(b) (6)
Project Manager

September 28, 2020

U.S. Environmental Protection Agency Region III
Joseph Vitello
Site Assessment Manager
Superfund and Emergency Management Division
1650 Arch Street
Philadelphia, PA 19103-2029

Subject: **Norwood Landfill –**
Final Residential Field Sampling Plan
EPA Contract No.: 68HE0320D0003 (START VI, Region 3)
EPA Technical Direction Document No.: T603-20-07-004
Document Tracking No.: 0009_Revision 1

Dear Mr. Vitello:

The Tetra Tech, Inc. Superfund Technical Assessment and Response Team (START) is submitting this Revised Final Residential Field Sampling Plan (FSP). The FSP was originally developed by Weston Solutions, Inc., dated May 2020 (Document Control No.: W0146.1E.02955) with a revision date of June 2020 (Document Control No.: W0146.1E.03023). Tetra Tech revised the FSP in accordance with Tetra Tech Standard Operating Procedures and the Tetra Tech *Draft Uniform Federal Policy Program Quality Assurance Project Plan* and addressed comments received from the EPA Region 3 Applied Science and Quality Assurance Branch (ASQAB) on September 23, 2020. This FSP is being submitted to document sampling to be conducted at the Norwood Landfill Site (Site) located in Norwood, Delaware County, Pennsylvania.

Please call me at (b) (6) if you have any questions or comments regarding this submittal.

Sincerely,

(b) (6)

(b) (6)
Project Manager

Enclosure

cc: TD file

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TETRA TECH

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RESIDENTIAL FIELD SAMPLING PLAN
REV. 1
NORWOOD LANDFILL SITE
NORWOOD, DELAWARE COUNTY, PENNSYLVANIA

EPA CONTRACT NO.: 68HE0320D0003
TECHNICAL DIRECTION DOCUMENT NO.: T603-20-07-004
DOCUMENT TRACKING NO.: 0009

Prepared By:

EPA Region III
START VI
Superfund Technical Assessment and Response Team

Submitted To:
United States Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103

September 2020

TITLE AND APPROVAL PAGE

RESIDENTIAL FIELD SAMPLING PLAN

Rev. 1

NORWOOD LANDFILL SITE
NORWOOD, DELAWARE COUNTY, PENNSYLVANIA

TECHNICAL DIRECTION NO.:	T603-20-07-004	
EPA SITE ASSESSMENT MANAGER:	Joseph Vitello	
SITE NAME:	Norwood Landfill	
SITE LOCATION:	Norwood, Delaware County, Pennsylvania	
SAMPLING ACTIVITIES:	Expanded Site Inspection (ESI) Sampling Event	
SAMPLING DATES:	November 2020	
FSP PREPARER:	(b) (6)	
SIGNATURE/DATE	(b) (6)	9/24/20
QUALITY ASSURANCE OFFICER:	(b) (6)	
SIGNATURE/DATE:	(b) (6)	9/25/20
EPA OSC/SAM APPROVAL SIGNATURE/DATE:		9/28/20
EPA REGION 3 APPLIED SCIENCE AND QUALITY ASSURANCE BRANCH (ASQAB) DELEGATED APPROVING OFFICIAL (DAO) SIGNATURE/DATE:		
DOCUMENT TRACKING NO.:	0009_Revision 1	

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LIST OF ACRONYMS

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CVAA	cold vapor atomic absorption
DPT	direct push technology
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERT	EPA Environmental Response Team
ESAT	Environmental Services Assistance Team
ESI	Expanded Site Inspection
FSP	Field Sampling Plan
GPR	Ground-Penetrating Radar
GPS	Global Positioning System
HRS	Hazard Ranking System
IATA	International Air Transport Association
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
IDW	investigation-derived waste
LTSB	EPA Region III Laboratory and Technical Services Branch
mL	milliliter
MS/MSD	matrix spike/matrix spike duplicate
NPL	National Priorities List
OLEM	Office of Land and Emergency Waste
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pdf	portable document file
pH	hydrogen ion concentration
PMC	Program Management Company
PPE	personal protective equipment
QA/QC	quality assurance/quality control
RBC	Risk-Based Concentration
RSL	Regional Screening Level
SIM	selected ion monitoring

LIST OF ACRONYMS, CONTINUED

SOP	Standard Operating Procedure
SOW	Statement of Work
START	Superfund Technical Assessment and Response Team
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TDD	Technical Direction Document
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USFWS	U.S. Fish and Wildlife Service
VOA	volatile organic analysis
VOC	volatile organic compound
WAM	Work Assignment Manager
TETRA TECH®	Tetra Tech Solutions, Inc.
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Under the Eastern Area Superfund Technical Assessment and Response Team (START) Contract No. 68-HE-0320-D003, Technical Direction (TD) No. T603-20-07-004, the U.S. Environmental Protection Agency (EPA) Region III tasked Tetra Tech EM, Inc. (Tetra Tech) to conduct a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Expanded Site Inspection (ESI) of the Norwood Landfill Site (the Site) located in Norwood, Delaware County, Pennsylvania.

The Norwood Landfill ESI is being conducted in accordance with EPA *Guidance for Performing Site Inspections Under the Comprehensive Environmental Response, Compensation, and Liability Act* (EPA, 1992). The purpose of this ESI is to collect sufficient information concerning the conditions at the Site to assess the relative threat posed to human health and the environmental with respect to the actual or potential release of hazardous substances attributable to the Site, and to determine the need for additional action under CERCLA based on criteria set forth in EPA's Hazard Ranking System (HRS) Final Rule (EPA, 1990). The HRS model is a screening tool used to determine whether a site meets the criteria required to be considered for the National Priorities List (NPL), which is EPA's list of sites warranting federal interest. The scope of the ESI includes multi-media sampling and analysis.

