one another
•Through respiratory droplets produced when an infected person coughs or sneezes.

Respiratory droplets are produced when an infected person coughs or sneezes and can land in the mouths or noses, or possibly be inhaled into the lungs, of people who are nearby. Close contact may include:

- Being within approximately 6 feet of an individual with COVID-19 for a prolonged period of time.
- Having direct contact with body fluids (such as blood, phlegm, and respiratory droplets) from an individual with COVID-19.

6 MONITORING EQUIPMENT AND INSTRUMENTS

Monitoring equipment and instruments may vary based on the scope of work being performed and potential hazards. The following subsections describe the applicable equipment and instruments used for monitoring the known or potential hazards.

Peak will use an ultraviolet Photoionization Detector ("PID") to screen the site for semi- and volatile organic gases and vapors during the field work. If vapors are present, a Combustible Gas Indicator ("CGI") may be appropriate to monitor the lower explosive limit ("LEL") in the atmosphere. These instruments are described as follows:

Instrument:	PID	CGI
Detection Method:	Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.	A filament usually made of platinum is heated by burning the combustible gas or vapor. The increase in heat is measured.
Limitations:	Does not detect Methane or any compound if the probe used has a lower energy level than the compound's ionization potential. Response may change when gases are mixed. Other volatile sources may interfere with measurements. Reading can only be reported to the calibration standard used. Response may be affected by humidity.	Accuracy depends in part on the difference between calibration and sampling temperatures. Sensitivity is a function of the differences in the chemical and physical property between the calibration gas and the sample gas. Silicones, tetraethyl lead, halides and oxygen enriched atmospheres can damage the filament. Does not pro- vide a valid reading under oxygen deficient conditions.
General Care and Maintenance:	Recharge or replace battery. Regularly clean and maintain the instrument and accessories.	Recharge or replace battery. Calibrate immediately before use.

Operating Times:	10 hours; 5 hours with strip chart recorder.	Life of battery, or for the recommended interval between calibrations.

The Photoionization Detector (PID) or equivalent will be used to detect trace concentrations of certain organic gases and a few inorganic gases in the air. PID readings reflect total (readable) vapors in the air. The PID detects mixtures of compounds simultaneously. PID readings do not measure concentrations of any individual compound when a mixture of compounds is present.

The PID will be calibrated twice each day (before start of work and after the conclusion of work) using an isobutylene standard (molecular weight = 56.2) for calibration. Calibrations will be logged. PID readings should be measured in the breathing zone of the most highly exposed worker (i.e., the person who is closest to the source of known or suspected contamination) at least hourly.

7 TRAINING

All personnel working in areas where hazardous substances or hazardous wastes are present or suspected may be trained in accordance with OSHA requirements set forth in 29 CFR 1910.120(e)(1) and (2), which is a 40-hour training program consistent with job function and responsibilities. As warranted by the project, employees directly responsible for or who supervise employees engaged in hazardous waste operations shall complete at least eight additional hours of specialized supervisory training at the time of job assignment, in accordance with 29 CFR 1910.120(e)(3).

The SSO (or project manager after conferring with the SSO) will provide daily briefing, when new operations are planned, when changes in work practices must be implemented due to new information, or if site or environmental conditions change. Briefings will be documented on the Tailgate Forms (Appendix A). Briefings will facilitate conformance with prescribed safety practices when performance deficiencies are identified during routine activities or as a result of safety audits. Site training and daily briefings will include the following:

- Eating, drinking, chewing tobacco and smoking is prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
- Smoking or carrying smoking materials or flame producing devices within restricted areas is prohibited.
- Avoid whenever possible, contact with potentially contaminated substances and try to avoid walking through puddles, pools, mud, etc. Also avoid, whenever possible, kneeling on the ground, leaning or sitting on drums, equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., drum, ground, etc.).
- Prevent, to the extent possible, spillage. In the event that a spillage occurs, contain liquid if possible.
- No visitors will be allowed on site unaccompanied.
- Locate a decontamination area between site operations and the site exit.
- Protective equipment including, boots, gloves, and splash shields will be washed off before leaving the site and stored on-site in a predetermined location. Boots may be

decontaminated at the end of the field effort. Gloves, disposable suits, and splash shields should be thrown away.

8 PERSONNEL MONITORING

As required by the scope of work, known and potential hazards, air monitoring will be performed during working operations to ensure worker safety and health and to evaluate ambient air conditions at the site. The primary unit to be utilized is the photoionization detector. This unit will be calibrated daily in accordance with its operating manual.

8.1 Personnel Protective Equipment Monitoring

Skin contact with potentially contaminated soils, and vapor and dust inhalation are expected to be the primary exposure hazards to workers at the site. The SSO will monitor workers usage of proper personnel protective equipment (PPE).

9 LEVELS OF PROTECTION

An initial modified Level D will be donned for non-volatile and non-dust containing atmospheres. During intrusive work a PID will be used by the SSO to scan the area for volatile organics. The following criteria will define the action levels for the use of respiratory protective gear at the site:

PID READING OF AMBIENT AIR	ACTION
0-10 ppm above background	CONTINUE IN LEVEL D
10-200 ppm above background	EVACUATE THE AREA, LEVEL C PPE REQUIRED

* These action levels pertain to volatile organic compounds identified at the site. If other acutely toxic compounds are identified, action levels may need to be altered.

Peak personnel are not permitted to work under conditions that require Level C or above PPE. Only those workers who are medically certified to work wearing respirator protection will be permitted to continue activities. Level C will also be required if contaminated soil-dust becomes entrained in the air during field activities. The soils will be lightly wet down to help reduce dust.

PPE are required when engineering controls and work practices are not feasible. PPE are necessary to reduce doses of hazardous substances to concentrations below the PELs, as defined in 29 CFR 1910.120(g)(1)(ii). A PPE assessment is performed for all field tasks through the HASP. The following table provides guidance on action levels for PPE use.

