January 30, 2018

Ms. Tara Rutland, P.E.
Project Manager
Remediation Bureau A, Section A
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7015

RE: Suspected Discovered Contamination Soil Characterization Work Plan
Former TransTechnology Corporation Facility Glen Head, New York

Dear Tara:

WSP USA, on behalf of our client, Breeze-Eastern LLC, prepared this work plan for additional investigation at the former TransTechnology Corporation (TTC) facility at 1 Robert Lane in Glen Head, New York. The work consists of characterizing whether soil exhibiting properties of suspected "Discovered Contamination", as defined in the *Interim Soil Management Plan* (SMP), dated November 9, 2015, contains regulated chemicals above the applicable soil cleanup objectives (SCOs) and warrants further action, such as removal from the site.[1] This letter provides background on the areas of suspected Discovered Contamination and provides procedures for the site characterization work.

Background

Following demolition of the TTC buildings in 2016, Breeze-Eastern initiated removing subsurface drainage structures and piping at the request of the Town of Oyster Bay. During the implementation of this work several drainage structures (e.g., drywells and catch basins), most of which were buried at depths between 2 and 5 feet, were encountered. This prompted Breeze-Eastern to undertake a geophysical survey and subsequent test pits in areas of geophysical anomalies in an effort to identify additional structures. In addition, Breeze-Eastern's contractor, with an oversight consultant present, removed piping in a further effort to identify buried drainage structures, based on the theory that piping could lead to structures that may have not been previously been identified.

During this work, when soil exhibiting properties of Discovered Contamination was encountered, some of the affected soil was removed for off-site disposal on a conservative basis.[2] However, soil deemed to be suspected of meeting the definition of Discovered Contamination, was left in place and the area designated for future characterization. These areas of suspected Discovered Contamination are the primary focus of this work plan. The red-hatched ovals in Figure 1A (southern portion of the site) and Figure 1B (northern portion of the site) show the areas of suspected Discovered Contamination designated for characterization.

[1] Discovered Contamination refers to the management of soil that may be discovered during the course of site activities that exhibits evidence of suspected contamination, or is confirmed by testing to exceed one or more of the site-specific soil cleanup objectives.
[2] Soil disposal documentation will be submitted to NYSDEC following completion of the post-*denouement* activities.

WSP USA
4th Floor
75 Arlington Street
Boston, MA 02116

Tel.: +1 617 426-7330
Fax: +1 617 960-4987
wsp.com

In some of the areas, a single, preliminary sample was collected to assist in guiding whether the soil warranted off-site disposal. A total of 20 samples were collected and, except for a sample collected next to holding tank HT-A, none contained chemical concentrations exceeding the applicable SCOs.[3] The sample collected next to the southwest corner of the base of HT-A at a depth of approximately 9 feet below ground surface (bgs) contained 573,000 micrograms per kilogram (µg/kg) of 1,2-dichlorobenzene, 123,000 µg/kg of 1,4-dichlorobenze, and 109,000 µg/kg of 1,1,1-trichloroethane, which exceed the Residential SCOs for Protection of Public Health. The sample results are provided in Table 1 and the results are summarized in chemical boxes plotted on Figures 1A and 1B. Full data deliverables for these samples will be included in a report summarizing the post-*denouement* OU-1 activities.

There have been two petroleum-related incidents at or near the facility. The first event occurred on June 5, 2017 when a street sweeper operated by the Town of Oyster Bay released an unknown quantity of diesel fuel onto the paved surface of One Robert Lane close to the former TTC site entrance. Evidence of a petroleum sheen was noticeable in the decontamination area rocks during rain events at the facility entrance shortly after the event, but the sheen is no longer visible. Although this is not Breeze-Eastern's responsibility, sampling is warranted to verify that the soil on the former TTC site was not adversely affected by the Town's release.

The second event occurred on July 18, 2017, when a hydraulic line on one of the contractor's trucks broke and released hydraulic oil onto a paved location of the site. The contractor cleaned up the released hydraulic oil and reported that the volume was less than 5 gallons and, thus, did not require NYSDEC notification. A soil sample was collected from under the asphalt and analyzed for volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) to verify that the underlying soil had not been affected. No VOCs or PAHs were detected above the Residential SCOs for Protection of Public Health and no further action is warranted relative to this event.

The following section describes the scope of the soil characterization activities in the areas of suspect Discovered Contamination.

Scope of Work

Identifying and Sampling Soil Exhibiting Properties of Suspected Discovered Contamination

The scope of work design for the soil characterization is biased toward areas of soil that are deemed to exhibit properties of suspected Discovered Contamination. To support this biased design, an excavator will be used instead of a direct-push drill rig to enable the sampling professional to observe the soil within open trenches in the designated areas and identify areas exhibiting properties of suspected Discovered Contamination. This will require excavating a trench across, and in the approximate center of, each designated area. If warranted to uncover additional potentially affected soil, additional trenching may be performed perpendicular to the initial trench (e.g., extending a second trench perpendicular from visibly affected soil to confirm the source, if any, and extent of the staining). The intent of this exercise is to locate soil with properties of suspected Discovered Contamination; no soil will be removed until the characterization data are received.

[3] The NYSDEC, in a response conference call and memorialization email dated March 3, 2017, stated that for post OU-1 closure activities conducted in support of the redevelopment of the property, the relevant evaluation criteria were the current Part 375 criteria (Residential SCOs for Protection of Public Health for Parcel A and Restricted Residential SCOs for Protection of Public Health for Parcel B [Table 375-6.8(b)]).

The soil areas are named based on the existing or former drainage structures. The sampling frequency in each designated area is provided below:

Designated Suspect Area	Quadrant	Existing Sample No.	No. of Samples	Full Analytical List (Yes/No)
LP-40	7	None	3	Yes
C2-C4	7 & 9	SWE, BOC3/C4	2	No
LP-43	8	LP-43	2	No
LP-1A	11	LP1A	2	No
LP-3/LP-3A	11	None	3	Yes
Grid 12 (no nearby structure)	12	None	3	Yes
LP-C	15	None	3	Yes
LP-48, LP-49, LP-50, LP-53	17	LP-48	4	No
E/W Pipe	15	E/W Pipe	2	No
LP-9+ (also other structures)	19	LP-5/6	5	No

The rationale supporting the number of samples is that there should be a minimum of three samples per area; however, if a sample has previously been collected from an area, then only two additional samples are warranted to meet the minimum of three. The areas listed above with more than three samples are slightly larger in size and warrant additional samples. Furthermore, based on the field conditions encountered, additional samples may be collected if deemed warranted by Breeze-Eastern.

Delineating Discovered Contamination in the Vicinity of Holding Tanks HT-A

The soil in the vicinity of the base of holding tank HT-A is designated as Discovered Contamination due to the presence of VOCs above the applicable SCOs. To gather additional information on the extent of VOCs, ten additional soil samples will be collected in this area as follows:

- two in the same approximate location as prior sample LP-21 (collected at a depth of approximately 9 feet bgs), but at depths of 12 and 15 feet bgs (3 and 6 feet below the bottom of the tank);
- four in each direction at a distance of 10 feet from prior sample LP-21 at a depth corresponding to approximately 1 foot below the base of the tank; and,
- four in each direction at a distance of 20 feet from prior sample LP-21 at the same depth.

The samples collected at the 20-foot distance will be archived pending analysis of the first set of samples. If any sample from the 10-foot distance exceeds the Residential SCO for Protection of Public Health, then the 20-foot sample in that same direction will be released for analysis. The laboratory will be instructed to analyze the 10-foot samples in time to make the determination whether to release any of the 20-foot samples within the specified holding time of 14 days.

Sampling in Vicinity of Town's Diesel Fuel Release

Three soil samples will be collected from 6 to 12 inches beneath the rock area at the front entrance close to Robert Lane. The samples will be placed evenly across the approximate 30-foot wide front entrance area.

Sample Collection Procedures

The sampling will be performed in accordance with New York State Department of Environmental Conservation's (NYSDEC's) *DER-10, Technical Guidance for Site Investigation and Remediation*, dated May 3, 2010, the *Soil Cleanup Guidance* under *Commissioner Policy-51 (CP-51)*, dated October 10, 2010, and WSP's standard operating procedures (SOPs), including SOP 3, SOP 4, and SOP 9; Enclosure A).

All of the sample locations will be measured from a known surveyed point (e.g., all the drainage structures have been surveyed) and marked on a map. These locations will be plotted on a scaled figure similar to Figures 1A and 1B.

After completing the sampling activities, the soil excavated for the trenches will be replaced.

Sample Analysis

The soil samples will be transported to a New York-certified laboratory for analysis. A minimum of one sample from each area will be analyzed for the full list of analytes listed in Section D-11, Appendix D (Excavation Work Plan) of the SMP (target analyte list [TAL] metals; target compound list [TCL] VOCs and semi-volatile organic compounds, TCL pesticides, and polychlorinated biphenyls [PCBs]). Based on the site history, the primary chemicals of concern at the former TTC site are VOCs, metals, and PAHs. Therefore, for the additional samples from each area, WSP and Breeze-Eastern request that NYSDEC limit the analytical parameter list to TCL VOCs, TAL metals/hexavalent chromium analyses, and polycyclic aromatic hydrocarbons (PAHs). In other words, for each area at least one sample will be analyzed for the full analyte list and the others for the truncated list.

The initial sample next to holding tank HT-A, Sample LP-21, was analyzed for the full list of analytes listed in Section D-11 and the only exceedance of the Residential SCO for Protection of Public Health was for VOCs. Therefore, WSP and Breeze-Eastern request that the additional samples from the vicinity of holding tank HT-A only be analyzed for TCL VOCs. Section D-11 of the Excavation Work Plan explicitly allows these requests for limited analytical parameters; however, the request must be approved to limit the analytical parameter list. If this request is denied, then the samples will be analyzed for the full analyte list in Section D-11, Appendix D.

The samples collected from the front entrance to verify that the Town's diesel fuel spill did not adversely affect the former TTC property will be analyzed for VOCs and PAHs (this area is not considered suspected Discovered Contamination).

Quality Assurance/Quality Control

Field QA/QC procedures for the proposed sampling activities will include collecting and analyzing blind duplicate samples, matrix spike and matrix spike duplicates (MS/MSDs), and trip blanks. The blind duplicate samples will be analyzed with the other samples to evaluate the reproducibility of the sample collection and analytical procedures, and the MS/MSD samples will be collected to evaluate the effect of the matrix on the analytical protocol. Dedicated, disposable equipment will be used; therefore, equipment rinsate blanks are not necessary. A trip blank will accompany the sample containers from the laboratory to the field and the samples from the field to the laboratory. The trip blanks, which will be analyzed for TCL VOCs, are used to assess cross-contamination during transit. Quality assurance and quality control samples will be collected during the proposed activities in accordance with WSP's SOP 4 (Enclosure A).

Project Schedule and Reporting

The proposed sampling will be performed during a period of reasonably warm weather (i.e., over 40° Fahrenheit). The soil characterization fieldwork is anticipated to require up to 4 days to complete with the preliminary analytical results expected within 2 weeks of sample collection. The results of the soil investigation, which will be compared to the Part 375 Residential (Parcel A) and Restricted-residential (Parcel B) SCOs for Protection of Public Health. The results and SCO comparison will be provided as an interim data deliverable to NYSDEC consisting of tables, figures, and an email or letter summary within 6 weeks of receiving the sample results. The work will be formally summarized in a report describing the overall post-*denouement* site activities.