The sampling strategy for the ESI presented in this Field Sampling Plan (FSP) emphasizes the collection of samples intended to meet analytical data requirements presented in the *Guidance for Performing Site Inspections Under the Comprehensive Environmental Response, Compensation, and Liability Act* (EPA, 1992). Tetra Tech developed the FSP in accordance with the provisions of the EPA Region III START 6 *Draft Uniform Federal Policy Program Quality Assurance Project Plan* (UFP-QAPP) (Tetra Tech 2020). Key personnel, an organizational chart, UFP-QAPP distribution list, and a communication list are provided in the UFP-QAPP (Tetra Tech 2020).

2.0 BACKGROUND

This section describes the site location, presents a description of the Site, and summarizes the previous investigation activities associated with the Site.

2.1 SITE LOCATION AND DESCRIPTION

The Norwood Landfill site consists of the Lower Norwood Neighborhood, known as Winona Homes, which was constructed during the 1950s, the surrounding wooded area, and the adjacent Muckinipattis and Darby Creeks (Figure 1). The geographic coordinates of the approximate center of the neighborhood are 39°52'55.76" north latitude and 75°17'29.04" west longitude (Figure 1). Norwood Park borders the neighborhood and wooded area to the north-northeast and the Norwood Elementary School borders the neighborhood to the northwest. Additional residential areas are located west of the Lower Norwood neighborhood (Figure 1).

2.2 SITE HISTORY

Based on a review of available information and historical aerial photos, approximately 10 acres of land directly south of Norwood Park was used as the Norwood Dump from approximately 1950 to 1959. From 1960 to 1963, those 10 acres and an additional 15 acres of land located immediately to the south along Darby Creek were used as a sanitary landfill by a landfill operator who had a contract with Norwood Borough (the land owner) to dispose of municipal solid waste collected in the City of Philadelphia. In August 2016, EPA learned that several current and former residents of Norwood Borough who are concerned about reports of cancer and auto-immune diseases in their community had sought assistance from state environmental and health agencies to investigate whether those illnesses were caused by contamination resulting from the landfill. Additionally, residents are also concerned with the potential for material originating from the nearby Glenolden Laboratories (and subsequently Merck, Sharp, and Dohme Pharmaceutical Laboratories) to have been disposed in the landfill, as well as other unregulated and unpermitted dumping on the landfill over time.

Another concern reported by a resident is that the Winona Homes section of Lower Norwood was constructed on fill soil, brought to the site from an unknown source on or near the Walt Whitman Bridge in Philadelphia, PA, while it was under construction. Because the origin of soil or fill material is an unknown source, there is a potential for it to contain hazardous substances.

Finally, an additional area of concern to residents is the former Muckinipates Wastewater Treatment Plant (WWTP) that was located to the northwest of the dump and operated from some time prior to

1957 until it was demolished in the early 1980s. Residents are concerned that raw sewage was deposited in a flat field adjacent to the plant. Historic aerial photos and an archival newspaper article confirm that sludge was stored in this area, which is now the site of a sewage pumping station that directs waste water to a treatment facility in Southwest Philadelphia. Areas of concern are shown on Figure 2.

2.3 PREVIOUS INVESTIGATIONS

In 1993, the U.S. Fish and Wildlife Service (USFWS) conducted a Level I Contamination Survey of two tracts of land, which they refer to as Tract 24 and Tract 35, located between the residential neighborhoods of Lower Norwood and Darby Creek. The Level I Contamination Survey noted that the Borough of Norwood historically had used Tract 35 as municipal landfill and that debris was scattered across the property at the time of the survey. Observed debris included glass jars and bottles, automobile frames and parts, aluminum siding, asphalt, concrete, and tires (Program Management Company [PMC], 1999). Tract 24 is a private land parcel owned by the Darby Realty Company that consists of mostly tidal wetlands.

In 1999, PMC conducted a Level II Survey of Tracts 24 and 35 for USFWS, during which test pits were excavated and samples of soil (21 shallow and 17 deep), sediment (7), surface water (6), and groundwater (10) were collected. The samples were analyzed for target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides, polychlorinated biphenyls (PCBs), chlorinated herbicides, target analyte list (TAL) metals (total and dissolved for groundwater samples), and cyanide. Analytical results were compared to the EPA Region III Risk-Based Concentrations (RBCs) (now known as Regional Screening Levels [RSLs]) residential and industrial soil screening levels for the surface soil and sediment samples and to the EPA RBCs for tap water for the surface water and groundwater samples, where applicable (PMC, 1999).

VOCs were not detected in any of the soil, sediment, or surface water samples above RBCs, and only chloroform was detected above the RBC in one groundwater sample. Several SVOCs were detected above RBCs in the soil, sediment, and groundwater samples, and in one surface water sample. Pesticides were not detected above RBCs in the surface water or sediment samples; however, one pesticide, chlordane, was detected above the RBC in one of the soil samples. Concentrations of PCBs were detected above RBCs in several soil samples, but did not exceed RBCs in the sediment, surface

water, or groundwater samples. Manganese was the only inorganic analyte that exceeded RBCs in the surface water samples; however, several inorganic analytes were detected above RBCs in the soil, sediment, and groundwater samples. Additional details on analytical results and sample locations are provided in the *Final Preliminary Assessment Report for the Norwood Landfill* (TETRA TECH, 2017).

Although constituents were detected in samples collected as part of the Level II Survey, the concentrations of the constituents were attributed to natural conditions in the area, impacts from surface water runoff from adjacent properties and streets, and non-hazardous materials previously disposed on the property (PMC, 1999).