Potential Air Contaminant	Instrument	Action Levels	Level of PPE Protection
Asbestos Lead-based paint	PCM or PDM Mini-Ram or equivalent [1]	> 1 fibers/cubic centimeter < 0.03 mg/m^3	Evacuate affected area
Explosive Vapors	CGI	Oxygen levels ≤ 19.5% or > 10% LEL Oxygen levels > 19.5% or < 23.5% or < 10% LEL	Evacuate affected area [2] Level D

Radiation	RAD	≤ 2 mRem/hr. > 2 mRem/hr	Level D Evacuate affected area [3]
Nuisance Particulates	Mini-Ram	< 5 mg/m^3 > 5 mg/m^3	Level D Evacuate affected area
Organic Vapors	PID/FID PID/FID	Continuous sustained (> 5 min.) readings < 5 units above background in the breathing zone and no visible dust Sustained (> 5 min.) readings > 5 units above background in the breathing zone and/or sustained dust clouds	Level D Evacuate affected area

[1] An equivalent unit shall be approved by the CHSM.

[2] Peak personnel are not trained for Level C work. At these levels, personnel shall leave the affected area for situation evaluation.

[3] Personnel are not trained for radiation work. If radiation levels exceed 2 mRem/hour, personnel shall evacuate the affected work area.

All PPE shall be of safe design and construction for the work to be performed and shall meet applicable American National Standards Institute (ANSI) standards, the NIOSH guidelines and/or OSHA regulations. PPE shall properly fit each employee. Our firm will provide all PPE free of charge to employees.

Eye and/or face protection will be provided when hazards exist from flying particles, liquid chemicals, or chemical gases or vapors. Safety glasses shall always incorporate side shields. Safety glasses not equipped with side shields will require the addition of such equipment. Safety glasses must be used in conjunction with splash/face shields, as the face shields are not impact rated or ANSI tested and approved. If prescription glasses are utilized, larger safety glasses or goggles will be provided to fit over the employee's glasses.

Hard hats will be provided whenever hazards from falling objects, overhead hazards, or low clearance hazards exist. Hard hats shall always be worn in the manner for which they are tested and designed. The hardhat brim shall always face forward. Hard hats shall be periodically inspected for cracks, gouges, or other defects that may not adequately protect the employee.

The levels of protection selected should be based primarily on:

- Type(s) and measured concentration(s) of the contaminant / chemical substance(s) in the ambient atmosphere and its toxicity.
- Potential or measured exposure to substances in the air, splashes or liquids, or other direct contact with material due to work being performed.

In situations where the type(s) of contaminant / chemical(s), concentration(s), and possibilities of contact are not known, the appropriate level of protection must be selected on the basis of professional experience and judgment until the hazards can be better characterized.

The recommended level of protection worn for each specific task will be determined by the SSO, PM, and/or CHSM, and protection levels are based on the known and suspected hazard characteristics of the site and subject to upgrading or downgrading based on changing environmental conditions and different work procedures. If needed, the SSO, PM and CHSM can obtain advice from the contract CIH/CSP.

While PPE reduces the potential for contact with harmful substances, the health and safety of response personnel requires safe work practices, decontamination, site entry protocols, and other safety considerations. Together, these protocols establish a combined approach for reducing potential harm to workers.

The following brief description of equipment is provided.

9.1 Level D

Level D is primarily a work uniform. It can be worn in areas where only boots or gloves can be contaminated or there are no inhalable toxic substances. Initially, Level D personal protection will be worn at the site by all personnel. The SSO, however, may require appropriate upgrading of PPE depending on actual site conditions.

Level D personnel protective equipment may include:

- Coveralls or Tyvek suits.
- Gloves.
- Boots/shoes, leather or chemical-resistant, steel toe and shank. Additional equipment (dependent on actual conditions) may include:
    - Boots (outer), chemical-resistant (disposable).
    - Safety glasses or chemical splash goggles.
    - Hard hat (with face shield).
    - Escape mask.

The actual combination of protective equipment worn will be decided by the SSO based on site conditions.

9.2 Cleaning, Maintenance, and Disposal

Each employee is responsible for inspecting his/her PPE before and after each use. Any damaged or defective PPE is to be taken out of service immediately and repaired or replaced.

Used or disposable PPE items are to be properly contained at job sites and disposed in accordance with the site-specific work plan. Non-disposable items, such as hard hats, are to be decontaminated at the job site. Personnel are responsible for cleaning their own PPE after each work shift. Cleaning procedures are listed in Section 16.

10 SITE CONTROL ZONES

Prior to the initiation of any field activities, site control measures (i.e., establishment of work zones) shall be implemented to:

- Reduce accidental spread of hazardous substances by workers or equipment from contaminated areas to the clean area;
- Confine work activities to appropriate areas, minimizing likelihood of accidental exposure,
- Facilitate location and evacuation of personnel in case of an emergency.

In general, three work zones are used: the exclusion zone (work area), the contaminant reduction zone, and the support zone. The wind direction will be taken into account when establishing these zones. The wind direction will be monitored continuously, and zones modified if need be. Each of these is discussed in the following sections.

10.1 Exclusion Zone

The exclusion zone is the area where contamination is either known or expected to occur and the greatest potential for exposure or contaminants of concern exists. The exclusion zone ("hot zone") separates the area of contamination from the rest of the site and should be physically secured (barrier tape, fences, chains) from the rest of the site. The exclusion zone may also be referred to as a work zone where an individual(s) could perform a job task. The hot zone:

- Provides sufficient space to protect personnel outside the zone from potential fire or explosions;
- Allows an adequate area in which to conduct site operations; and
- Reduces the potential for contaminant migration.

Access is restricted in the Exclusion Zone to authorized site personnel. However, all personnel located in the Exclusion Zone shall receive instruction in the proper evacuation procedures in case of a hazardous substance release or other emergency.