Please contact me at (617) 210-1668 or John Simon of Gnarus Advisors at (202) 505-1906 if you have any questions or comments regarding this work plan or any other aspect of the project.

Sincerely yours,

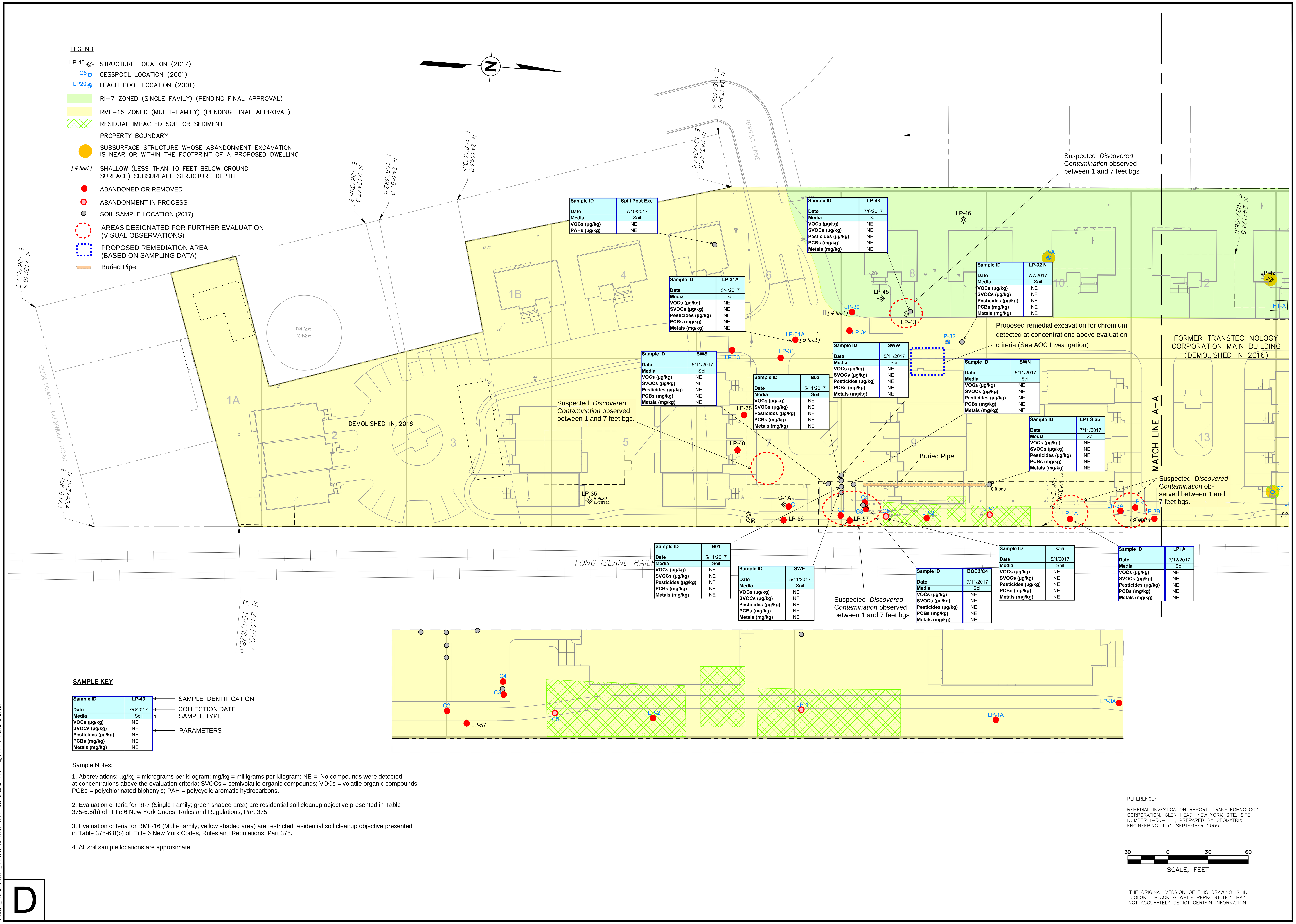
Michael J. Brown

Michael J. Brown, Ph.D.
Vice President

cc/encl: Mr. Anthony C. Perretta, New York State Department of Health
Mr. Carlos Pareja, Nassau County Department of Health
Mr. Morris Mehraban, One Robert Lane LLC
Mr. John A. Simon, Gnarus Advisors LLC

Enclosures

FIGURES



LEGEND

- LP-45 STRUCTURE LOCATION (2017)
- C6 CESSPOOL LOCATION (2001)
- LP20 LEACH POOL LOCATION (2001)
- RI-7 ZONED (SINGLE FAMILY) (PENDING FINAL APPROVAL)
- RMF-16 ZONED (MULTI-FAMILY) (PENDING FINAL APPROVAL)
- RESIDUAL IMPACTED SOIL OR SEDIMENT
- PROPERTY BOUNDARY
- SUBSURFACE STRUCTURE WHOSE ABANDONMENT EXCAVATION IS NEAR OR WITHIN THE FOOTPRINT OF A PROPOSED DWELLING
- [4 feet] SHALLOW (LESS THAN 10 FEET BELOW GROUND SURFACE) SUBSURFACE STRUCTURE DEPTH
- ABANDONED OR REMOVED
- ABANDONMENT IN PROCESS
- SOIL SAMPLE LOCATION (2017)
- AREAS DESIGNATED FOR FURTHER EVALUATION (VISUAL OBSERVATIONS)
- PROPOSED REMEDIATION AREA (BASED ON SAMPLING DATA)
- Buried Pipe

Sample ID	Spill Post Exc
Date	7/19/2017
Media	Soil
VOCs (µg/kg)	NE
PAHs (µg/kg)	NE

Sample ID	LP-43
Date	7/6/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP-32 N
Date	7/7/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP-31A
Date	5/4/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	SWS
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	SWW
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	SWN
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	B02
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP1 Slab
Date	7/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	B01
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	SWE
Date	5/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	BOC3/C4
Date	7/11/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	C-5
Date	5/4/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP1A
Date	7/12/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

SAMPLE KEY

Sample ID	LP-43	SAMPLE IDENTIFICATION
Date	7/6/2017	COLLECTION DATE
Media	Soil	SAMPLE TYPE
VOCs (µg/kg)	NE	
SVOCs (µg/kg)	NE	
Pesticides (µg/kg)	NE	PARAMETERS
PCBs (mg/kg)	NE	
Metals (mg/kg)	NE	

Sample Notes:

1. Abbreviations: µg/kg = micrograms per kilogram; mg/kg = milligrams per kilogram; NE = No compounds were detected at concentrations above the evaluation criteria; SVOCs = semivolatile organic compounds; VOCs = volatile organic compounds; PCBs = polychlorinated biphenyls; PAH = polycyclic aromatic hydrocarbons.

2. Evaluation criteria for RI-7 (Single Family; green shaded area) are residential soil cleanup objective presented in Table 375-6.8(b) of Title 6 New York Codes, Rules and Regulations, Part 375.

3. Evaluation criteria for RMF-16 (Multi-Family; yellow shaded area) are restricted residential soil cleanup objective presented in Table 375-6.8(b) of Title 6 New York Codes, Rules and Regulations, Part 375.

4. All soil sample locations are approximate.

REFERENCE:

REMEDIAL INVESTIGATION REPORT, TRANSTECHNOLOGY CORPORATION, GLEN HEAD, NEW YORK SITE, SITE NUMBER 1-30-101, PREPARED BY GEOMATRIX ENGINEERING, LLC, SEPTEMBER 2005.

30 0 30 60
SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

D

REVISIONS
REV DESCRIPTION
DRAWN BY
CHECKED
APPROVED
DATE
SEAL

SUBSURFACE STRUCTURE LOCATIONS SOUTH (PART 1 of 2)

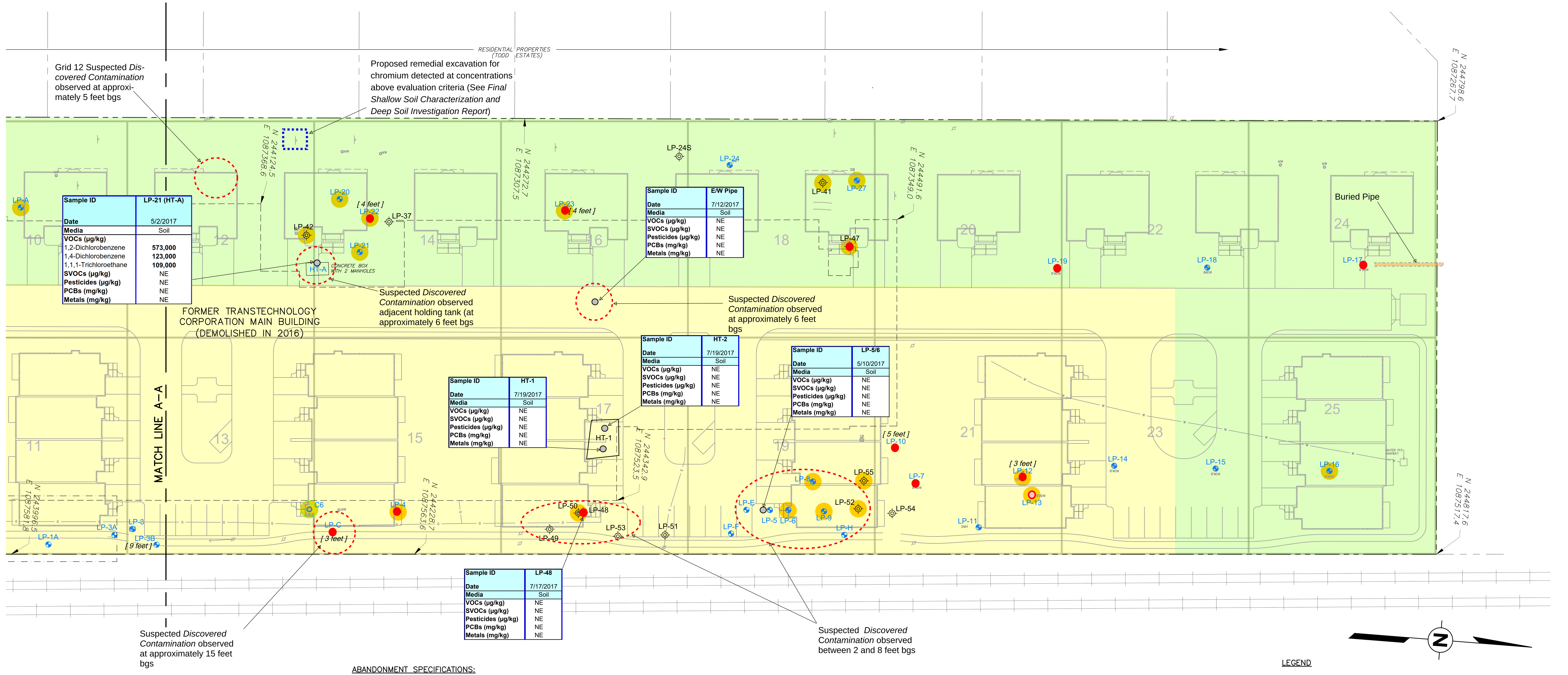
FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE-EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
75 ARLINGTON STREET, 4th FLOOR
BOSTON, MA 02116
TEL +1 617.426.7330