In August 2016, EPA received complaints from concerned citizens regarding the historical use of the surrounding area as a waste dump for landfill material and laboratory equipment, as well as the use of potentially contaminated fill material during construction of the housing development, and requested that EPA conduct an investigation to determine whether hazardous substances may be present on the Site.

In September 2017, EPA collected 20 surface (0 to 6 inches below ground surface [bgs]) soil and 9 subsurface (24 to 48 inches bgs) soil samples, including 1 duplicate surface soil sample, 2 background surface soil samples, and 1 background subsurface soil sample. Soil samples were collected in the wooded right-of-way between the homes along E. Winona Avenue and W. Martin Lane and throughout the wooded area south of the neighborhood adjacent to Darby Creek. Surface soil samples were collected directly behind the homes to determine whether fill material used during the construction of the Lower Norwood neighborhood may have contained contaminants at concentrations that may pose a risk to human health. The subsurface soil samples were collected to determine whether landfill material was present below the surface. Debris and/or landfill material was generally not observed in the subsurface soil samples, with the exception of glass debris at one location.

Analytical results of soil samples indicated detected VOCs did not exceed applicable EPA Regional Screening Levels (RSLs [previously known as RBCs]) for residential soil. Low levels of SVOCs were detected in the majority of the soil samples; however, with the exception of the concentrations of benzo(a)anthracene in two surface soil samples and the concentrations of benzo(b)fluoranthene, benzo(a)pyrene, and indeno(1,2,3 cd)pyrene in one surface soil sample, detected concentrations of

SVOCs in surface soil samples did not exceed applicable EPA RSLs. Additionally, concentrations of benzo(a)pyrene in five subsurface soil samples and the concentrations of dibenzo(a,h)anthracene in three subsurface soil samples met or exceeded the EPA RSL for residential soil. Concentrations of PCBs in two surface soil samples exceeded the EPA RSL for residential soil. PCBs were not detected at elevated concentrations in the subsurface soil samples. Low levels of pesticides were detected in the majority of the soil samples; however, with the exception of the concentration of dieldrin in one soil sample and the concentrations of dieldrin and aldrin in one subsurface soil sample, detected concentrations did not exceed EPA RSLs. Concentrations of detected inorganics did not exceed applicable EPA RSLs with the exception of the concentrations of cobalt in one surface soil sample and the concentrations of manganese in one surface and one subsurface soil sample. Additionally, two subsurface soil samples contained elevated concentrations of lead exceeding the EPA residential lead screening level. Additional details on analytical results and sample locations are provided in the Final Preliminary Assessment Report for the Norwood Landfill (TETRA TECH, 2017).

In spring of 2018, EPA mailed letters to approximately 37 residences along E. Winona Avenue, as well as to residents living along Essex Road, Love Lane, Martin Lane, and Mohawk Avenue who expressed interest in having their property sampled. EPA gained access to 21 residential properties to collect soil samples. In May 2018, EPA collected 23 surface soil (0 to 12 inches bgs) samples from the 21 residential properties, including two duplicate soil samples.

Analytical results of the residential surface soil samples indicated that VOCs were not detected in the soil samples exceeding EPA RSLs for residential soil; three surface soil samples contained concentrations of the SVOCs benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene exceeding EPA RSLs; one soil sample contained a concentration of PCBs above the EPA residential RSL; two soil samples contained concentrations of dieldrin above the EPA RSL for residential soil; and one soil sample contained concentrations of antimony and lead above applicable EPA RSLs. Additional details on analytical results and sample locations are provided in the *Final Site Inspection Report for the Norwood Landfill*, *Revision 1* (TETRA TECH, 2018).

3.0 DATA QUALITY OBJECTIVES

Planning and scoping meetings were held between EPA, Tetra Tech, and Borough officials to discuss the project and determine the data quality objectives in accordance with the Tetra Tech UFP-QAPP (Tetra Tech 2020). The objective of this sampling event is to collect soil samples across a broader geographic area of the Winona Homes neighborhood than what was sampled in 2018. Additionally, soil samples will be collected from randomly selected properties in other neighborhoods across Lower Norwood to provide a better understanding of residential soil conditions at properties where potentially contaminated fill is not known to exist.

The analytical data will be used to determine whether hazardous substances are present in the surface and subsurface soil on residential properties at levels that may pose a risk to human health. Background soil samples will be collected from areas not suspected to have been impacted by landfill or filling activities to assess the relative increase of contaminants in accordance with the UFP-QAPP (Tetra Tech 2020). The data will be used to provide EPA with adequate information to determine whether the Site is eligible for placement on the NPL. Analytical data will be compared to EPA RSLs for residential soil (EPA, 2020). Table 1 provides a summary of the EPA Contract Laboratory Program (CLP) Contract Required Quantitation Limits (CRQLs) and the applicable RSLs. The data will be used to prepare an ESI report and calculate a preliminary HRS score. The site-specific data quality objectives stated in this FSP were prepared in accordance with the UFP-QAPP (Tetra Tech 2020).

4.0 PROPOSED ACTIVITIES

This section describes the scope of work, including proposed sampling activities and field measurements; summarizes samples for the project; explains how samples will be collected and handled; and describes equipment decontamination procedures and the disposal of investigation-derived waste (IDW) generated during sampling.