10.2 Contaminant Reduction Zone

The contaminant reduction zone (CRZ) is the transition area between the exclusion zone ("hot zone") and the support zone ("clean zone"). The CRZ is the area in which decontamination procedures take place so that contamination decreases while progressing from the exclusion zone to the support zone.

The SSO shall exercise professional judgment in determining how the Contamination Reduction Zone will be organized and what decontamination materials will be used. Factors to be considered include:

- The extent and type of hazard expected;
- Number of site personnel requiring decontamination facilities;
- Explosive potential;
- Meteorological conditions;
- Topography;
- Levels of protection selected; and,
- Availability of equipment and supplies.

Access is restricted in the Containment Reduction Zone to authorized site personnel. However, all personnel located in the Containment Zone shall receive instruction in the proper evacuation procedures in case of a hazardous substance release or other emergency.

10.3 Support Zone

The Support Zone is the uncontaminated area where workers are unlikely to be exposed to hazardous substances or dangerous conditions. The Support Zone is the appropriate location for the command post, medical station, equipment and supply center, field laboratory and any other administrative or support functions that are necessary to keep site operations running efficiently.

Access is restricted in the Support Zone to authorized site personnel. However, all personnel located in the Support Zone shall receive instruction in the proper evacuation procedures in case of a hazardous substance release or other emergency.

11 EMERGENCY AND FIRST AID EQUIPMENT AND COMMUNICATIONS

Basic emergency and first aid equipment will be available and include a first aid kit, emergency eyewash or drench system, fire extinguisher, and Level D protective equipment. A telephone may be located at the Response Vehicle for communication with emergency support services/facilities. If not appropriate for this particular project, the nearest public phones or cell phones shall be identified.

12 EMERGENCY PROCEDURES

When possible and practicable (following PM's assessment), personnel on-site will use the "buddy" system (pairs). Buddies will use pre-arranged hand signals or other means of emergency signals for communication in case of radio breakdown.

In emergencies, the following hand signals are to be used:

- Hand gripping throat: Out of air, can't breathe.
- Grip partner's wrist or place both hands around waist: Leave area immediately!
- Hands on top of head: Need assistance.
- Thumbs up: OK, I'm all right, I understand.
- Thumbs down: No, negative.

Visual contact will be maintained between "buddies" on-site with the team remaining in close proximity in order to assist each other in case of emergencies. Site entrance and exit routes will be planned and emergency escape routes will be delineated by the PM and/or SSO.

Field crew members will inform each other of non-visual effects of possible toxic exposure:

- headaches
- dizziness
- blurred vision
- cramps
- irritation of eyes, skin or respiratory tract

In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on scene, the entire field crew will immediately halt work and act according to the instructions provided by the SSO.

The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and a re-evaluation will be conducted by appropriate on-site Health and Safety personnel.

13 ON-SITE EVACUATION PLAN

Should either a fire or explosion occur on-site, all personnel will proceed to the nearest safe zone. At this time, the local fire and police department will be called for assistance. The acting officer of the fire department and the SSO will determine if further evacuation is necessary. This evacuation would include all personnel and inhabitants of any surrounding area which are in immediate danger.

14 SPILL CONTROL PLAN

The best emergency spill plan is planning to avoid and prevent spills. Upon planning a job the PM will inquire if there are any site-specific emergency procedures or spill kits on-site and inform the SSO and field team, as appropriate. In the event of accidental spillage, the following spill response protocol will be implemented as follows:

1. First Aid will be administered to injured/contaminated persons. Any employee observing a spill will act immediately to remove and/or protect injured/contaminated persons from any life-threatening situation. First Aid and/or decontamination procedures will be implemented as appropriate.
2. Warn unsuspecting persons of the hazard. Personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons and by obtaining assistance of other personnel who are familiar with spill control and cleanup techniques.
3. Stop the spill at the source, if possible. Hit/activate an emergency stop button if one exists. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. Personnel will not expend more than a brief effort prior to notifying the SSO.
4. Utilizing available personal radio communications or other rapid communication procedures, the SSO will be notified of the spill, including information on material spilled, quantity, personnel injuries, and immediate life-threatening hazards.
5. Spill assessment and primary containment. The SSO will make a rapid assessment of the spill and direct primary containment measures which may include, but are not limited to:
    A. Construction of a temporary containment beam utilizing on-site absorbent pads and booms or earth.
    B. Digging a sump, installing a polyethylene liner and diverting the spilled material to the sump.
6. Spill clean-up. Personnel will cleanup all spills following the above referenced and any additional appropriate spill clean-up procedures.

15 ACCIDENT AND INCIDENT REPORTING AND INVESTIGATIONS

15.1 Personal Injury

Emergency first aid shall be applied on site as deemed necessary. Then decontaminate and transport the individual to the nearest medical facility if needed. Decontamination may be waived prior to

transport, if the injury or illness is life threatening. The ambulance/rescue squad shall be contacted for transportation as necessary in an emergency. A Route to Hospital Map is provided behind the front cover of this HASP and in Appendix B if transportation is required without the assistance of an ambulance. If an accident occurs, an accident report will be filed by the SSO. A blank accident form is provided behind the Route to Hospital Map. The phone numbers listed on the first page and the primary hospital route will be kept in a designated location (e.g. site vehicle) and/or posted at the work site.

15.2 Accident / Incident Reporting

The SSO will maintain logs and reports covering health and safety aspects of the project throughout the duration of work activities. In the event of an on-site accident resulting in an exposure or injury, the SSO will immediately complete an Accident/Incident Form (Appendix C) and send copies to PM and CHSM within 72 hours.