FIGURE 1A

Drawing Number
314P0522-D08



Sample ID	LP-21 (HT-A)
Date	5/2/2017
Media	Soil
VOCs (µg/kg)	
1,2-Dichlorobenzene	573,000
1,4-Dichlorobenzene	123,000
1,1,1-Trichloroethane	109,000
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

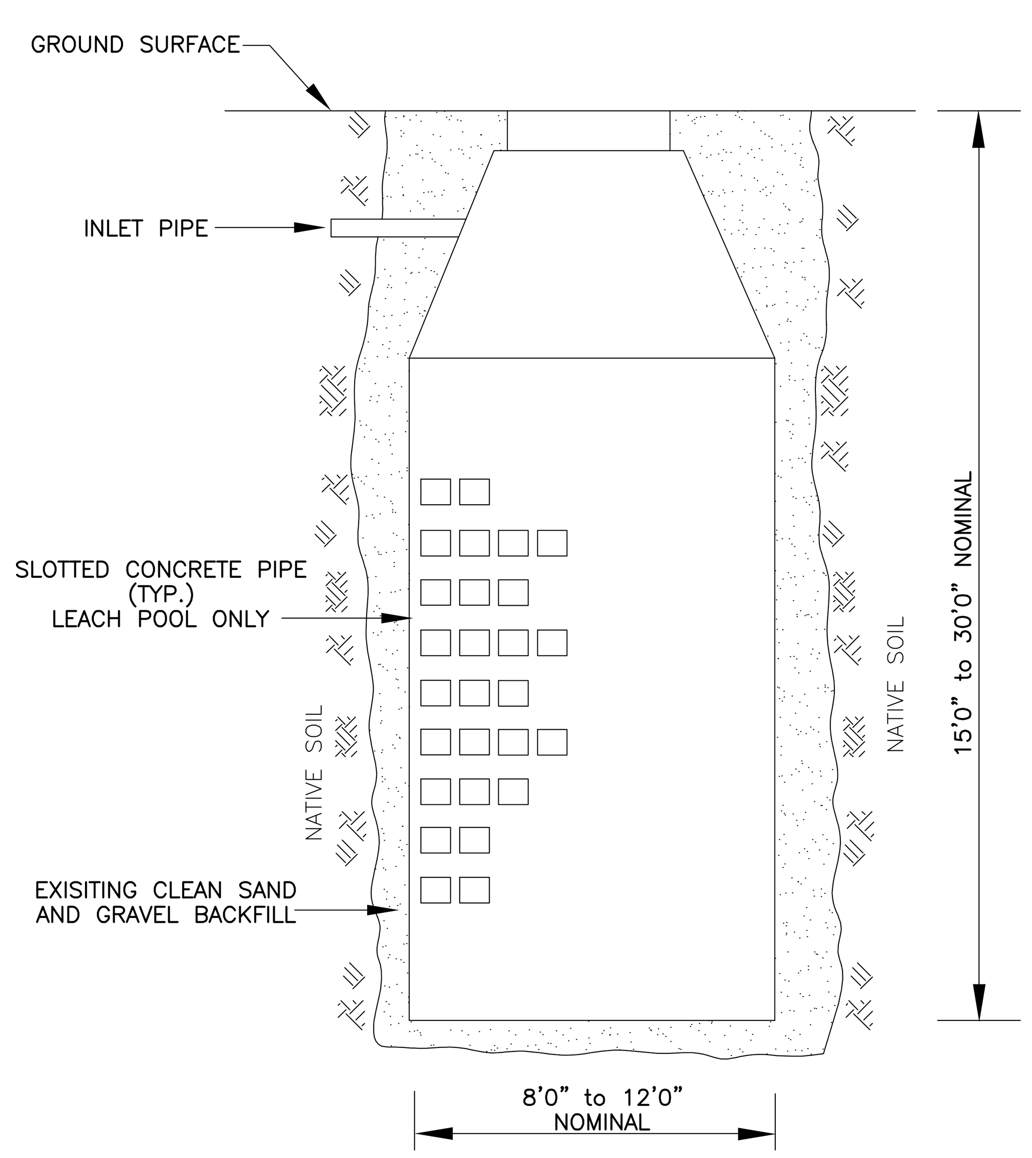
Sample ID	E/W Pipe
Date	7/12/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	HT-2
Date	7/19/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	HT-1
Date	7/19/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP-5/6
Date	5/10/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE

Sample ID	LP-48
Date	7/17/2017
Media	Soil
VOCs (µg/kg)	NE
SVOCs (µg/kg)	NE
Pesticides (µg/kg)	NE
PCBs (mg/kg)	NE
Metals (mg/kg)	NE



TYPICAL LEACH POOL AND CESSPOOL

NOT TO SCALE

ABANDONMENT SPECIFICATIONS:

1. LEACH POOLS ARE TYPICALLY 8 FEET IN DIAMETER AND ARE CONSTRUCTED OF SLOTTED CONCRETE PIPE WITHOUT A CONCRETE BOTTOM.

2. CESSPOOLS TYPICALLY VARY FROM 8 TO 12 FEET IN DIAMETER AND ARE CONSTRUCTED OF NON–SLOTTED CONCRETE PIPE WITH OR WITHOUT A CONCRETE BOTTOM.

3. IN–PLACE ABANDONMENT OF LEACH POOLS AND CESSPOOLS SHALL OCCUR BY UNCOVERING THE STRUCTURE, FILLING THE STRUCTURE WITH CRUSHED CONCRETE OR STONE TO A DEPTH OF 10 FEET BELOW GRADE, AND THEN REMOVING THE UPPER 10 FEET OF THE CONCRETE PIPE; ASSOCIATED PIPING WILL BE REMOVED AS PART OF THE ABANDONMENT ACTIVITIES. (NOTE: FOR STRUCTURES LESS THAN 10 FEET DEEP, THE STRUCTURE WILL BE REMOVED AND DISPOSED OF OFF–SITE).

4. NATIVE SOIL AND BACKFILL FROM THE UNCOVERING ACTIVITIES WILL BE STOCKPILED ADJACENT TO THE EXCAVATION AND SCREENED FOR POTENTIAL REUSE AS BACKFILL (UPPER 2 FEET ONLY) IN ACCORDANCE WITH THE SOIL MANAGEMENT PROCEDURES OUTLINED IN THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION–APPROVED (NYSDEC–APPROVED) INTERIM SITE MANAGEMENT PLAN (SMP).

5. GRAVEL OR REPROCESSED CONCRETE (FROM PREVIOUS ONSITE BUILDING DEMOLITION ACTIVITIES) SHALL BE USED TO BACKFILL THE REMAINING PORTION OF THE STRUCTURE AND THE OPEN EXCAVATION TO A DEPTH OF APPROXIMATELY TWO FEET BELOW GROUND SURFACE.

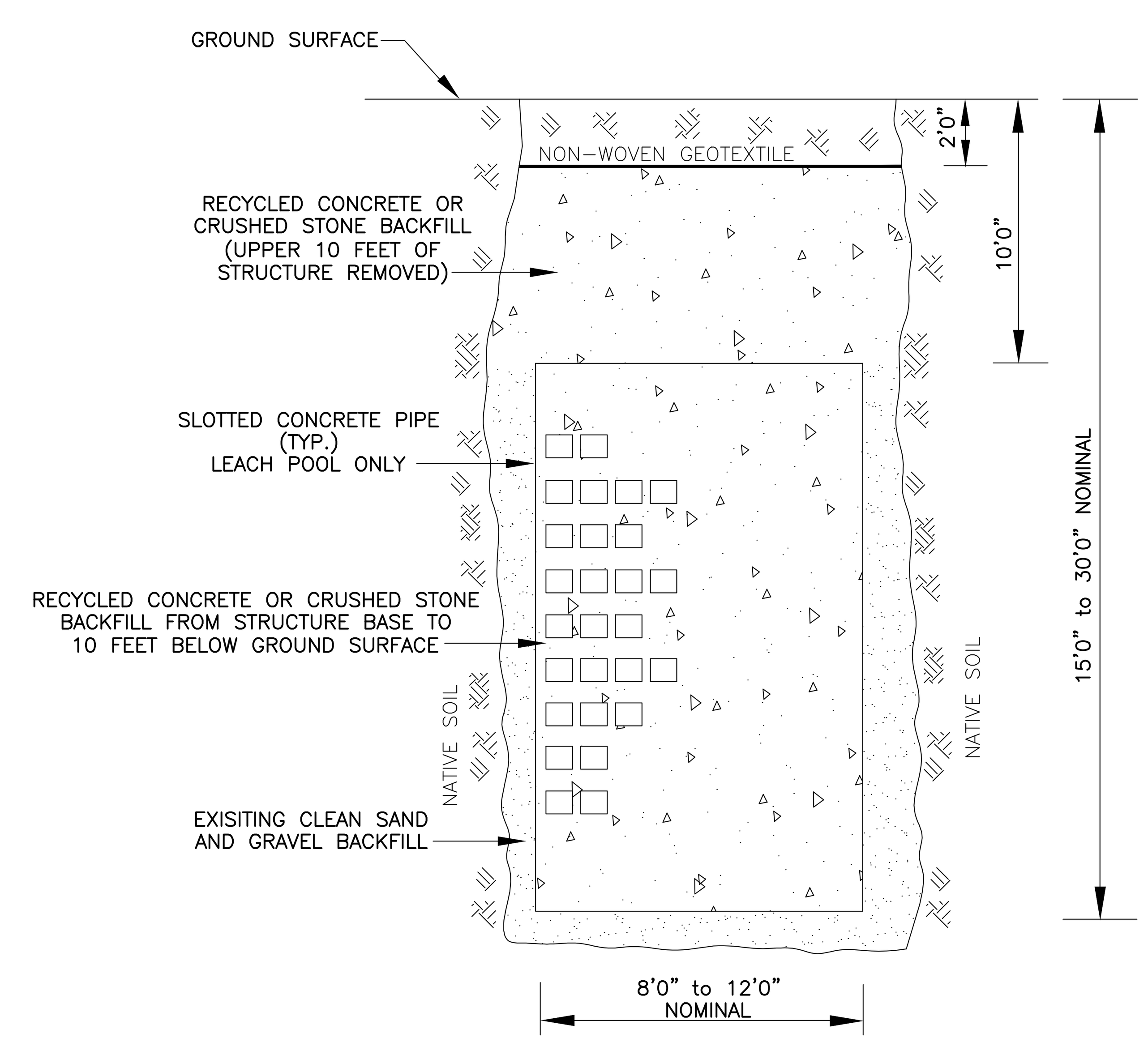
6. A NON–WOVEN GEOTEXTILE SHALL BE PLACED OVER THE GRAVEL/ REPROCESSED CONCRETE BACKFILL AT TWO FEET BELOW GROUND SURFACE. SOIL OR OTHER OFFSITE BACKFILL APPROVED IN ACCORDANCE ACCORDANCE WITH THE SMP SHALL BE PLACED IN 8–INCH LOOSE LIFTS AND COMPACTED WITH EQUIPMENT APPROPRIATE FOR THE SOIL TYPE (E.G., VIBRATORY PLATE, VIBRATORY ROLLER, SHEEPSFOOT ROLLER, ETC.) TO MINIMIZE SETTLING AND SUBSIDENCE.