4.1 SCOPE OF WORK

As part of the sampling event for the Site, Tetra Tech will perform the following tasks:

- Identify sampling locations in the field by physically marking sampling locations with pin flags and record sampling locations using Global Positioning System (GPS) technology.
- Provide clearance of boring locations through a private underground utility clearance contractor using geophysics/ground-penetrating radar (GPR) and/or other technology to locate potential underground utilities and other underground features.
- Collect one 5 point composite surface soil sample from 0 to 6 inches bgs from up to 150 residential properties.
- Collect one discrete surface soil sample from 0 to 6 inches bgs from up to 150 residential properties.
- Collect one discrete shallow subsurface soil sample from 24 to 48 inches bgs interval from approximately 40 properties in the Winona neighborhood.
- Collect one discrete deep subsurface soil sample from 8 to 10 feet bgs interval from approximately 20 properties in the Winona neighborhood using Direct Push Technology (DPT).
- Photo document sampling activities and sampling locations.
- Record all sampling locations using GPS technology.
- Package and ship all samples collected to the assigned EPA Contract Laboratory Program (CLP) laboratory for the following analyses: VOCs, SVOCs, polycyclic aromatic hydrocarbons (PAHs) by selected ion monitoring (SIM), PCBs, pesticides, and metals including mercury.

4.2 SAMPLE COLLECTION

This section describes the proposed sampling activities and general locations for each sample to be collected as part of the field activities. Proposed sampling locations are shown on Figure 3, Proposed Residential Sampling Area Map. Delineation of neighborhood boundaries outside of Winona Homes is based entirely on capturing the location of residents that volunteered for sampling. The exact sample locations and number of samples to be collected will be based upon access to residential properties and at the discretion of the EPA. EPA sent access agreements for sample collection to 157 properties within the boundaries depicted on Figure 3. Table 2 summarizes the matrices, analyses, analytical methods, containers, preservatives, detection limits, and maximum holding times for all the samples proposed to be collected during the sampling event.

4.2.1 SOIL SAMPLING

4.2.1.1 Composite Surface Soil Sampling

At each residential property, Tetra Tech will first collect a 5-point composite surface soil sample. Each aliquot will consist of an equal amount of soil collected from 0 to 6 inches bgs in accordance with EPA ERT SOP No. 2012, Surface Soil Sampling (EPA ERT, 2000). The exact locations of the aliquots will be determined in the field based on each properties individual characteristics (e.g. yard space in front of residence vs. in back, proximity to asphalt street or driveway, etc.). Prior to sampling, any vegetation or debris will be removed with a plastic scoop in preparation for sample collection. Soil from the 5 aliquots will be placed into an aluminum pan using a plastic scoop, and all sticks, leaves, and stones will be removed. The soil in the aluminum pan will be thoroughly homogenized prior to being placed into appropriate sample containers for analysis of SVOCs, PAHs, PCBs, pesticides, metals, including mercury. Because mixing causes volatile compounds to evaporate, composite samples will not be analyzed for VOCs. Additional soil samples will be collected as field duplicates for field quality assurance/quality control (QA/QC).

4.2.1.2 Discrete Surface Soil Sampling

At each residential property, Tetra Tech will collect 1 discrete soil sample from 0 to 6 inches bgs in accordance with Tetra Tech SOP No. 005, Soil Sampling (Tetra Tech 2017). The purpose of the additional grab sample is to meet the requirements of establishing an observed release by chemical analysis (or area of contaminated soil) under the Hazard Ranking System's Soil Exposure Pathway. The sample will be collected from within 200 feet of each residential dwelling. The exact locations of the sample will be determined in the field based on each properties individual characteristics (e.g. yard space in front of residence vs. in back, proximity to asphalt street or driveway, etc). Prior to sampling, any vegetation or debris will be removed with a plastic scoop in preparation for sample collection. Soil collected from the sample location will be placed into an aluminum pan using a plastic scoop, and all sticks, leaves, and stones will be removed. Soil to be analyzed for VOCs will then be collected directly from the bottom of the borehole using an Encore™ sampling device. The soil in the aluminum pan will be thoroughly homogenized prior to being placed into appropriate sample containers for analysis of

SVOCs, PAHs, PCBs, pesticides, and metals (including mercury) including percent moisture. Additional samples will be collected for field duplicates for field QA/QC.

4.2.1.3 Subsurface Shallow Soil Sampling

A shallow subsurface soil boring will collected from the residential properties located at in the Winona neighborhood, using a stainless steel hand auger. Tetra Tech will advance a hand auger to a depth between 24 and 48 inches bgs for the collection of a subsurface soil sample in accordance with Tetra Tech SOP No. 005, Soil Sampling (Tetra Tech 2017). A shallow sub-surface sample depth of between 24 and 48 inches was chosen because depths below this range are unlikely to be encountered by most homeowners even through seldom gardening, maintenance, or construction projects. Soil that is removed from 0 to 24 inches bgs will be staged in a pile next to the borehole, soil that is removed from 24 to 48 inches bgs will be placed into a dedicated, disposable aluminum pan. The soil to be analyzed for VOCs will be collected immediately from the bottom of the bore hole directly into an EnCore® sampler. The soil in the aluminum pan will be thoroughly homogenized prior to being placed into appropriate sample containers for analysis of SVOCs, PAHs, PCBs, pesticides, metals (including mercury), and percent moisture. Additional samples will be collected as field duplicates for field QA/QC at a frequency of one field duplicate per every 20 field samples. The remaining soil in the aluminum pan will be placed back into the borehole and will be back filled; garden soil and grass seed will be placed on top if warranted. The stainless steel hand auger will be decontaminated between each sampling location using water and Liquinox.®

4.2.1.4 Subsurface Deep Soil Sampling

Up to 20 soil borings will be advanced with DPT using a Geoprobe® type drill rig. Prior to boring installation, an underground utility specialist will use GPR and/or electromagnetic instruments and other methods to locate potential underground utilities, in addition to contacting the underground utility locator service 811 hotline and completing a mark-out request ticket. The exact location and number of the proposed borings will be based upon the type of home, access to the results of the subsurface utility investigation and utility mark-outs. The deep sub-surface soil sample depth interval between 8 and 10 feet was chosen to determine whether soil at the depth of basement foundations is impacted by

contamination. Tetra Tech will collect soil samples in accordance with Tetra Tech SOP No. 005, Soil Sampling (Tetra Tech 2017).