15.3 Accident Investigations

Accidents are usually complex. An accident may have 10 or more events that can be causes. A detailed analysis of an accident will normally reveal three cause levels: basic, indirect, and direct. At the lowest level, an accident results only when a person or object receives an amount of energy or hazardous material that cannot be absorbed safely. This energy or hazardous material is the direct cause of the accident. The direct cause is usually the result of one or more unsafe acts or unsafe conditions, or both. Unsafe acts and conditions are the indirect causes or symptoms. In turn, indirect causes are usually traceable to basic causes such as poor management policies and decisions, or to personal or environmental factors.

Most accidents are preventable by eliminating one or more causes. Accident investigations determine not only what happened, but also how and why. The information gained from these investigations can prevent recurrence of similar or perhaps more disastrous accidents. Accident investigators are interested in each event as well as in the sequence of events that led to an accident. The accident type is also important to the investigator. The recurrence of accidents of a particular type or those with common causes shows areas needing special accident prevention emphasis.

The initial investigation has three purposes:

1. Prevent further possible injury and property damage
2. Collect facts about the accident
3. Collect and preserve evidence (where applicable)

The SSO will be responsible for the reporting associated with an accident and for obtaining all relevant information. The SSO will be responsible for the reporting of the accident and for promptly informing the PM. The SSO will take the following steps:

a. Secure the area. Do not disturb the scene unless a hazard exists.
b. Prepare the sketches and photographs necessary to help determine the cause(s) of the accident. Label each carefully and keep accurate records.
c. Interview each victim and witness. Also interview those who were present before the accident and those who arrived at the site shortly after the accident. Keep accurate records of each interview. Use a recording device if desired and if approved.

16 DECONTAMINATION PROCEDURES

This section establishes general decontamination guidelines for activities involving known or potential hazardous substances. This section applies to all field activities where exposure to hazardous substances may occur.

16.1 Personal Decontamination

Decontamination procedures are dependent on the level of respiratory and dermal protection employed during site activities. The higher the level of protection, the more steps in the decontamination procedures. Personnel typically conduct field activities by utilizing Level C and Level D respiratory / dermal protection; therefore, this section discusses the full decontamination procedures for these PPE levels only. If Level B protection is required, specific procedures will be incorporated into the site-specific HASP and associated training provided accordingly.

- Equipment necessary for decontamination of personnel should include:
- Plastic drop cloths
- Hay bales, soil or some other means to contain liquids;
- Plastic wash tubs;
- Long-handled brushes;
- Decontamination fluids (e.g., alconox, water);
- Paper towels;
- Spray units; and,
- Containers for collection of wash water (as necessary).

16.1.1 Level D Decontamination Procedures

The following section outlines the decontamination procedures for Level D dermal protection, which consists of:

- Steel toed boots
- Chemical-resistant outer gloves
- Nitrile gloves
- Hard hat (as required)
- Safety glasses or goggles

In general, the steps for Level D shall be followed; however, the decontamination procedures may be modified in the site-specific HASP, with the approval of the SSO.

1. Segregated equipment drop
2. Outer glove/coverall/boot cover wash and rinse
3. Outer glove/coverall/boot cover removal
4. Inner glove wash and rinse
5. Inner glove and safety glasses/googles removal

17 SITE PLAN

N
W
E
S

PEAK ENVIRONMENTAL LLC
26 Kennedy Boulevard, Suite A, East Brunswick, NJ 08816
Phone: 732-326-1010 www.peak-environmental.com

LEGEND

PROPERTY BOUNDARY

BROWNFIELD SITE BOUNDARY LINE

SOURCE:

1. MAP CREATED IN HARN/NY.NY-EF, NEW YORK STATE PLANE, EAST ZONE, U.S. SURVEY FOOT
2. AERIAL IMAGE FROM 2019 GOOGLE MAPS.
3. SITE BOUNDARY GRAPHICALLY SHOWN PER THE WESTCHESTER COUNTY GEOGRAPHIC INFORMATION SYSTEMS WEBSITE.