7. CONCRETE DEBRIS AND PIPING REMOVED DURING THE ABANDONMENT ACTIVITIES WILL BE DISPOSED OF OFFSITE IN ACCORDANCE WITH THE PROCEDURES OUTLINED IN THE SMP.

8. STORM WATER CATCH BASINS AND SEPTIC TANKS ARE TYPICALLY LESS THAN 4 FEET DEEP AND WILL BE UNCOVERED AND COMPLETELY REMOVED. SOIL AND CONCRETE DEBRIS FROM THE REMOVED STRUCTURES WILL BE HANDLED IN ACCORDANCE WITH THE SMP. SOIL OR OTHER OFFSITE BACKFILL APPROVED IN ACCORDANCE WITH THE SMP SHALL BE PLACED IN 8–INCH LOOSE LIFTS AND COMPACTED WITH EQUIPMENT APPROPRIATE FOR THE SOIL TYPE (E.G., VIBRATORY PLATE, VIBRATORY ROLLER, SHEEPSFOOT ROLLER, ETC.) TO MINIMIZE SETTLING AND SUBSIDENCE.

9. SOIL EXCAVATED FROM THE MULTI–FAMILY PARCEL (RMF–16 ZONED) WILL NOT BE USED ON THE SINGLE–FAMILY PARCEL (RMF–7 ZONED).

10. THESE SPECIFICATIONS ARE ONLY INTENDED TO PROVIDE A SET OF PROCEDURES FOR RESPONSIBLY ABANDONING THE SUBSURFACE DRAINAGE STRUCTURES AND, AS SUCH, DO NOT CONSTITUTE A FOUNDATION DESIGN. ADDITIONAL BACKFILLING, COMPACTION, AND OTHER GEOTECHNICAL SPECIFICATIONS MAY BE WARRANTED FOR THOSE AREAS WHERE FUTURE BUILDINGS OR ROADS WILL BE CONSTRUCTED.



TYPICAL ABANDONED LEACH POOL AND CESSPOOL

NOT TO SCALE

LEGEND

- LP-45 STRUCTURE LOCATION (2017)
- C6 CESSPOOL LOCATION (2001)
- LP20 LEACH POOL LOCATION (2001)
- RI–7 ZONED (SINGLE FAMILY) (PENDING FINAL APPROVAL)
- RMF–16 ZONED (MULTI–FAMILY) (PENDING FINAL APPROVAL)
- RESIDUAL IMPACTED SOIL OR SEDIMENT
- PROPERTY BOUNDARY
- SUBSURFACE STRUCTURE WHOSE ABANDONMENT EXCAVATION IS NEAR OR WITHIN THE FOOTPRINT OF A PROPOSED DWELLING
- [4 feet] SHALLOW (LESS THAN 10 FEET BELOW GROUND SURFACE) SUBSURFACE STRUCTURE DEPTH
- ABANDONED OR REMOVED
- ABANDONMENT IN PROCESS
- SOIL SAMPLE LOCATION (2017)
- AREAS DESIGNATED FOR FURTHER EVALUATION (VISUAL OBSERVATIONS)
- PROPOSED REMEDIATION AREA (BASED ON SAMPLING DATA)
- Buried Pipe

SEE COMPANION FIGURE (FIGURE 1A) FOR SAMPLE KEY

REFERENCE:

REMEDIAL INVESTIGATION REPORT, TRANSTECHNOLOGY CORPORATION, GLEN HEAD, NEW YORK SITE, SITE NUMBER I–30–101, PREPARED BY GEOMATRIX ENGINEERING, LLC, SEPTEMBER 2005.

30 0 30 60

SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

D

REVISIONS

REV	DESCRIPTION	Revised:	Chkd:	Appr:

SEAL

DATE

DRAWN BY RA 10/18/2017

CHECKED

APPROVED

PROPERTY OF WSP USA INC.
IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS AND SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP USA INC.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IT IS A VIOLATION OF STATE LAW FOR ANY PERSONS, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

SUBSURFACE STRUCTURE LOCATIONS NORTH (PART 2 of 2)

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
75 ARLINGTON STREET, 4th FLOOR
BOSTON, MA 02116
TEL: +1 617.426.7330

FIGURE 1B

Drawing Number
314P0522–D08

TABLE

Table 1

Soil Characterization Results - Summary of Detected Compounds

Former TransTechnology Corporation Facility, Glen Head, New York (a)

Sample ID (a)	Residential Criteria (b)	Restricted Residential Criteria (b)	SPS-1	SPN-1	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	SB-55	SB-56	SB-58	SB-71	SB-72	SB-73	SB-74	SB-75	SB-76	SB-77	SB-78	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	LP-31A	LP-21	C5
Date			2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	2/22/17	3/22/17	3/22/17	3/22/17	3/22/17	3/22/17	3/22/17	3/22/17	5/4/17	5/2/17	5/4/17
Metals (mg/kg)																																
Aluminum	-	-	7,050	11,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,900	4,190	14,600
Arsenic	16	16	3.5	3.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	4.5
Barium	350	400	32.9	37.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31.4	28.6	55.9
Beryllium	14	72	0.44	0.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.31	ND	0.59
Cadmium	2.5	4.3	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.89	ND
Calcium	-	-	16,000	1,220	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	653	1,630	1,100
Chromium (total)	58	290	11.9	15.3	NA	NA	NA	NA	NA	NA	NA	15.7	16.7	10.2	14.0	37.0	15.1	12.2	5.3	11.7	41.5	15.6	NA	NA	NA	NA	NA	NA	NA	10.4	7.9	21.5
Cobalt	30 (c)	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	8.1
Copper	270	270	21.1	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.5	34.4	11.6
Iron	2000 (c)	-	13,500	14,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,670	6,820	17,100
Lead	400	400	16.2	11.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	10.6	12.4
Magnesium	-	-	2,890	2,130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,350	888	2,650
Manganese	2,000	2,000	246	197	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	115	71.5	425
Mercury	0.81	0.81	0.057	0.043	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.086	ND
Nickel	140	310	10.2	9.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.3	6.1	14.2
Potassium	-	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Silver	36	180	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	1.2	ND
Sodium	-	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Vanadium	100,000 (c)	-	21.5	22.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.6	7.3	27.6
Zinc	2,200	10,000	64.4	27.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.3	29.9	28.4
PCBs (mg/kg)																																
Aroclor 1248	1	1	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.125	ND
Aroclor 1254	1	1	ND	0.0452	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.110	ND
Pesticides (µg/kg)																																
alpha-Chlordane	910	4,200	0.64 J	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
4,4'-DDD	2,600	13,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	26	ND
4,4'-DDE	1,800	8,900	0.94	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	2.9	ND
4,4'-DDT	1,700	7,900	2.0	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
delta-BHC	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Dieldrin	39	200	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
gamma-Chlordane	540 (c)	-	0.82	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Heptachlor epoxide	77 (c)	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	5.9	ND
SVOCs (µg/kg)																																
Acenaphthene	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Acenaphthylene	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Anthracene	100,000	100,000	28.6 J	23.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Benzo(a)anthracene	1,000	1,000	198	169	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Benzo(a)pyrene	1,000	1,000	213	186	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Benzo(b)fluoranthene	1,000	1,000	320	283	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Benzo(g,h,i)perylene	100,000	100,000	176	144	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Benzo(k)fluoranthene	1,000	3,900	114	97.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
bis(2-Ethylhexyl)phthalate	-	-	447	162	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73.4	1,850	ND
Carbazole	-	-	34.9 J	25.6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
1,1-Biphenyl	-	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20.6 J	26.4 J	ND
Chrysene	1,000	3,900	272	221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	20.4 J	ND
Dibenzo(a,h)anthracene	330	330	41.3	41.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Dibenzofuran	14,000	59,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	16.8 J	ND
Fluoranthene	100,000	100,000	497	413	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	18.7 J	ND
Fluorene	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	24 J	ND
Indeno(1,2,3-cd)pyrene	500	500	179	152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
2-Methylnaphthalene	410 (c)	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	65.6 J	ND
3&4-Methylphenol	134,000	200,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	40.6 J	ND
Naphthalene	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	25.8 J	ND
N-Nitrosodiphenylamine	-	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Phenanthrene	100,000	100,000	183	135	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	86.7	ND
Phenol	100,000	100,000	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Pyrene	100,000	100,000	479	402	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	21.2 J	ND
VOCs (µg/kg)																																
Acetone	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	31.9	ND	138
Benzene	2,900	4,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27 J
2-Butanone (MEK)	100,000 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	21.3
Carbon disulfide	100,000 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	1.5 J	407 J	0.55 J
Chlorobenzene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	2,360	ND
Chloroethane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.27 J	0.25 J	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	100,000	100,000	ND	ND	0.64 J	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	573,000	0.47 J
1,3-Dichlorobenzene	17,000	49,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	10,000	ND
1,4-Dichlorobenzene	9,800	13,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	123,000	ND
1,1-Dichloroethane	19,000	26,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	7.3	4,660	5.2
1,1-Dichloroethene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	1.6	3,130	0.33 J
cis-1,2-Dichloroethene	59,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.1
trans-1,2-Dichloroethene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7 J
Ethylbenzene	30,000	41,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	100,000 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	0.66 J	ND	ND
Methylcyclohexane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	51,000	100,000	ND	ND	ND	1.4 J	1.3 J	2.5 J	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	1.9 J	1.1 J	1.0 J	0.98 J	1.3 J	1.0 J	ND	ND	1 J
Tetrachloroethene	5,500	19,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7 J
Toluene	100,000	100,000	ND	ND	0.29 J	0.25 J	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	0.45 J	5,420	0.21 J
1,2,3-Trichlorobenzene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	677 J	ND
1,2,4-Trichlorobenzene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	2,280 J	ND
1,1,1-Trichloroethane	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	46.5	109,000	21.7
Trichloroethene	10,000	21,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	4,360	19.3
Xylene (total)	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.45 J	0.45 J	0.18 J	0.22 J	0.25 J	ND	0.32 J	ND	574	ND

Table 1
Soil Characterization Results - Summary of Detected Compounds
Former TransTechnology Corporation Facility, Glen Head, New York (a)