Soil borings will be advanced with a standard 2-inch probing rod and 5-foot Geoprobe® sampler. Soils will be collected in acetate sleeves and continuously collected, logged, and screened for volatile organic vapors. Borings will be advanced to the prescribed depth of 8 to 10 feet bgs, the groundwater table, or refusal, whichever is encountered first. The Geoprobe® sampler and other sampling equipment will be decontaminated before use and between boring locations. All decontamination fluids will be containerized for later disposal.

At each soil sampling location, the sampler will first collect sample volume for VOC analysis using an Encore® sampling device. The sample will be collected directly from the soil core in the acetate sleeve. Following the collection of soil for VOC analysis, Tetra Tech will collect additional soil volume from the boring sleeve using a dedicated, disposable polyethylene scoop in a disposable aluminum foil pan for homogenization prior to placement into appropriate sample containers for analysis of SVOCs, PAHs, PCBs, pesticides, and metals (including mercury).

4.3 SAMPLE IDENTIFICATION

The Sample Identifier will be listed on the chain-of-custody document for each field sample and will provide the date and sample location as follows:

NL-MMDDYYYY-XX-###

The "NL" prefix refers to the Site name – Norwood Landfill. The YYYY refers to the date of sample collection (i.e., 2020 for samples collected in the year 2020). The XX portion of the Sample Identifier refers to the sample type ("CS" for composite soil, "SS" for surface soil, "SH" for shallow subsurface, and "SB" for deep subsurface soil, "RB" for rinsate blank, and "TB" for trip blank). The "###" portion of the suffix refers to the unique sequential sample number assigned to a specific sampling location. Field duplicate samples will be identified with a -01 suffix following the sequential sample number.

In addition to the Sample Identifier, samples to be shipped to CLP laboratories for analysis will be assigned unique CLP sample numbers. Organics samples will be identified in the format C#### (where

the # may represent a number or letter), and the corresponding inorganics sample ID will be in the format MC####. The CLP sample number and the Sample Identifier will be included on the chain-of-custody, the bottle labels, and the sample tags attached to each bottle.

4.4 SAMPLE MANAGEMENT

Tetra Tech will document field activities using logbooks, photographic records, and chain-of-custody documentation. Documentation, record keeping, and data management activities will be conducted in accordance with the Tetra Tech UFP-QAPP (Tetra Tech 2020) and in accordance with the *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2014a), unless otherwise specified. Each sampling location will be noted in the field logbook in accordance with Tetra Tech SOP No. 024, Recording of Notes in Logbook (Tetra Tech 2020). Scribe software will be used for sample documentation and data management.

Sample handling, packaging, and shipment procedures will be in accordance with the *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2014) for samples shipped to CLP laboratories. Sample labels and tags will be affixed to each sample jar shipped to the CLP laboratory. Samples will be placed in plastic zipper bags. Bagged containers will be placed in coolers with ice and packed with appropriate absorbent material. All sample documents will be sealed in a plastic zipper bag and affixed to the underside of each cooler lid. The lid will be sealed with shipping tape, and custody seals will be affixed to the cooler. Coolers will be labeled with the origin and destination locations.

Chain-of-custody documents will be completed using Scribe software and will accompany field samples to the laboratory. Samples will be shipped to the designated CLP laboratories via Federal Express. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the U.S. Department of Transportation. Air carriers that transport hazardous materials require compliance with the current International Air Transport Association (IATA) regulations, which apply to shipment and transport of hazardous materials by air carrier. TETRA TECH will follow all applicable IATA regulations.

4.5 DECONTAMINATION AND INVESTIGATION-DERIVED WASTE

Dedicated, disposable sampling equipment and personal protective equipment (PPE) will be used wherever applicable. Disposable sampling equipment and PPE will be double-bagged and disposed of as dry industrial waste. Non-dedicated sampling equipment, such as a stainless steel trowel or hand auger will undergo a gross decontamination between each sampling point with Liquinox, followed by a double rinse with distilled water, in accordance with Tetra Tech SOP No. SA-7-1, Decontamination of Field Equipment and Investigative Derived Waste Handling (Tetra Tech 2008). IDW is defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. Soil cuttings will be placed back into the borehole. IDW water, will be consolidated and containerized in 5-gallon buckets and stored onsite awaiting analytical results, which will determine the appropriate disposal method for the IDW in accordance with Office of Land and Emergency Waste (OLEM), formerly known as Office of Solid Waste and Emergency Response (OSWER) 9345.3-02 (EPA, 1991).

5.0 ANALYTICAL PARAMETERS AND METHODS

Samples will be analyzed for VOCs, SVOCs, PAHs by SIM, PCBs, pesticides, and TAL metals (including mercury) in accordance with EPA CLP Methods SOM02.4 and ISM02.4 for organics and inorganics, respectively (EPA, 2016a and EPA, 2016b).

Inorganics in soil will be analyzed for aluminum, calcium, iron, magnesium, potassium, and sodium by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) with the remaining metals analyzed by ICP-Mass Spectrometry (MS) and mercury analyzed by cold vapor atomic absorption (CVAA). The equipment rinsate blanks associated with soil samples will be analyzed by the same methods as the soil samples. Table 1, Analytical Parameters, summarizes the matrices, analyses, analytical methods, containers, preservatives, QA/QC samples, and technical holding times for the samples proposed for collection during the sampling event.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

This section describes the QA and QC procedures for personnel during the site sampling event, including responsibilities, field QC, laboratory QC, data evaluation, and data management.