SITE MAP

5 WESTESTER PLAZA
ELMSFORD, NEW YORK

PROJECT: 2847

DATE: APRIL 05, 2021

DRAWN BY: EC

CHECKED BY: MB

DRAWING 2

G:\0000_PROJECTS\2847_MACKCALI - WESTCHESTER, NY\01-CAD\2021-04-05_RIW MAP SET\2021-04-05_BROWNFIELD APP.DWG

18 APPENDIX A: TAILGATE SAFETY MEETING / JOB SAFETY ANALYSIS FORM

PEAK ENVIRONMENTAL INC

TAILGATE SAFETY MEETING FORM / JOB SAFETY ANALYSIS

Project Name / Number: _____ Date: _____ Time: _____

Client: _____ Site Address: _____

Weather Conditions: _____ Forecasted Weather: _____

Wind Direction: _____ Safe Haven: _____

Evacuation Routes: _____

Assembly Point: _____

Hospital Name / Address: _____

Hospital Phone #: Ambulance Phone #: 911

Work Activities: **Personal Protective Equipment:**

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Equipment: _____

Other Safety Topic(s): _____

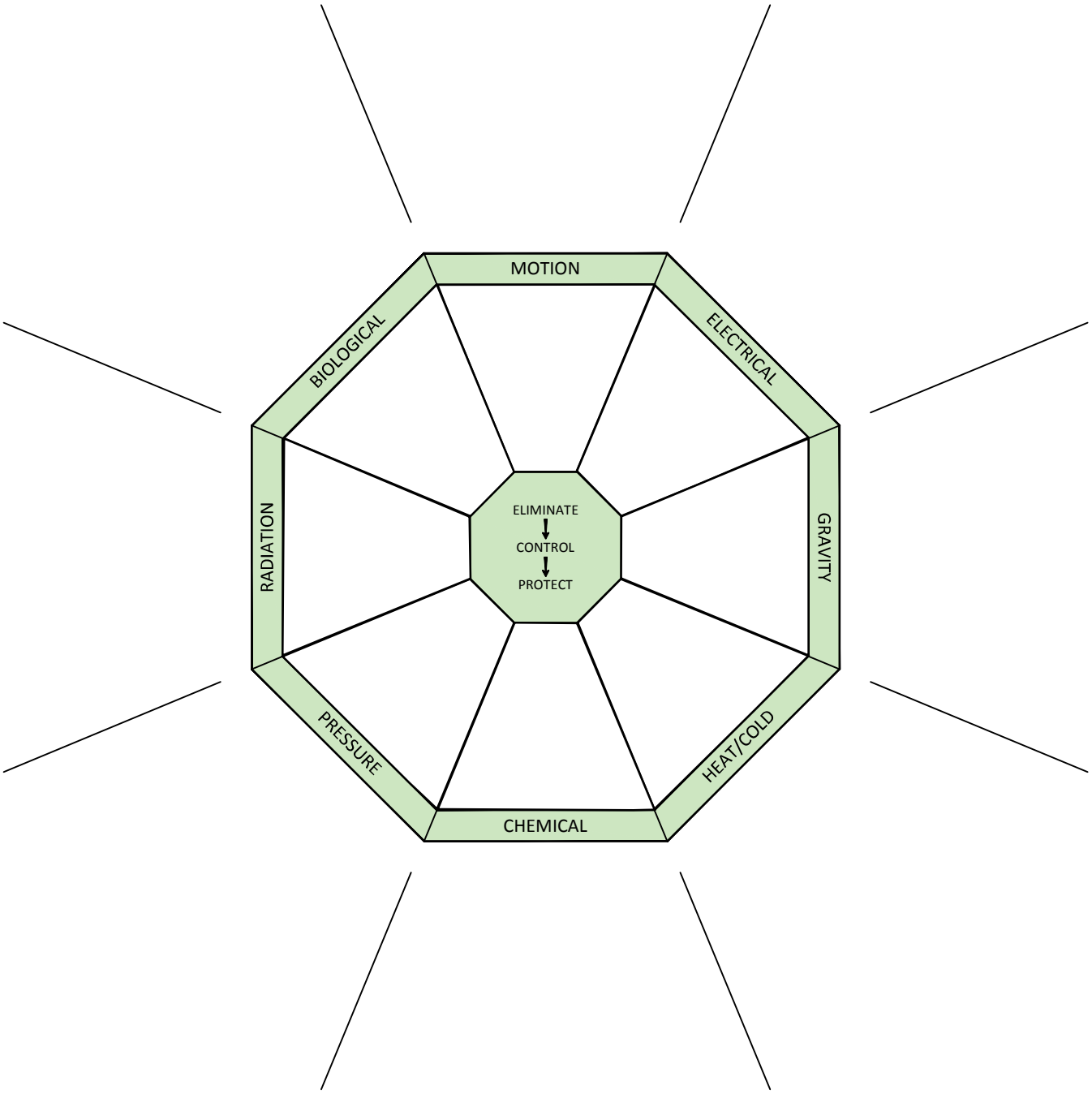
H&S Topics Presented by Subcontractor:

Potential H&S Hazard:	**Mitigation Plan:**

Attendees

Printed Name	**Signature**

Meeting Conducted by:



PEAK ENVIRONMENTAL LLC
26 Kennedy Blvd, Suite A, East Brunswick, NJ 08816
Phone: 732-326-1010 www.peak-environmental.com

Note all related health and safety hazards in the inner box.
Describe actions that will be taken to mitigate hazards the outer box.

Job Safety Analysis Checklist Form

DATE:
JOB#:
PERMIT#:
ISSUED BY:
SUPERVISOR:

Job Analyzed: _____ **Project Name:** _____

Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS
_____ Excavation
_____ Cold Work
_____ Hot Work
_____ Confined Space Entry Permit
_____ All Conditions Met
_____ Signed-off When Complete
_____ Road/Sidewalk Opening Permit
_____ Traffic Control Officer
_____ Other:

PPE
_____ Subcontractor HASP/JSA
_____ Chemical Protective Gloves
_____ Leather Gloves
_____ Special Purpose Gloves (e.g. Whizards)
_____ Chemical Protective Coveralls
_____ Acid Suit
_____ Chemical protective Boots
_____ Chemical Splash Goggles
_____ Face Shield
_____ Respirator
_____ Fresh Air Ventilation
_____ PID
_____ Multi-gas Meter
_____ Dust Monitor
_____ Hearing Protection
_____ Safety Harness
_____ Traffic Cones/Signs
_____ Sunscreen
_____ Drinking Water Available
_____ Other:

TOOLS
_____ Current Inspection
_____ Proper Tools for the Job
_____ Good Tool Condition
_____ Qualifications, e.g. explosive actuated tool
_____ Other:

EMERGENCY EQUIPMENT
_____ Fire Extinguishers
_____ Safety Shower/Eyewash
_____ Evacuation Route Mapped
_____ Other:

ACCESS
_____ Scaffold (properly inspected ____)
_____ Scaffold Training
_____ Ladder (HS 302 followed)
_____ Man-lift
_____ Personnel Basket (inspected/approved)
_____ Operator Training
_____ Special Provisions
_____ Other:

WELDING
_____ Flash-burns
_____ Combustibles
_____ Spark Containment
_____ Shields
_____ Fire Resistant Suit
_____ Goggles
_____ Welder's Helmet
_____ Grounding
_____ Water Hose
_____ Fire Extinguisher
_____ Fire Blanket
_____ Fire Watch
_____ Sewer Covers
_____ Other:

OVERHEAD WORK
_____ Barricades
_____ Signs
_____ Hole Cover
_____ Handrail
_____ Other:

ELECTRICAL
_____ Locked & Tagged out
_____ Try Start/Stop Switch
_____ GFCI Test
_____ Assured Grounding
_____ Extension Cord Inspection
_____ Other:

LIFTING
_____ Forklift
_____ Boom Truck
_____ Load Chart
_____ Angle
_____ Crane
_____ Chain-fall
_____ Proper Rigging Practices
_____ Manual Lifting
_____ Condition of Equipment
_____ Operator Certification

DRILLING / DIRECT PUSH
_____ Underground Utilities
_____ Overhead Hazards
_____ Rig Inspected
_____ Air Monitoring
_____ Emergency Procedures
_____ Other:

HAZARDS (ENVIRONMENTAL)
_____ Cold Stress
_____ Heat Stress
_____ Heavy Objects/Manual Lifting
_____ Hot/Cold Surfaces or Materials
_____ Inadequate Lighting
_____ Irritating Plants
_____ Noise
_____ Vehicular Traffic
_____ Heavy Weather
_____ Water/Flooding Hazards
_____ Insects/Animals
_____ Other:

HAZARDS (CHEMICALS)
_____ CoCs Identified
_____ Chemical Burn Skin/Eyes
_____ Flammable
_____ Ingestion
_____ Inhalation
_____ Skin Contact

HAZARDS (BODY)
_____ Fall Potential
_____ Pinch Points
_____ Slip-Trip Potential
_____ Other:

OTHER WORK IN AREA
_____ Others Working Overhead
_____ Type Work Others Doing
_____ PPE Due to Other Work
_____ Other:

CONFINED SPACE ENTRY
_____ Permit Required
_____ Permit Completed
_____ Personnel Trained
_____ Rescue Services Available

EXCAVATION
_____ Permit Completed
_____ Competent Person Supervising
_____ Underground Utilities
_____ Overhead Hazards
_____ Soils Tested
_____ Heavy Equipment Inspected
_____ Perimeter Protection
_____ Daily Inspections
_____ Protective Systems
_____ Air Monitoring

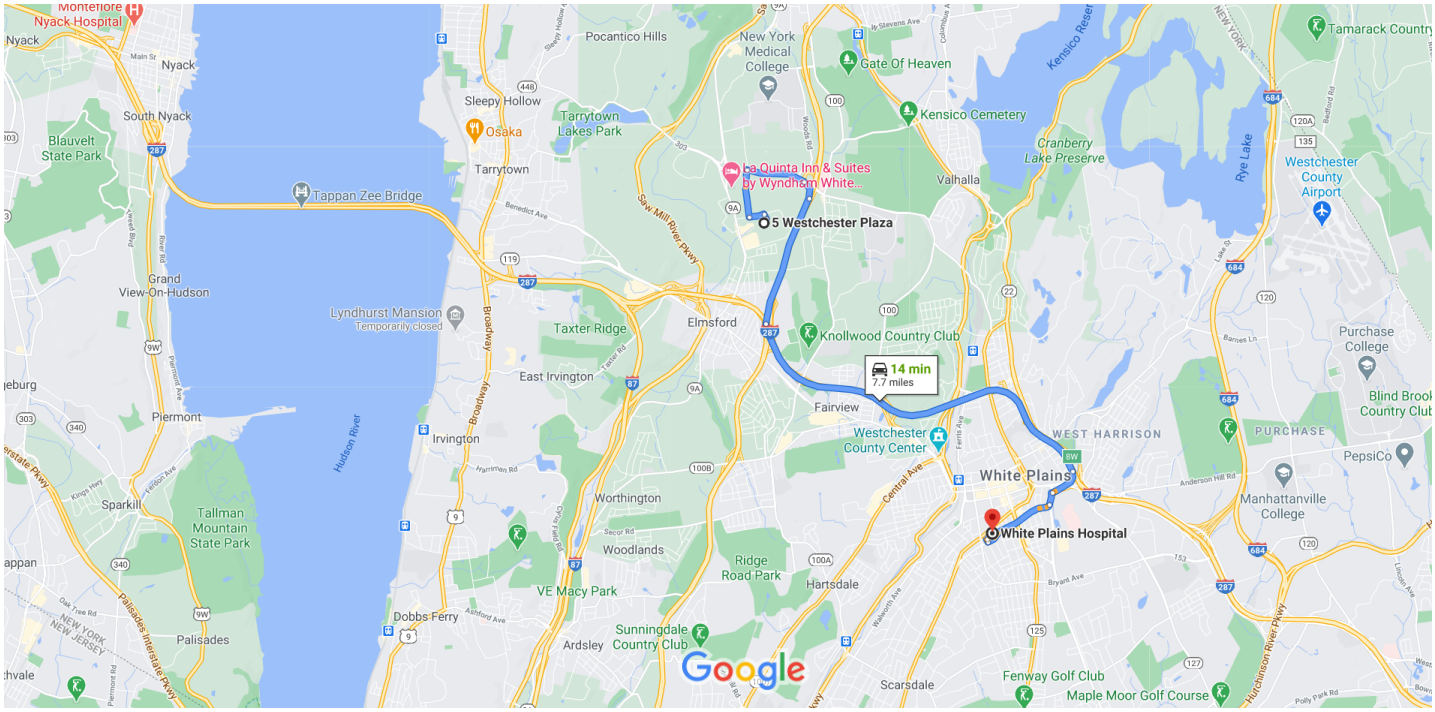
SUPERVISOR/FOREMAN RECOMMENDATIONS:

19 APPENDIX B: MAPS

Google Maps

5 Westchester Plaza, Elmsford, NY 10523 to White Plains Hospital

Drive 7.7 miles, 14 min



Map data ©2021 1 mi

5 Westchester Plaza

Elmsford, NY 10523

Get on Sprain Brook Pkwy S from Clearbrook Rd and NY-100C E

4 min (1.4 mi)