Sample ID (a) / Date	Residential Criteria (b)	Restricted Residential Criteria (b)	B-01 5/11/17	B-02 5/11/17	SWN 5/11/17	SWE 5/11/17	SWS 5/11/17	SWW 5/11/17	LP-5/6 5/10/17	LP-43 Exterior 7/6/17	LP-32 N Pipe 7/7/17	LP-1 Slab 7/11/17	BOC3/C4 7/11/17	LP1A 7/12/17	E/W Pipe 7/12/17	LP48 7/17/17	Spill Post Exc 7/18/17	HT-1 7/19/17	HT-2 7/19/17	West 1/2 Cell 8/28/17	Stockpile 9/1/17	LPH-230I 1/3/18	SP-8 1/3/18	SP-9 1/3/18	C1A-I20I 1/2/18
Metals (mg/kg)																									
Aluminum	-	-	3,210	5,540	4,210	2,600	5,060	2,940	11,700	9,860	13,300	9,010	12,200	12,500	12,800	11,000	ND	17,400	13,400	14,900	7,610	11,000	9,120	11,000	10,600
Arsenic	16	16	ND	3	ND	ND	2.8	2.7	3.0	2.5	4.1	3.5	3.4	3.5	5.5	4.8	ND	5.9	3.8	6.1	4.5	3.6	4.0	4.9	6.4
Barium	350	400	ND	28	24.4	ND	46.7	ND	46.4	42.9	47.7	37.4	45.3	49.1	43.8	41.9	ND	62.8	49.1	57.1	31.6	67.8	38.5	47.5	55.2
Beryllium	14	72	ND	0.33	ND	ND	0.29	0.25	0.52	0.49	0.56	0.46	0.44	0.58	0.61	0.57	ND	0.84	0.64	0.82	0.51	0.37	0.42	0.50	0.47
Cadmium	2.5	4.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	-	-	ND	6,480	1,190	512	3,000	ND	938	735	1,100	1,570	869	1,270	660	2,670	ND	2,020	1,070	1,250	8,540	7,220	7,000	8,140	2,210
Chromium (total)	58	290	7.3	10.8	4.7	6.8	9.1	8.5	17.9	17.8	18.8	16.8	20.7	17.4	21.9	14.5	ND	21.9	16.4	22.2	23.6	27.7	17.8	21.9	29.1
Cobalt	30 (c)	-	ND	ND	ND	ND	ND	ND	ND	7.0	6.0	6.2	ND	6	6.6	6.4	ND	7.1	7.2	6.7	ND	ND	5.2	5.9	6.6
Copper	270	270	4.6	8.1	8.7	4.2	7.0	5.6	9.1	10.4	8.3	11.1	8.6	10.4	10.5	9.1	ND	13.3	11.2	14.9	17.3	94.3	12.3	27.0	15.9
Iron	2000 (c)	-	7,470	10,400	8,830	6,980	8,330	9,720	13,900	16,400	16,500	12,800	13,200	13,400	17,500	14,000	ND	19,300	16,500	18,400	12,700	10,600	13,700	15,300	15,300
Lead	400	400	3.3	7.8	ND	2.3	8.1	3.1	9.2	6.2	13.5	14.0	6.8	16.6	29.5	21.3	ND	25.1	8.6	27.5	13.6	85.7	35.7	65.2	8.3
Magnesium	-	-	749	3,680	2,050	946	1,660	716	2,500	2,420	2,180	1,940	2,330	2,190	2,140	2,730	ND	3,130	2,790	2,480	5,450	5,340	4,590	5,740	3,950
Manganese	2,000	2,000	153	238	168	138	434	196	183	347	169	311	139	191	321	414	ND	290	174	332	213	151	246	294	286
Mercury	0.81	0.81	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.052	0.057	0.043	ND	ND	ND	0.067	ND	0.18	0.034	0.044	ND
Nickel	140	310	6.1	9.3	9.3	5.7	7.7	7.0	11.6	13.8	12.3	10.7	11.4	11.3	12.8	12.2	ND	14.8	14.3	12.7	11.7	12.1	11.7	13.1	15.9
Potassium	-	-	ND	ND	ND	ND	ND	ND	ND	1,230	ND	ND	ND	ND	ND	ND	ND	1,130	ND	ND	ND	1,150	ND	ND	1,720
Silver	36	180	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	100,000 (c)	-	6.9	13.2	14.7	6.3	10.8	7.9	21.9	21.6	24.6	19.1	24.8	23.0	25.0	20.0	ND	29.7	23.6	30.0	18.6	18.4	19.2	21.6	24.0
Zinc	2,200	10,000	12.1	21.7	15.8	10.2	23.8	12.6	26.6	28.6	23.6	31.3	29.2	33.5	43.0	33.3	ND	42.9	33.6	44.9	31.3	127	41.1	51.6	35.7
PCBs (mg/kg)																									
Aroclor 1248	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	1	1	0.0386	0.0454	ND	ND	ND	0.0268 J	ND	ND	ND	0.0735	ND	ND	0.0226 J	ND	NA	ND	ND	ND	ND	ND	0.0242 J	0.0377	ND
Pesticides (µg/kg)																									
alpha-Chlordane	910	4,200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	11.8	ND	ND	ND	ND	ND
4,4'-DDD	2,600	13,000	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.4	1.7	ND	NA	ND	ND	ND	ND	1.4	1.4	1.3	0.70 J
4,4'-DDE	1,800	8,900	1.7	ND	ND	ND	0.68 J	ND	ND	ND	1.7	ND	ND	2.9	1.8	ND	NA	2.0	ND	1.7	ND	1.1	0.64 J	ND	1.1
4,4'-DDT	1,700	7,900	2.3	1.4	ND	2.0	1.4	ND	0.49 J	ND	ND	ND	ND	0.82	3.7	ND	NA	2.8	ND	1.5	2.4	ND	1.1	1.3	2.1
delta-BHC	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	1.4	ND	ND	ND
Dieldrin	39	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	1.3	ND	ND	ND
gamma-Chlordane	540 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	8.5	ND	ND	ND	ND	ND
Heptachlor epoxide	77 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	1.0	ND	ND	ND	ND	ND
SVOCs (µg/kg)																									
Acenaphthene	100,000	100,000	ND	30.0 J	ND	ND	ND	ND	ND	222	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80.3	ND	ND	ND	ND
Acenaphthylene	100,000	100,000	ND	ND	ND	67.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	100,000	100,000	ND	80.5	ND	ND	ND	ND	ND	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	142	ND	ND	ND	ND
Benzo(a)anthracene	1,000	1,000	ND	269	ND	14.2 J	85.5	ND	ND	ND	ND	17.9 J	ND	ND	ND	18.8 J	41.9	ND	ND	ND	401	ND	ND	ND	ND
Benzo(a)pyrene	1,000	1,000	ND	251	ND	ND	84.4	ND	ND	ND	ND	17.3 J	ND	ND	ND	ND	36.5 J	ND	ND	ND	378	ND	ND	ND	ND
Benzo(b)fluoranthene	1,000	1,000	ND	354	ND	ND	107	ND	ND	ND	ND	22.7 J	ND	ND	ND	23.6 J	49.3	ND	ND	19.8 J	456	ND	ND	ND	ND
Benzo(g,h,i)perylene	100,000	100,000	ND	177	ND	24.5 J	68.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.2 J	ND	ND	ND	246	ND	ND	ND	ND
Benzo(k)fluoranthene	1,000	3,900	ND	108	ND	ND	43.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	153	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	56.0 J	ND	ND	ND	ND
Carbazole	-	-	ND	60.5 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	72.4	ND	ND	ND	ND
1,1-Biphenyl	-	-	ND	ND	ND	ND	ND	ND	ND	133	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	1,000	3,900	ND	328	ND	23.3 J	103	ND	ND	ND	ND	17.6 J	ND	ND	ND	23.6 J	41.2	ND	ND	ND	373	ND	ND	ND	ND
Dibenzo(a,h)anthracene	330	330	ND	47.3	ND	ND	15.4 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	65.3	ND	ND	ND	ND
Dibenzofuran	14,000	59,000	ND	19.5 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	34.4 J	ND	ND	ND	ND
Fluoranthene	100,000	100,000	18.2 J	626	ND	ND	131	ND	ND	36.4	ND	28.7 J	ND	ND	ND	26.5 J	55.7	ND	ND	21.4 J	846	ND	ND	ND	ND
Fluorene	100,000	100,000	ND	28.2 J	ND	ND	ND	ND	ND	617	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	59.5	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	500	500	ND	188	ND	ND	74.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	24.7 J	ND	ND	ND	269	ND	ND	ND	ND
2-Methylnaphthalene	410 (c)	-	ND	ND	ND	22.2 J	ND	ND	ND	ND	ND	ND	ND	26.8 J	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
3&4-Methylphenol	134,000	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	-	-	ND	ND	ND	198	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	100,000	100,000	ND	491	ND	ND	52.9	ND	ND	1,420	ND	17.5 J	ND	20.4 J	ND	16.2 J	59.6	ND	ND	ND	668	ND	ND	ND	ND
Phenol	100,000	100,000	ND	ND	ND	53.9 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	100,000	100,000	19.6 J	584	ND	32.2 J	180	ND	ND	77.3	ND	36.2	ND	ND	18.6 J	32.7 J	87.6	ND	ND	16.8 J	754	ND	ND	ND	ND
VOCs (µg/kg)																									
Acetone	100,000	100,000	9.1 J	ND	ND	7.6 J	8.1 J	ND	123	39.2	178	ND	ND	37.6	95.5	ND	NA	5.7 J	ND	111	ND	ND	ND	ND	ND
Benzene	2,900	4,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	51.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	100,000 (c)	-	ND	ND	ND	ND	ND	ND	15.9	ND	18.9	ND	ND	ND	19.1	ND	NA	ND	ND	15.8	ND	ND	ND	ND	ND
Carbon disulfide	100,000 (c)	-	ND	ND	ND	ND	ND	ND	0.30 J	ND	2.8	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100,000	100,000	ND	ND	ND	ND	ND	ND	18.2	ND	ND	ND	38.0 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.4 J	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	-	-	ND	ND	ND	ND	ND	ND	0.60 J	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	100,000	100,000	ND	ND	ND	ND	ND	ND	4.1	ND	ND	ND	9,150	4.9	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	17,000	49,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	229	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	9,800	13,000	ND	ND	ND	ND	ND	ND	2.5	ND	ND	ND	2,020	0.87 J	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	19,000	26,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.7 J	3.7	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	59,000	100,000	15.1	0.75 J	1.4	0.59 J	1.5	ND	ND	ND	0.56 J	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	30,000	41,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19.7 J	5.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	100,000 (c)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.77 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	51,000	100,000	ND	ND	ND	ND	ND	1.6 J	1.2 J	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	2.7 J	ND	ND
Tetrachloroethene	5,500	19,000	0.84 J	ND	0.33 J	ND	ND	ND	ND	ND	4.8	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.5	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	240 J	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	100,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	62.4 J	2.3	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	10,000	21,000	56.3	2.0	6.6	2.1	3.4	1.6	ND	ND	56.6	ND	50.5 J	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	100,000	100,000	ND	0.23 J	0.27 J	ND	ND	ND	0.25 J	ND	ND	ND	63.0 J	30.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

a) Concentrations shaded exceed evaluation criteria. µg/kg=micrograms per kilogram; mg/kg=milligrams per kilogram; J=estimated result; NA=not analyzed; ND=not detected; SVOC=semivolatile organic compounds; VOCs=volatile organic compounds; PCB=polychlorinated biphenyls.
b) Evaluation criteria are the residential soil cleanup objectives (SCO) presented in Table 375-6.8(b) of Title 6, New York Codes, Rules and Regulations, Part 375.
c) Supplemental soil cleanup objective listed.

ENCLOSURE

A STANDARD OPERATING PROCEDURES

FIELD STANDARD OPERATING PROCEDURE #3

SAMPLE PACKAGING AND SHIPMENT PROCEDURE

Shipping samples is a basic but important component of field work. The majority of field activities include the collection of environmental samples. Proper packing and preservation of those samples is critical to ensuring the integrity of our work product. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

3.1 ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
IATA	International Air Transport Association
HASP	Health and safety plan
PPE	Personal protective equipment
SOP	Standard operating procedure

3.2 MATERIALS

— Suitable shipping container (e.g., plastic cooler)
— Chain-of-custody forms
— Custody seals
— Sample container custody seals (as necessary)
— Mailing address labels (as necessary)
— Shipping form (with account number, as necessary)
— Tape (e.g., strapping, clear packing)
— Knife or scissors
— Permanent marker
— PPE
— Bubble wrap or other packing material

Temperature-preserved samples:

— Large plastic garbage bag
— Wet ice
— Heavy-duty zipper-style plastic bags
— Universal sorbent materials

Note: Some materials will be supplied by the laboratory, while others are must be supplied by the sampler. Confirm supplier of materials prior to mobilizing to the field.