6.1 FIELD QUALITY CONTROL

Field QA/QC measures will consist of collecting field duplicates and field blanks (e.g., trip blank samples, and equipment rinsate blank samples). These measures will be applied in accordance with the Tetra Tech Draft EPA Region III START 5 Program-Wide UFP-QAPP (Tetra Tech 2020). The numbers and types of QC samples to be collected are summarized in Table 1.

Field duplicate samples will be collected at a rate of one per 20 samples per sample matrix and will be used to test the reproducibility of sampling procedures and analytical results.

Trip blank samples will be collected and provided in each cooler containing samples for VOC analysis. Trip blank samples will be used to assess whether samples may have become cross-contaminated with VOCs during storage and shipment.

Equipment rinsate blanks will be collected from non-dedicated sampling equipment at a frequency of 1 rinsate per day for each parameter to be analyzed to demonstrate equipment decontamination. An equipment rinsate blank will be collected from hand auger following decontamination to document that the non-dedicated sampling equipment were properly decontaminated between locations. Equipment blank results will be used to verify proper decontamination of non-dedicated sampling equipment.

Temperature blanks will be placed in each sample cooler and used to determine whether samples have been adequately cooled during shipment and storage. The temperature blank will be prepared using tap water placed in a VOA vial without preservative.

6.2 LABORATORY QUALITY CONTROL

Samples will be shipped to the CLP laboratory assigned through the EPA Region III Laboratory and Technical Services Branch (LTSB) Laboratory Section. Laboratory QC measures will consist of all QC elements identified in the analytical method or CLP Statement of Work (SOW) as required by EPA Region III policy, and will incorporate all reportable QC (including forms and deliverables) required by the SOW and this FSP.

For samples that are shipped to EPA CLP laboratories, analysis of matrix spike/matrix spike duplicate (MS/MSD) samples are required for PCBs and pesticides and matrix spike/duplicate (S/D) samples are

required for inorganic analyses. EPA Region III does not require analysis of MS/MSD samples for CLP VOCs, SVOCs, or PAHs.

MS/MSD and S/D sample results are used to assess analytical precision and accuracy in a specific sample matrix. Tetra Tech field personnel will collect a minimum of one MS/MSD and one S/D sample per 20 samples of the same matrix. For soil samples, a double volume of sample required for the PCB and pesticide MS/MSD but no additional sample volume is required for the TAL metals S/D sample. See Table 1, Analytical Parameters, for a summary of QA/QC samples being collected.

6.3 DATA VALIDATION

Validation of all analytical data will be performed by the Environmental Services Assistance Team (ESAT) contractor under the direction of the LTSB Laboratory Section. Organic and inorganic data will be validated at EPA Region III Organic Level 2 and Inorganic Level 2, respectively, in accordance with the EPA CLP *National Functional Guidelines for Superfund Organic Methods Data Review*, EPA-540-R-2017-002 (EPA, 2017a), and the EPA CLP *National Functional Guidelines for Inorganic Superfund Methods Data Review*, EPA-540-R-2017-001 (EPA, 2017b).

6.4 DATA EVALUATION AND MANAGEMENT

This section describes how Tetra Tech will evaluate data generated from the sampling event, determine whether data are representative of the Site, and ensure that data are secure and retrievable.

6.4.1 DATA EVALUATION

Tetra Tech will review the data validation reports to determine whether any major or minor deficiencies were encountered during sampling and analysis. These deficiencies may include major deficiencies (such as unusable or rejected data) or minor deficiencies affecting data, including data that were estimated or qualified as a result of failure to meet project-specific or National Functional Guideline QC acceptance limits.

To assess the effectiveness of field sampling procedures and implement corrective actions as needed, Tetra Tech will evaluate field blank results. Trip blank contamination not attributed to laboratory sources may be due to contamination in the field or during shipment. Rinsate blank contamination not

otherwise attributed to laboratory sources may be due to inadequate decontamination procedures or contamination in source water used for the rinsate blank. Failure of the temperature blank to meet the temperature acceptance criteria indicates the need to better ice down the samples.

6.4.2 DATA REPRESENTATIVENESS AND COMPLETENESS

The intent of this FSP is to obtain a complete data set that is representative of site conditions. Data will be reviewed for completeness. If not all samples are collected or received/analyzed by the laboratory, resulting in less than 100% completeness, the reason for the data gaps will be identified in the ESI Report. If any data are rejected, the reason for the data rejection will be discussed in the ESI Report. If sampling activities or procedures vary significantly from this FSP as a result of unexpected conditions in the field or other unforeseeable factors, Tetra Tech will discuss in the ESI Report these deviations from the FSP and whether the changes affect data representativeness.

6.4.3 DATA MANAGEMENT

EPA Region III will provide Tetra Tech with a validation report for the analytical data in portable document file (pdf) format along with an importable Excel electronic data deliverable (EDD). Tetra Tech will upload the EDD data to the Scribe® database and compare the EDD results to the sample results received in pdf format in conjunction with the data validation report to ensure their consistency. All electronic data will be stored in a Scribe® database for future retrieval and reference, based on the requirements of the Work Assignment Manager (WAM).