1. Head north toward Westchester Plaza W

85 ft

2. Turn right onto Westchester Plaza W

95 ft

3. Turn left onto Westchester Plaza

276 ft

4. Turn left onto Executive Blvd/Hunter Ln

0.1 mi

5. Turn right onto Clearbrook Rd

0.5 mi

6. Turn right onto NY-100C E

0.6 mi

7. Use the right lane to take the ramp onto Sprain Brook Pkwy S

0.2 mi

Take I-287 E to Bloomingdale Rd in White Plains. Take exit 8W from I-287 E

6 min (5.3 mi)

8. Merge onto Sprain Brook Pkwy S

1.3 mi

9. Use the left lane to merge onto I-287 E toward White Plains

3.7 mi

10. Take exit 8W for Bloomingdale Rd

0.3 mi

Take Maple Ave to your destination

5 min (0.9 mi)

11. Use the middle lane to turn left onto Bloomingdale Rd

0.1 mi

12. Turn right onto Maple Ave

0.7 mi

13. Turn right onto Davis Ave

151 ft

14. Turn right

Destination will be on the right

285 ft

White Plains Hospital

41 E Post Rd, White Plains, NY 10601

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

20 APPEXDIX C: SIGNATURE PAGE

SITE SPECIFIC HEALTH AND SAFETY PLAN SIGNATURE PAGE

Prior to the start of work, this Health and Safety Plan has been reviewed by the following:

Company	Name	Signature	Date

21 APPENDIX D: ACCIDENT FORM

Employee's Report of Injury Form

Instructions: Employees shall use this form to report all work related injuries, illnesses, or "near miss" events (which could have caused injury or illness) – *no matter how minor*. This helps us to identify and correct hazards before they cause serious injuries. This form shall be completed by employees as soon as possible and given to a supervisor for further action.

I am reporting a work related: ☐ Injury ☐ Illness ☐ Near Miss	
Your Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this injury/near miss? ☐ Yes ☐ No	
Date of injury/near miss:	Time of injury/near miss:
Name of witnesses (if any):	
Where, exactly, did it happen?	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe step by step what led up to the injury/near miss. (continue on the back if necessary):	
What could have been done to prevent this injury/near miss?	
What parts of your body were injured? If a near miss, how could you have been hurt?	
Did you see a doctor about this injury/illness? ☐ Yes ☐ No	
If yes, whom did you see?	Doctor's phone number:
Date:	Time:
Has this part of your body been injured before? ☐ Yes ☐ No	
If yes, when?	Supervisor:
Your signature:	Date:

Supervisor's Accident Investigation Form

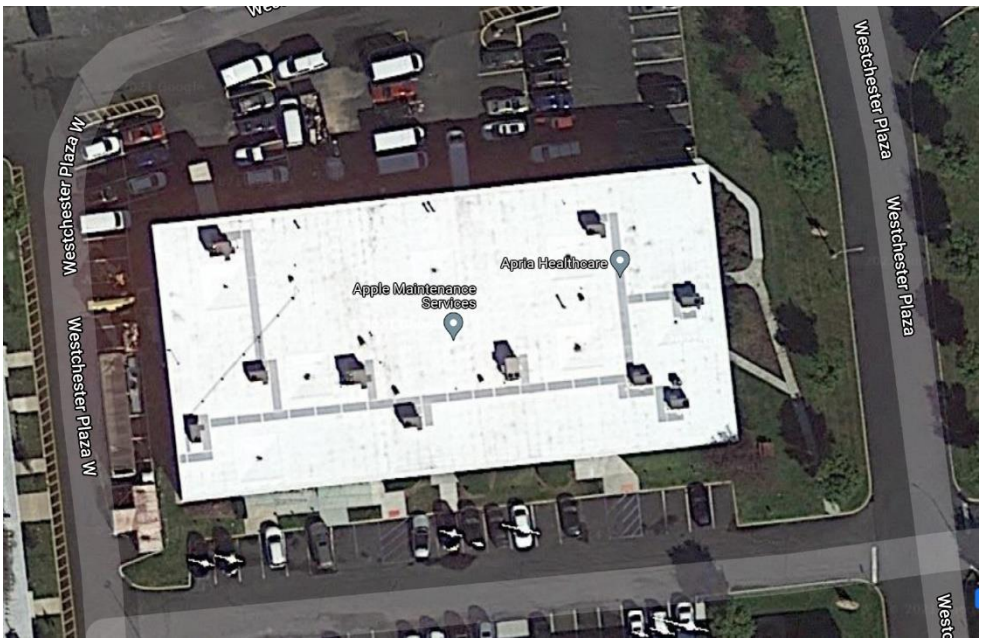
Name of Injured Person_____
Date of Birth_____ Telephone Number_____
Address_____
City_____ State_____ Zip_____
(Circle one) Male Female
What part of the body was injured: Describe in detail. _____
_____
_____
Describe fully how the accident happened: What was employee doing prior to the event?
What equipment, tools being used?_____
_____
_____
Names of all witnesses:
_____ _____
_____ _____
Date of Event_____ Time of Event_____
Exact location of event:_____
What caused the event?_____
_____
_____
Were safety regulations in place and used? If not, what was wrong?_____
_____
Employee went to doctor/hospital? Doctor's Name_____
Hospital Name_____
Recommended preventive action to take in the future to prevent reoccurrence.
_____
_____
_____

_____ _____
Supervisor Signature Date

Appendix D

COMMUNITY AIR MONITORING PLAN

5 Westchester Plaza
Elmsford
Westchester County, New York



November 2021

Peak Project # 2847

NYSDEC Site#
C360205

Prepared for:
Mack-Cali CW Realty Associates L.L.C.
210 Hudson St., Suite 400
Jersey City, NJ 07311

Prepared By:
Peak Environmental LLC
26 Kennedy Blvd, Suite A
East Brunswick, NJ 08816

TABLE OF CONTENTS

1 INTRODUCTION

Mack-Cali CW Realty Associates L.L.C. (Mack-Cali) has entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate potential chlorinated volatile organic compound (CVOC) contamination at 5 Westchester Plaza (Site, NYSDEC Site #C360205). Peak Environmental LLC (Peak) has prepared this Community Air Monitoring Plan (CAMP) to support Remedial Investigation (RI) activities required at the Site.