3.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

This SOP is designed to provide the user with a general outline for shipping samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample collection and quality assurance procedures (SOP 4), and investigation derived waste management procedures (SOP 5).

Most environmental samples are classified non-hazardous materials due to unknown characteristics and hazardous classes, however environmental samples can meet the definition of DOT hazardous materials when shipped by air, ground, or rail from a project site to the laboratory (e.g., free product, samples preserved with a hazardous material [TerraCore® samplers]). As such, field staff must work with their assigned company compliance professional to determine whether the sample shipment is subject to any specific requirements (e.g., packaging, marking, labeling, and documentation) under the DOT hazardous materials regulations.

3.4 SAMPLE SHIPMENT PROCEDURES

The two major concerns in shipping samples are incidental breakage during shipment and complying with applicable DOT and courier requirements for hazardous materials shipments.

> **NOTE: Many couriers, including Federal Express and UPS, have requirements that the company register with them before shipping hazard materials. In most cases, it is the sampling location, not the company office address, which needs to be registered. Therefore, each project will likely have unique requirements. Please contact your company compliance professional to determine whether or not you will be required to register for your shipment.**

Protecting the samples from incidental breakage can be achieved using "common sense." Pack all samples in a manner that will prevent them from moving freely about in the cooler or shipping container. Do not allow glass surfaces to contact each other. When possible, repack the sample containers in the same materials that they were originally received in from the laboratory. Cushion each sample container with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. A more detailed procedure for packing environmental samples is presented below.

3.4.1 NON-HAZARDOUS MATERIAL ENVIRONMENTAL SAMPLES

The first step in preparing your samples for shipment is securing an appropriate shipping container. In most cases, the analytical laboratory will supply the appropriate container for bottle shipment, which can be used to return samples once they have been collected. Be sure that the container is large enough to contain the samples plus a sufficient amount of packing materials, and if applicable, enough wet ice to maintain the samples at the preservation temperature (usually 4 degrees Celsius). Use additional shipping containers as needed so that sample containers are protected from breakage due to overcrowding. Do not use lunch-box sized coolers or soft sided coolers, which do not offer sufficient insulation or protection from damage.

3.4.1.1 TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Temperature-preserved samples should be shipped to the laboratory in an insulated container (e.g., cooler). If using a plastic cooler with a drain, securely tape the inside of the drain plug with duct tape or other material to ensure that no water leaks from the cooler during shipment. Place universal sorbent materials (e.g., sorbent pads) in the bottom of the insulated container. The amount of sorbent material must be sufficient to absorb any condensation from the wet ice and a reasonable volume of water from melted wet ice (if a bag were to rupture) or a damaged (aqueous) sample container.

The next step is to line the insulated container with a large, heavy-duty plastic garbage bag. If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between the sample containers. Place large or heavy sample containers on the bottom of the cooler with lighter samples placed on top to minimize the potential for breakage. Place all sample containers in the shipping container right-side up. Do not overfill the cooler with samples; room must be left for a sufficient volume of wet ice. Wet ice must be double-bagged in heavy-duty zipper-style plastic bags (1 gallon-sized, or less); properly seal both bags before placing in the insulated container. Place the bags of ice on top of or between the samples. Place as much ice as possible into the cooler to ensure the samples arrive at the lab at the required preservation temperature, even if the shipment is delayed. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice. Securely close the top of the heavy-duty plastic bag and seal with tape.

3.4.1.2 NON-TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Non-temperature-preserved samples should be shipped to the laboratory in a durable package (e.g., hard plastic container or cardboard box). If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between and on top of the sample containers. Place large or heavy sample containers on the bottom of the container with lighter samples placed on top to minimize the potential for breakage. Place all sample containers within the shipping container right-side up. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice.

3.4.1.3 CONTAINER SHIPMENT

Place the original, white, top copy of the chain-of-custody form (i.e., laboratory copy) into a heavy-duty zipper-style plastic bag, affix/tape the bag to the shipping container's inside lid, and then close the shipping container. Only one chain-of-custody form is required to accompany one of the shipping containers per sample shipment; the other coolers in the shipment do not need to include chain-of-custody forms. At this point, sample shipment preparations are complete if using a laboratory courier.

Once the shipping container is sealed, shake test the shipping container to make sure that there are no loose sample containers. If loose sample containers are detected, open the shipping container, repack the contents, and reseal the shipping container. If sending the sample shipment through a commercial shipping vendor, place two signed and dated chain-of-custody seals on alternate sides of the shipping container lid so that it cannot be opened without breaking the seals. Securely fasten the top of the shipping container shut with clear packing tape; carefully tape over the custody seals to prevent damage during shipping.

Using clear tape, affix a mailing label with the company's return address to the top of the shipping container. Ship environmental samples to the contracted analytical laboratory using an appropriate delivery schedule. If applicable, check the appropriate box on the airbill for Saturday delivery (you need to verify with the laboratory that someone will be at the laboratory on a Saturday to receive the sample shipment). Declare the value of samples on the shipping form for insurance purposes, if applicable, and be sure to include the project billable number on the shipping form's internal billing reference section. When shipping samples to a lab, identify a declared value equal to the carrier's default value ($100); additional fees will be charged based on a higher value declared. Our preferred carrier, Federal Express, will only reimburse for the actual value of the cooler and its contents if a sample shipment is lost; they will not reimburse for the cost of having to re-collect the samples. [Please note: if you are shipping something other than samples, such as field equipment, declare the replacement value of the contents.]

Record the tracking numbers from the shipping company forms (i.e., the airbill number) in the field book and retain a copy of the shipping airbill. On the expected delivery date, confirm sample receipt by contacting the laboratory or tracking the package using the tracking number; provide this confirmation information to the project manager.

NOTE: Most shipping carriers adhere to transit schedules with final pickup times each day; these schedules are subject to change and vary by service location. If shipping containers are dropped off at a service location after the final pickup time, transit to the laboratory will not be initiated until the following day, and samples may not be properly preserved. Therefore, confirm transit schedules in advance of each sampling event, and ensure samples are dropped off before the final pickup time of the day.

3.4.2 HAZARDOUS MATERIALS SAMPLES

Employees rarely ship hazardous materials due to DOT shipping requirements. If you find that your samples could be considered a DOT hazardous material, first coordinate with the assigned company compliance professional and project manager to make a hazardous material classification and, if necessary, establish the necessary protocols and to receive the appropriate training/certification.

NOTE: Employees shipping samples regulated as hazardous materials or exempt hazardous materials by air must have International Air Transport Association (IATA) training. IATA training is a separate training required in addition to DOT hazardous materials training for such shipments. Most of our employees do not have IATA training and therefore, anyone who needs to ship by air MUST consult with a company IATA-trained compliance professional.

FIELD STANDARD OPERATING PROCEDURE #4

SAMPLE COLLECTION AND QUALITY ASSURANCE PROCEDURE

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under U.S. Environmental Protection Agency (EPA) or other agency approved protocols. This operating procedure describes sample identification procedures, sampling order for select analytes, quality control and quality assurance (QA/QC) sampling procedures, and custody documentation for environmental sampling. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

4.1 ACRONYMS AND ABBREVIATIONS

ºC	Degrees Celsius
COC	Chain-of–custody [form]
DI	Deionized water
DOT	U.S. Department of Transportation
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
HASP	Health and safety plan
ID	Identification [number]
MS/MSD	Matrix spike and matrix spike duplicate
MSA	Master Services Agreement
PPE	Personal protective equipment
QA	Quality assurance
QA/QC	Quality assurance/quality control
QAPP	Quality assurance project plan
SOP	Standard operating procedure
VOCs	Volatile organic compounds

4.2 MATERIALS

— Field book
— Indelible (waterproof) markers or pens
— PPE
— Sample containers
— Sample labels
— Clear tape
— Deionized (DI) water
— Cleaned or dedicated sampling equipment

4.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's USA Corp. Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

This SOP is designed to provide the user with a general outline for collecting environmental and quality assurance samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), investigation derived waste management procedures (SOP 5), and equipment decontamination (SOP 6). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a site-specific work plan or a dedicated quality assurance project plan (QAPP).

4.4 SAMPLE IDENTIFICATION PROCEDURES

Information on the sample container labels must include the site/project name, project/task number, unique alpha-numeric sample identification (ID) number, sample collection date, time of collection using the military or 24-hour clock system (i.e., 0000 to 2400 hours), analytical parameters, preservative, and the initials of the sampling personnel. Employees are advised to use pre-printed waterproof mailing labels (e.g., Avery® 5xxx-series Waterproof Address Labels) for all sample identification. Label templates are available.

The sample identification (ID) number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the company's naming protocol. This protocol was developed to aid in determining the type of sample collected (e.g., soil, groundwater, vapor, etc.), the sample location, and, where appropriate, the sample depth. The protocol was also designed to ensure consistency across the company.

Construct sample IDs in the following format:

SB-10A (4-6)

Where, in this example:

— SB = the first two or three characters will define the sample type (see list of approved prefixes below); in this case, a soil boring
— 10A = the next two or three alpha-numeric digits (separated by a dash from the sample type identifier) indicate the location of the boring on the site; in this case, boring number 10A
— (4-6) = the depth the sample was collected, with the first number (including decimals, if necessary) indicating the top of the sample interval (in feet) and the second number indicating the bottom of the sample interval (in feet); not all sample types will include depth information.

Additional label information may be added after the last character of the sample ID number (e.g., sample date, underground storage tank number, area of concern number, "Area" number, client identifier, etc.). Separate any additional information from the required portion of the sample name by dash(es).

Sample Prefix	Permitted Use
AA	Ambient outdoor air sample
CC	Concrete core/chip sample
CS	Confirmation/verification soil sample collected from an excavation
HA	Soil sample collected with a hand auger

Sample Prefix	Permitted Use
IAB	Indoor air sample – basement
IAC	Indoor air sample – crawl space
IAF	Indoor air sample – first floor
MW	Soil sample collected from a monitoring well borehole or a groundwater sample collected from a monitoring well
PZ	Groundwater sample collected from a piezometer
SB	Soil sample collected from boreholes that will not be converted to monitoring wells
SED	Sediment sample
SG	Soil gas sample other than a sub-slab sample (e.g., sample collected from a temporary or permanent polyvinyl chloride sample point or stainless steel screen implant)
SL	Sludge sample
SS	Surface soil sample collected using hand tools (e.g., trowel, spoon, etc.) and typically at depths less than 2 feet below ground surface
SSV	Sub-slab vapor sample
SW	Surface water sample
TC	Tree core sample
TP	Soil sample collected from a test pit
WC	Waste characterization sample
WP	Wipe sample
WW	Wastewater

4.5 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

The first step in sample collection is to verify that the analytical laboratory has provided the correct number and type of sample containers and each contains the appropriate preservatives for the proposed project (i.e., check against the sampling plan requirements outlined in the site-specific QAPP or, for those projects without a site-specific QAPP, the laboratory Task Order). Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration. Report any discrepancies, or non-receipt, of specific types of sample containers to the team leader or project manager immediately. Make arrangements with the laboratory to immediately ship missing or additional sampling containers.