7.0 SCHEDULE AND DELIVERABLES

The Draft Tetra Tech UAF-QAPP was submitted to EPA for review in September 2020. Tetra Tech anticipates that sample collection will be conducted in November 2020. Tetra Tech will ship samples to the assigned laboratory for analysis. Tetra Tech expects to receive validated analytical data from EPA Region III LTSB approximately 60 to 90 days after the Region receives the unvalidated data from the assigned CLP laboratory. Tetra Tech will provide EPA with the ESI Report within 60 days after all site activities have been completed and validated data are available.

Information obtained during the sampling event will be compiled in an ESI Report. The ESI Report will include a discussion of data collection methods; document sampling locations; and will present data summary tables, figures, maps, and site photographic documentation.

8.0 REFERENCES

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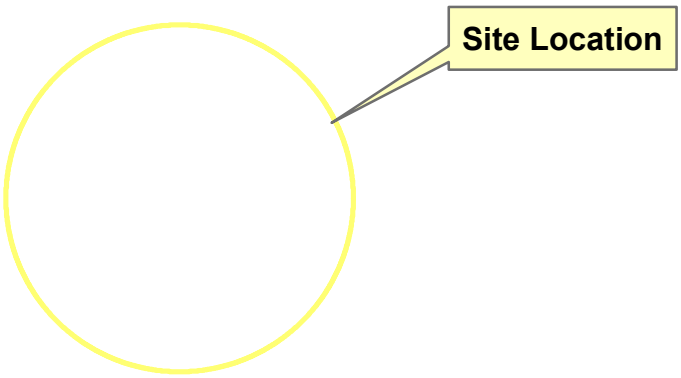
WESTON (Weston Solutions, Inc.). 2018. Final Site Inspection Report for the Norwood Landfill. October.

FIGURES



Norwood Landfill Site
Norwood, Delaware County, PA

Figure 1

Site Location

[redacted]

Source: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO,

Prepared For: R3 START VI

Prepared By: Megan Kelly

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

EPA Contract No: 68HE0320D0003

TDD No: T603-20-07-004

Date Saved: 9/24/2020

File Path: C:\Users\megan.kelly\Desktop\GIS_Data\norwood\Figure 1.mxd

Legend

Muckinipattis Creek

Areas of Concern

- Former Muckinipates WWTP
- Winona Homes (area of potentially contaminated fill)
- Norwood Sanitary Landfill
- Old Norwood Dump

Data Sources
Imagery: ESRI, Bing Mapping Service
The source of this map image is Esri, used by the EPA with Esri's permission

Shapefiles: US Fish and Wildlife Service

Coordinate System:
WGS 1984 UTM Zone 18N
Linear Unit: Foot US

Datum: WGS 1984

N

0 175 350
Feet

Norwood Landfill Site
Norwood, Delaware County, PA

Figure 2
Areas of Concern

TDD#: T603-20-07-004
Contract: 68HE0320D0003
Prepared: 09/24/2020

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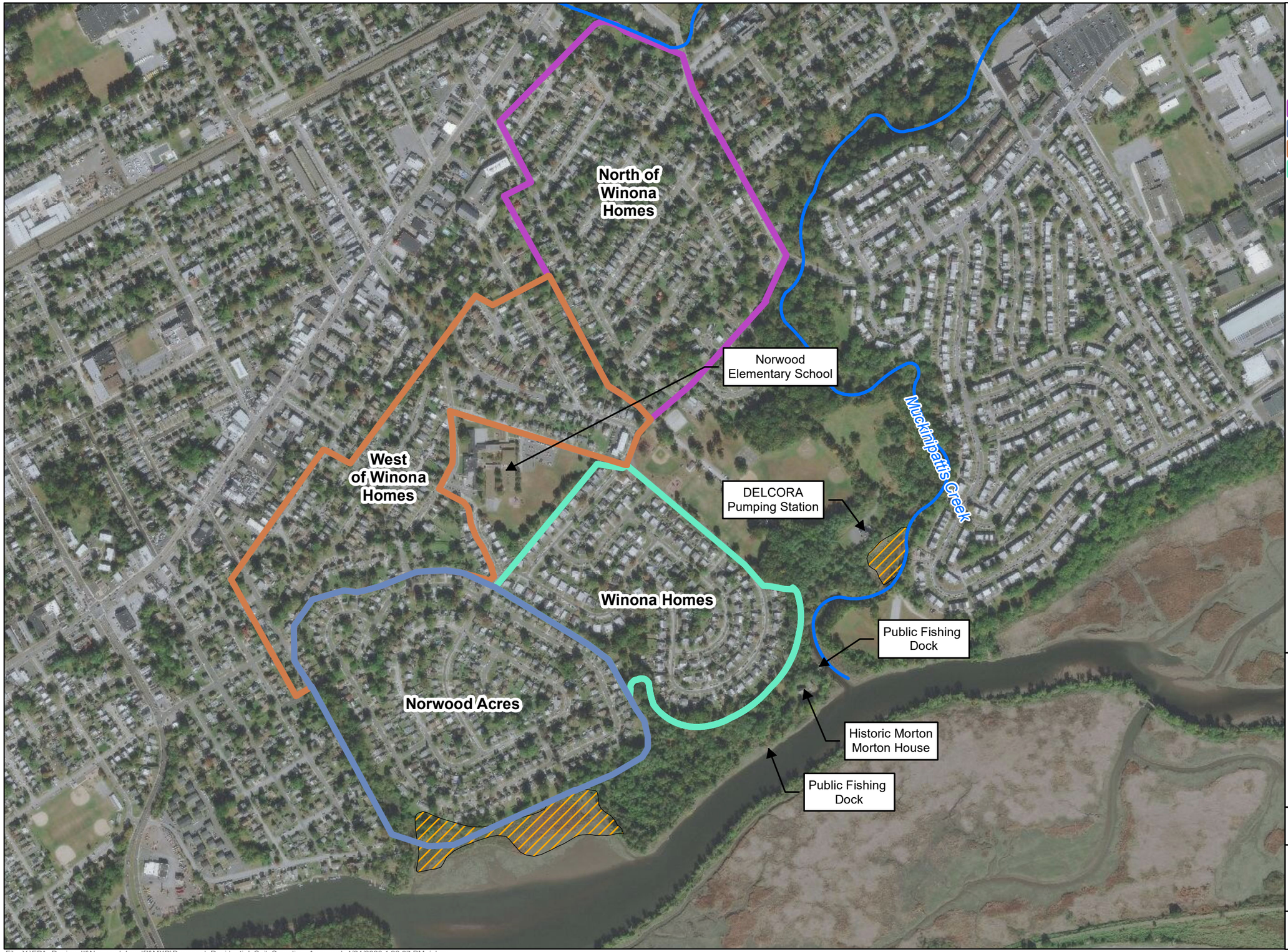