The CAMP for this site requires real-time monitoring for particulates (i.e., dust) and volatile organic compounds (VOCs) at the upwind and downwind perimeters and adjacent to the nearest residential structure within the work area when certain activities are in progress at the site. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide protection for residents within the designated work area and the downwind community (e.g., off-site potential receptors including adjacent and other nearby residences and local pedestrians not involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial construction activities. The action levels specified herein require monitoring and, when necessary, corrective actions to abate emissions, and/or shutdown work. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air. Reliance on the CAMP should not preclude simple, common-sense measures, including visual observations, to keep dust at a minimum around the work areas.

2 MONITORING

The CAMP conducted at the site will monitor volatile organic compounds (VOCs), particulate dust, and meteorological conditions throughout the investigation. The locations, frequency, and methodology for the parameters listed above will be described in sections 2.1, 2.2, and 2.3, respectively.

2.1 VOC Monitoring

VOC monitoring will be conducted using a photoionization detector (PID). Whether monitoring is continuous or periodic is determined by the scope of work being completed. Table 2.1 summarizes the monitoring required by specific site activities that may occur onsite.

Table 2.1 Utility of Continuous and Periodic Monitoring

Type of Monitoring	**Examples of Activities**
Continuous Monitoring	Intrusive • Soil/waste excavation and handling • Instillation of test pits • Installation of soil borings and monitoring wells
Periodic Monitoring	Non-Intrusive • Collection of soil samples

	• Collection of groundwater samples from existing monitoring wells

Once arriving onsite, the wind direction will be established to determine up and downwind directions. A background VOC level will be determined at this time from the upwind perimeter. In the case of changes in wind direction, a new reading will be taken once the upwind location is identified, and this establishes a new baseline level. The downwind reading will be performed immediately downwind of the work area. This is to ensure any VOCs being released by site activities are being monitored and if work needs to be stopped temporarily. Table 2.2 below summarizes the monitoring requirements for continuous monitoring.

Table 2.2 Location and Frequency/Activity for VOC Monitoring

Location	**Frequency/Activity**
Upwind of work area	• Start of each day • Change of wind direction • Need of background levels to be re-established
Downwind of immediate work area	• Continuous monitoring during ground-intrusive activities • Periodic monitoring during non-intrusive activities

2.2 Particulate Monitoring

Particulate monitoring will be conducted using a dust monitor located at up and downwind locations of the site. At the start of each day, the wind direction will be identified, and this will determine the up and downwind locations for the dust monitors. Dust monitoring instruments will be calibrated per manufacturer specifications before use. The monitors will be capable of continuously measuring particulate matter less than 10 micrometers in size (PM-10) and logging data every 15 minutes to compare against the action levels described below. The monitors will be equipped with an audible alarm to indicate any exceedance of the action level. Wind direction should be monitored throughout the day, and if it does change, the locations of the dust monitor will change to match the up and downwind directions.

2.3 Meteorological Monitoring

Meteorological monitoring will take place daily and will be written in the field notes. This includes wind direction, precipitation, temperature, and any other relevant environmental conditions. Any distinct change in wind direction or changes in environmental conditions will be noted in the field notes.

3 RESPONSE AND ACTION LEVELS

This section will describe the response and action levels for VOC and particulate monitoring.

3.1 VOC Action Levels

VOC monitoring data gathered per Section 2.1 will be evaluated based on the response levels in Table 3.1 below and appropriate actions taken. Table 3.1 below summarizes the action levels and actions to be taken under each circumstance.

Table 3.1 Response and Action Plan for VOC exceedances

Response Levels	**Actions**
Total VOCs downwind were to exceed 5 parts per million (ppm) above the background concentrations (upwind) for longer than 15-minute average	• Work must be temporarily halted • Once back-to-back readings are less than 5 ppm greater than the background level, then work can resume
Total VOCs downwind were to persistently exceed between 5 ppm and 25 ppm above the background concentrations for longer than 15-minute average	• Work must be halted • The source of vapors needs to be identified, and actions must be taken to abate any VOCs. Ex.) instruments such as a fan could be used to blow VOCs away from workers • After actions taken, if VOCs 200ft downgradient (or ½ distance to nearest receptor) of work area are below 5 ppm work may continue
Total VOC were to exceed 25 ppm above the background concentrations for longer than 15-minute average	• All work activities on site must shutdown • Contact Project Manager

3.2 Particulate Action Levels

Particulate monitoring data gathered per Section 2.2 will be evaluated based on the response levels in Table 3.2 below and appropriate actions taken. Table 3.2 below summarizes the action levels and actions to be taken.

Table 3.2 Response and Action Plan for Particulate Matter exceedances

Response Levels	**Actions**
PM-10 levels at downwind monitor are greater than 100 µg/m^3 than background (upwind) levels for a 15-minute period.	• Work must be temporarily halted • Dust suppression techniques implemented, and work may continue if PM-10 less than 150 µg/m^3

Airborne dust is leaving work area	• If needed, stop work and re-evaluate activities

4 DOCUMENTATION

During the implementation of the CAMP, the following information will be recorded and maintained:

- Calibration logs of all instruments used at the site;
- Field notes with periodic VOC readings;
- Daily air monitoring log with 15-min dust monitor readings;
- Climatological conditions including wind direction, precipitation, temperature, and any other relevant environmental conditions and times associated with them included in field notes;

VOC 15-min readings will be made available for review by the State (DEC and NYSDOH) if requested. All particulate readings will made available for review by the State (DEC and NYSDOH) and County Health personnel if requested.