Precautions must be taken to prevent cross-contamination and contamination of the environment when collecting samples. Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to sampling. The gloves must not come in contact with the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. Sample collection must follow all appropriate SOPs, state and federal regulations, or guidance, for the collection of environmental samples; the recommended order of sample collection is:

- Geochemical measurements (e.g., temperature, pH, specific conductance)
- Volatile organic compounds (VOCs)
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Total metals
- Dissolved metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collected samples that require thermal preservation must be immediately (within 15 minutes) placed in a cooler with wet ice and maintained at a preservation temperature of 4° Celsius (ºC).

4.6 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field quality assurance/quality control (QA/QC) samples include equipment blanks, trip blanks, duplicates, and split samples. The project manager or QAPP must specify the type and frequency of QA/QC sample collection. The QA/QC sample identification number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the company's naming protocol as discussed in the sections below. QA/QC samples must be clearly identified on our copy of the COC form and in the field book. Failure to properly collect and submit required QA/QC samples can result in invalidation of an entire sampling event.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

4.6.1 EQUIPMENT BLANKS

Equipment blanks are used to document contamination attributable to using non-dedicated equipment (i.e., equipment that must be decontaminated after each use). Collect equipment blanks in the field at a rate of one per type of sampling equipment per day, unless otherwise specified. If the site-specific work plan or QAPP indicates that an equipment blank is to be collected from dedicated sampling equipment, collect the equipment blank in the field before sampling begins. If field decontamination of sampling equipment is required, prepare the equipment blanks after the equipment has been used and field-decontaminated at least once. Prepare equipment blanks by filling or rinsing the pre-cleaned equipment with laboratory-provided analyte-free water, deionized water (DI) and collecting the rinsate in the appropriate sample containers. The samples must be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Record the type of sampling equipment used to prepare the blank. Have the equipment blanks analyzed for all the analytes for which the environmental samples are being analyzed, unless otherwise specified. Decontamination of the equipment following equipment blank procurement is not required. If laboratory-grade DI water is unavailable, store-grade distilled water can be used to prepare these blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book. Designate equipment blanks using "EB", followed by the date, and in the order of equipment blanks collected that day. For example, the first equipment blank collected on July 4, 2015, would be designated EB070415-1.

4.6.2 TRIP BLANKS

Trip blanks are used to document VOC contamination attributable to shipping and field handling procedures. Trip blanks are only required when analyzing samples for VOCs. Trip blank(s) are prepared by the laboratory and sent to the facility along with sample containers. Never open trip blank sample bottles; label them in the field and return them to the laboratory in the same shipping container in which the trip blank sample bottles arrived at the site. Keep the trip blank sample bottles in the same shipping container used to ship and store VOC sample bottles during the sampling event. Unless more stringent project requirements are in place, submit one trip blank in each shipping container of VOC samples. To minimize the number of trip blanks needed per shipment, if possible, ship all of the VOC samples in the same shipping container with the trip blank. If laboratory-provided trip blanks are not available, DI water, or store-grade distilled water and clean, empty VOC sample bottles can be used to prepare additional trip blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book. Identify trip blanks using "TB", followed by the date. For example, the trip blank shipped with a cooler of samples on July 4, 2015, would be designated TB070415-1. If a second trip blank is needed on that same day, the designation would be TB070415-2.

4.6.3 TEMPERATURE BLANK

Temperature blanks are used to determine if proper sample thermal preservation has been maintained by measuring the temperature of the sample container upon arrival at the laboratory. A temperature blank should be included in each sample cooler used to ship and store the sample bottles during the sampling event. If laboratory-provided temperature blanks are not available, fill a clean, unpreserved sample bottle with potable, DI, or store-grade distilled water and identify the bottle as a temperature blank.

4.6.4 DUPLICATES

Duplicates are useful for measuring the variability and documenting the precision of the sampling process. Unless more stringent project requirements are in place, collect duplicate samples at a rate of at least 1 per 20 samples collected. Under no circumstances can equipment or trip blanks be used as duplicates. Sample locations where sufficient sample volume is available and where expected contamination is present should be selected for sample duplication.

Collect each duplicate sample at the same time, from the same sample aliquot and in the same order as the corresponding field environmental sample. When collecting aqueous duplicate samples, alternately fill sample bottle sets (i.e., the actual sample bottle and the bottle to be used for the duplicate) with aqueous samples from the same sampling device. If the sampling device does not hold enough volume to fill the sample containers, fill the first container with equal portions of the sample, and pour the remaining sample into the next sample containers. Obtain additional sample volume and pour the first portion into the last sample container, and pour the remaining portions into the first containers. Continue with these steps until all containers have been filled.

Duplicate samples will be assigned arbitrary sample ID and a false collection time so that they are not identified as duplicates by the laboratory (i.e., submit the samples blind to the lab). The blind duplicate sample "location designation" will be left up to the project manager; however, in no case will "Dup" be allowed to appear in the sample name. Have the duplicate samples analyzed for the same analytes as the original sample. Be sure to record the duplicate sample ID, the false time, and the actual time of collection in the field notebook. The duplicate should also be indicated on our carbon copy of the chain-of-custody.

4.6.5 MATRIX SPIKE AND MATRIX SPIKE DUPLICATES

Matrix spike and matrix spike duplicate samples, known as MS/MSD samples, are used to determine the bias (accuracy) and precision of a method for a specific sample matrix. Many of the company's projects require the collection of MS/MSD samples; however, laboratory generated MS/MSD samples are sufficient for some projects. As required by your QAPP or site-specific work plan, collect MS/MSD samples at the required ratio; if the sampling ratio is not specified by your QAPP or site-specific work plan, collect MS/MSD samples at a rate of 1 for every 20 samples. Clearly convey the MS/MSD identity to the laboratory by adding "MS" or "MSD" after the sample name (e.g., MW 01MS) or in the comments section of the chain-of-custody. Under no circumstances can equipment or trip blanks be used as MS/MSD samples.

4.6.6 SPLIT SAMPLES

Split samples may be collected as a means of determining compliance or as an added measure of quality control. Unlike duplicate samples that measure the variability of both the sample collection and laboratory procedures, split samples measure only the variability between laboratories. Therefore, the laboratory samples must be subsamples of the same parent sample and every attempt must be made to ensure sample homogeneity. Collect aqueous split samples in the same manner as a duplicate sample.

Collecting split samples of soil, sediment, waste, and sludge is not recommended because the homogenization necessary for a true split sample in these matrices is not possible and the resulting laboratory results would not be comparable.

Spilt samples should have the same sample location designation (e.g., MW-01, SB-03 (4-6), but are differentiated from each other by inserting the laboratory analyzing or the agency/consultant collecting the sample after the sample location (e.g., MW-01-WSP and MW-01-EPA).

4.7 CUSTODY DOCUMENTATION

Sample custody protocols are used to demonstrate that the samples and sample containers were handled and transferred in such a manner as to prevent tampering. Legal chain of custody (COC) begins when the pre-cleaned sample containers are dispatched to the field from the laboratory and continues through sample analysis and eventual disposal of the sample and sample containers. Maintaining custody requires that samples must be in the actual possession or view of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician), secured by the same person to prevent tampering, or stored in a designated secure area.

It is a good idea to limit, to the extent possible, the number of individuals who physically handle the samples. Samples must be placed in locked storage (e.g., locked vehicle, locked storeroom, etc.) at all times when not in the possession or view of authorized personnel. Do not leave samples in unoccupied motel or hotel rooms or other areas where access cannot be controlled by the person(s) responsible for custody without first securing samples and shipping or storage containers with tamper-indicating evidence tape or custody seals

The COC form is used to trace sample possession from the time of collection to receipt at the laboratory. Although laboratories commonly supply their own COC form, it is recommended that the company's COC be used to ensure that all necessary data are recorded. Unless more stringent project requirements are in place, submit one COC form per sample shipment. At a minimum, the COC needs to have a unique COC number, accompany all the samples, and include the following information:

- Project number, name, and location
- Sampler's printed name(s) and signature(s)
- Sample identification number
- Date and time (military time) of collection
- Sample matrix
- Total number of containers per sample
- Parameters requested for analysis including number of containers per analyte
- Remarks (e.g., irreducible headspace, field filtered sample, expected concentration range, specific turn-around time requested, etc.)
- Signatures of all persons involved in the chain of possession in chronological order
- Requested turn-around-time
- Name and location of analytical laboratory
- Custody seal numbers
- Shipping courier name and tracking information
- Internal temperature of shipping container upon shipment to laboratory, as needed
- Internal temperature of shipping container upon delivery to laboratory
- Employee contact information

Affix tamper-indicating evidence tape or seals to all storage and shipping container closures when transferring or shipping sample container kits or samples to an off-property party. Place the seal so that the closure cannot be opened without breaking the seal. Record the time, calendar date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container. Affix new seals every time a seal is broken until continuation of evidentiary custody is no longer required.

FIELD STANDARD OPERATING PROCEDURE #9

SOIL SAMPLING PROCEDURE

The soil sampling procedures outlined in this standard operating procedure (SOP) are designed to ensure that collected soil samples are representative of current site conditions. Soil samples can be collected for onsite screening or for laboratory analysis. The user is advised to read the entire SOP and review the site health and safety plan (HASP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

9.1 ACRONYMS AND ABBREVIATIONS

ºF	Degrees Fahrenheit
HASP	Health and Safety Plan
IDW	Investigation derived waste
PID	Photoionization detector
PPE	Personal protective equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality assurance/quality control
SOP	Standard operating procedure
USCS	Unified Soil Classification System

9.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment, (e.g., photoionization detector [PID]), as needed
- Field test kits, as needed
- Sampling containers and labeling/shipping supplies
- Knife or scissors
- Ruler or tape measure
- Soil sampling method specific materials, as needed:
  - Stainless steel trowels, probes, or shovels
  - Stainless steel spatulas or spoons
  - Bucket augers, auger extension rods, auger handle, pipe wrenches
  - Split-spoon samplers, pipe wrenches
  - Direct-push acetate liners
  - Shelby tube samplers, plastic or wax caps
  - Mixing tray or bowl
- Munsell color chart
- Decontamination supplies

9.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

This SOP is designed to provide the user with a general outline for conducting soil sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation-derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and use and calibration of sampling and monitoring equipment (SOPs 7 and 8). This SOP does not cover investigation planning, nor does it cover the evaluation of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before soil sampling, be sure to review the project-specific work plan or Quality Assurance Project Plan (QAPP) and any applicable state and federal guidelines or sampling procedures. All sampling and monitoring references must be available for consultation in the field, including:

— Company's SOPs
— Applicable state and federal guidelines or sampling procedures
— Manufacturer's manuals
— Project-specific work plan and HASP
— QAPP

9.4 GENERAL PROCEDURES

Soil samples are collected using a variety of techniques and equipment, depending on the type (e.g., surface, subsurface) and purpose (e.g., lithological logging, headspace evaluation, laboratory analysis) of the sampling, and most sampling events employ more than one equipment type or methodology. Subsurface soil sampling, for example, often includes sample collection from split-spoon, macro-core, or other dedicated sampling devices advanced into the subsurface. Recovered cores are often logged (using a Munsell color chart and other logging aids), screened for volatile organic compounds (VOCs) using a PID, and sampled for laboratory analysis using disposable stainless steel spoons or other discrete sampling devices.