Legend

- Muckinipattis Creek
- NWI Wetlands

Proposed Residential Soil Sampling Area

- North of Winona Homes
- Norwood Acres
- West of Winona Homes
- Winona Homes

Data Sources
Imagery: ESRI, Bing Mapping Service
The source of this map image is Esri, used by the EPA with Esri's permission

Shapefiles: US Fish and Wildlife Service

Coordinate System:
WGS 1984 UTM Zone 18N
Linear Unit: Foot US

Datum: WGS 1984

N

0 150 300 600
Feet

Norwood Landfill Site
Norwood, Delaware County, PA

Figure 3
Proposed Residential Soil Sampling Area

TDD#: T603-20-07-004
Contract: 68HE0320D0003
Prepared: 09/24/2020

TETRA TECH

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TABLES

Table 2 Analytical Parameters

Matrix	Parameter	Analytical Method[1]	Container Type	Preservative	Detection Limit	Technical Holding Time	No. of Field Samples	No. of Field Duplicates	No. of Lab QC Samples[2]	No. of Blanks[3]
Soil	Low/medium VOCs	CLP SOW SOM02.4	Three 5-g Encores plus one 2-oz. jar (% moisture)	Ice	CRQL	2 days (unpreserved)	210	11	0	See below
	TAL SVOCs and PAHs by SIM	CLP SOW SOM02.4	One 8-oz CWM jar	Ice	CRQL	14 days (extract) 40 days (analysis)	360	18	0	See below
	Pesticides and PCBs	CLP SOW SOM02.4	One 8-oz CWM jar	Ice	CRQL	14 days (extract) 40 days (analysis)	360	18	18 MS/MSD	See below
	TAL Metals and Hg	CLP SOW ISM02.4	One 8-oz CWM jar	Ice	CRQL[1]	180 days (except 28 days for Hg)	360	18	18 S/D	See below
Water	Low VOCs	CLP SOW SOM02.4	Three 40-mL VOA vials	HCl to pH <2; Ice	CRQL	14 days	0	0	0	5 TB 5 RB
	TAL SVOCs	CLP SOW SOM02.4	Two 1-L glass amber jars	Ice	CRQL	7 days (extract) 40 days (analysis)	0	0	0	5 RB
	PAHs by SIM	CLP SOW SOM02.4	Two 1-L glass amber jars	Ice	CRQL	7 days (extract) 40 days (analysis)	0	0	0	5 RB
	Pesticides	CLP SOW SOM02.4	Two 1-L glass amber jars	Ice	CRQL	7 days (extract) 40 days (analysis)	0	0	0	5 RB
	PCBs	CLP SOW SOM02.4	Two 1-L glass amber jars	Ice	CRQL	7 days (extract) 40 days (analysis)	0	0	0	5 RB
	TAL Metals and Hg	CLP SOW ISM02.4	One 1-L polyethylene jar	HNO_3 to pH <2; Ice	CRQL[1]	180 days (except 28 days for Hg)	0	0	0	5 RB

Notes:
[1] Metals for soil samples will be analyzed by ICP-AES for aluminum, calcium, iron, magnesium, potassium, and sodium; remaining metals will be analyzed by ICP-MS. Hg will be analyzed by CVAA.
[2] Designate 1 sample per 20 samples for laboratory QC (i.e., MS/MSD for PCB and pesticide analysis and S/D for inorganic analysis). For soil samples, double volume is required for the PCB and pesticide MS/MSD sample but no additional volume is required for the metals sample designated for S/D analysis.
[3] Trip blanks and equipment rinsate blanks will be collected using the bottleware and preservatives shown in the table above and analyzed by the same method as the associated soil samples.

% = percent
CLP = Contract Laboratory Program
CRQL = Contract-required quantitation limit
CVAA = Cold vapor atomic absorption
CWM = clear wide mouth
g = gram
HCl = Hydrochloric acid
Hg = Mercury
HNO_3 = Nitric acid
ICP-AES = Inductively coupled plasma-atomic emission spectroscopy
ICP-MS = Inductively coupled plasma-mass spectroscopy
ISM02.4 = Inorganic Superfund Method version 2.4
L = Liter
mL = Milliliter
MS/MSD = matrix spike/matrix spike duplicate
oz = ounce
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
pH = hydrogen ion concentration
QC = Quality control
RB = Rinsate blank
S/D = matrix spike/duplicate
SIM = selected ion monitoring
SOM02.4 = Superfund Organic Method version 2.4
SOW = Statement of Work
SVOC = Semivolatile organic compound
TAL = Target analyte list
TB = Trip blank
VOA = Volatile organic analysis
VOC = Volatile organic compound