Each sampling configuration is associated with a unique set of sampling equipment requirements and techniques. The selected procedures and equipment are project-specific and should be discussed by the project team before arriving onsite. All types of soil sampling, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

— The use of new, disposable or decontaminated sampling equipment
— The use and rotation of the appropriate PPE
— Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not come in contact with the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. In no case should gloved hands be used as a soil sampling device; if the soil cannot be transferred directly from the sampling device to the laboratory-supplied containers use a stainless steel spoon or spatula to transfer the soil from the sampling device to the laboratory-supplied containers.

9.4.1 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment, such as polyethylene liners or single-use stainless steel spoons; or properly decontaminated sampling equipment, such as hand augers, split-spoon samplers, or trowels. Soil sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene) which are compatible with the chemical constituents at the site. When choosing sampling equipment, give consideration to:

- the types of soil or fill present
- the required depth of the sample
- the volume of sample required
- the analytes of interest

Select the types of equipment and decontamination procedures based on the types of sampling to be performed. Decontamination may require multiple steps or differing cleaning methods, depending on the sampling goals (see SOP 6 for decontamination procedures). In no case should disposable, single use materials (e.g., acetate liners, soil baskets) be used to collect more than one sample.

9.4.2 SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility (physical obstructions, slope, overhead and underground utilities) to the sampling location.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record a description of the sampling location and the approximate distance to and direction from at least one permanent feature.
- Should any sample location require a vertical or horizontal offset from the proposed location, indicate the reason and record the actual sample location in the field book.

Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate. When sampling soil, it is important to find a suitable sampling location away from any sources of cross-contamination that could compromise the integrity of the samples. Consider the following:

- Position the sample collection area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for VOCs with a PID, but should not be limited to the active sample collection.
- Store samples already collected from the field for laboratory analysis in clean containers in an ice-filled cooler (as required) and securely stage, if possible, in an uncontaminated area of the site.

9.5 SOIL COLLECTION

Soil samples can be collected from surface or subsurface depths, depending on the project requirements. Surface soils are generally those collected at depths less than 2 feet below ground surface (bgs) and can be collected using trowels, soil probes, shovels, or hand augers. Be aware that some states have specific definitions of what constitutes a surface soil sample. Subsurface soils are generally deeper and require specialized equipment to recover the samples. In most cases, subsurface soils will be collected using a drill rig or excavator to prevent the soil from being mixed with soils from a shallower interval.

Push or drive the method-specific sampling equipment (e.g., trowel, hand auger, hollow corers, split-spoon, direct push sampler, rotosonic core barrel sampler, excavator bucket) into the soil to the desired sampling depth using cleaned equipment. Record in the field book the depth interval through which the sampler was advanced and, when using a split-spoon sampler, the number of blows needed to drive the sampler 6 inches. If additional soil is needed to provide sufficient sample volume, repeat this step taking care to ensure that the same depth interval is collected during the resample. Use core catchers on the leading end of the sampler (if available) for soils that lack cohesiveness and are subject to falling out of the sampler (i.e., poor recovery).

Withdraw the sampling equipment from the interval, open the sampler (as appropriate), and collect the sample safely (e.g., avoid entering an excavation by collecting the sample from an excavator bucket at ground surface). Samples collected from an excavator bucket should be taken from the center of the material to ensure material is representative of the desired sampling interval.

Recovered soils should be placed on plastic sheeting in a consistent manner such that the orientation of the sample (i.e., which end is "up") and the depth interval is readily apparent to the sampling personnel. Measure the length of the material recovered relative to the interval the sampler was advanced in percent notation (e.g., 75%) or as a fraction of the total length of the sample interval (e.g., [3/4] indicating 3 out of 4 feet) and record this information in the field book. If field screening for organic vapors is required, break or cut the soil core every 3 to 4 inches and quickly scan the breaks in the core material with the appropriate air quality monitoring equipment (e.g., PID) and record the readings and approximate depth in the field book. These measurements can be used to select appropriate soil samples for VOC or headspace analysis, if required (see procedures below).

9.5.1 UNDISTURBED SOIL SAMPLES

Undisturbed soil samples collected for geotechnical parameters (e.g., porosity, permeability) generally require the use of specialized undisturbed sampling equipment (e.g., Shelby tube or sealed Geoprobe® liner) and collection procedures. The sampling device, once retrieved, is typically capped or sealed (to maintain the sample in its relatively undisturbed state), labeled with the sample name, orientation of the sample (i.e., top and bottom), depth interval, and shipped to the appropriate geotechnical laboratory. Follow sample labeling, preparation, and shipping procedures in SOPs 3 and 4.

9.5.2 VOLATILE ORGANIC COMPOUND SAMPLING

Analytical soil samples for VOC analysis should be collected immediately after screening with the PID to avoid loss of constituents to the atmosphere. Transfer the soil from the portion of the soil core to be sampled (usually the area where the highest PID readings were observed) directly into the sample containers; do not homogenize soils for VOC analysis. Place the soil in the sampling container such that no headspace is present above the soil when the cover is placed on the jar. If U.S. Environmental Protection Agency Method 5035 (e.g., Encore® samplers) is required, follow manufacturer's specifications and company recommended shipping procedures. Collect quality assurance/quality control (QA/QC) samples, if appropriate, in accordance with SOP 4, the project-specific work plan, and the QAPP.

9.5.3 SOIL HEADSPACE ANALYSIS

Collect soil samples for field-based headspace analysis, if required as part of the project-specific work plan, after collecting the VOC sample. First, examine the soil and remove coarse gravel, organic material (e.g., roots, grass, and woody material) and any other debris. Transfer the soil from the portion of the soil core to be sampled and place in a heavy-duty zipper-style plastic bag and seal the bag. Label the sample indicating the sampling location, depth, and date. Shake the sample vigorously for approximately 15 seconds to disaggregate the sample and expose as much surface area of the soil as possible (to release the VOCs to the atmosphere within the bag). If necessary, warm the sample to room temperature (70º Fahrenheit, [ºF]) by placing the bag in a heated room or vehicle. This step is critical when the ambient temperature is below 32ºF.

The VOCs, if present, will volatilize into the sealed bag. Allow the bag to stand (to achieve equilibrium) for approximately 15 minutes. Carefully open the bag slightly and place the tip of the PID into the opening. Do not insert the tip of the probe into the soil material and avoid the uptake of water droplets. Allow the PID to equilibrate and record the highest PID measurement noted. Erratic PID responses may result from high organic vapor concentrations or elevated headspace moisture. If these conditions exist, qualify the headspace data in the field book. It is also important to record the ambient temperature, humidity, and whether moisture was present in plastic bag. Duplicate 10% of the headspace samples by collecting two samples from the same location.

Generally, duplicate sample values should be consistent to ±20%. Samples collected for headspace screening cannot be retained for laboratory analysis.

9.5.4 SEMI- AND NON-VOLATILE ANALYTICAL SAMPLE COLLECTION

Collect remaining organic samples then inorganic samples in the following order of volatilization sensitivity:

— Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
— Metals
— Inorganic non-metallic and physical and aggregate properties
— Microbiological samples
— Radionuclides

If homogenization is required, mix the soils (using stainless steel bowls and spoons, or other appropriate equipment) to a homogeneous particle size and texture. Transfer the soils from the sampler or mixing bowl to the sample container using a decontaminated or dedicated stainless steel spoon or spatula. Collect QA/QC samples in accordance with SOP 4, the project-specific work plan, and the QAPP.

If approved by the appropriate regulatory agency and specified in the project-specific work plan, composite soil samples can be collected to minimize the total number of analytical samples. Composite samples consist of equal aliquots (same sample size) of soil from each location being sampled (e.g., from each borehole or from multiple areas of a soil pile), by mixing the waste to a homogeneous particle size and texture using new or decontaminated stainless steel bowls and a stainless steel spoon or trowel. Transfer the contents to the appropriate laboratory supplied sample container using a stainless steel spoon. Collect QA/QC samples in accordance with SOP 4, the project-specific work plan, and the QAPP, if required.

If necessary, conduct field tests or screening on soils in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment.

9.5.5 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once collected, prepare the soil samples for offsite laboratory analysis:

1. Clean the outside of the sample container with paper towels or appropriate materials, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, depth interval, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used)
4. Preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius (if required by analytical method)
5. Record the sample designation, date, time, depth interval, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   — Location
   — Sample name
   — Sample collection date and time
   — Number of sample containers
   — Analytical method
7. Complete sample packing and ship in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a company compliance professional.

9.5.6 SOIL CLASSIFICATION

Soil classification should be performed whenever soil samples are being collected to provide context for the analysis. Follow the Unified Soil Classification System (USCS) logging procedures as described in ATSM D2488[1] . The emphasis of soil classification in the field must be on describing the soils using ALL of the required descriptors; categorization of the USCS group name or symbol alone may not provide details about the soils that could later prove useful. Avoid geologic interpretation or the use of local formation names, which are often difficult to determine in the field without the regional framework. Record ALL of the following information for each sample interval/soil type:

- Depth interval
- USCS group name
- USCS group symbol
- Color, using Munsell chart (in moist condition)
- Percent of cobbles or boulders, or both (approximate; by volume)
- Percent of gravel, sand, or fines, or all three (approximate; by dry weight)
- Particle-size range:
  - Gravel—fine, coarse
  - Sand—fine, medium, coarse
  - Fines – clay or silt
- For gravel and sand:
  - Particle angularity: angular, subangular, subrounded, rounded
  - Particle shape: (if appropriate) flat, elongated, flat and elongated
  - Maximum particle size or dimension
  - Hardness of coarse sand and larger particles
- For clay and silt:
  - Plasticity: non-plastic, low, medium, high
  - Dry strength: none, low, medium, high, very high
  - Dilatancy: none, slow, rapid
  - Toughness: low, medium, high
- Odor (mention only if organic or unusual; factual descriptions only, no interpretations)
- Moisture: dry, moist, wet
- Additional comments: presence of roots or root holes, presence of mica, gypsum, etc., surface coatings on coarse-grained particles, caving or sloughing of auger hole or trench sides, difficulty in augering or excavating, etc.

For intact samples also include:

- Consistency (fine-grained [clay] soils only): very soft, soft, firm, hard, very hard
- Structure: stratified, laminated, fissured, lensed, homogeneous
- Cementation: weak, moderate, strong

Use the following standard descriptors for the textural percentages:

- Trace: <5%[2]
- Few: 5-10%
- Little: 15-25%
- Some: 30-45%
- Mostly: 50-100%

Example descriptions, using the information listed above, would read as follows:

[1] Note that certain states/regulatory programs may require soil classification under a secondary system (e.g., US Department of Agriculture) or the use of hydrochloric acid to test the reaction with soil (none, weak, strong).

[2] The use of "Trace" for describing the fraction of clay soils is inappropriate for field-based logs as clay contents of less than 20% in fine-grained soils cannot be reliably determined in the field.

— 8-10' – Well Graded Sand, SW (5YR 2/6) fine- to medium-grained sand, trace medium sub-angular rounded gravel (less than 0.5-inch diameter); medium dense to dense; wet; moderate petroleum-like odor between 9 feet bgs and 10 feet bgs.
— 10-12' – Lean Clay with Gravel, CL (5YR 2/6) some fine- to coarse-grained angular to subangular gravels (less than 0.25-inch diameter), trace fine- to medium-grained rounded sands; very stiff; low plasticity; low dry strength; no dilatancy; moist; no odors.

9.6 CLOSING NOTES

Once sampling is completed, restore and mark all sample locations with spray paint, stakes, or other appropriate marker for future reference or survey in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with applicable regulations.