Environment

Prepared For:
United Technologies Corp.
Shared Remediation Services
Farmington, CT

Prepared by:
AECOM
Buffalo, NY
60518491
October 2016

SITE-WIDE GROUNDWATER MONITORING SUPPLEMENTAL WELL INSTALLATION UTC/CARRIER SITE THOMPSON ROAD, SYRACUSE, NY

Sampling and Analysis Plan

Corrective Action Order - Index CO 7-20051118-4

NYSDEC Site Registry #734043

Environment

Prepared For:
United Technologies Corp.
Shared Remediation Services
Farmington, CT

Prepared by:
AECOM
Buffalo, NY
60518491
October 2016

SITE-WIDE GROUNDWATER MONITORING SUPPLEMENTAL WELL INSTALLATION UTC/CARRIER SITE THOMPSON ROAD, SYRACUSE, NY

Sampling and Analysis Plan

Corrective Action Order - Index CO 7-20051118-4

NYSDEC Site Registry #734043

Prepared for:

United Technologies

UTC Shared Remediation Services
9 Farm Springs Road
Farmington, Connecticut 06032

Prepared By:

AECOM USA, Inc.
257 West Genesee Street, Suite 400
Buffalo, New York 14202

Contents

List of Tables

List of Figures

List of Acronyms

AOC	Area of Concern
CAMP	community air monitoring program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DER	Division of Environmental Remediation
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
GSIP	Generic Site Investigation Protocol
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation-derived waste
mg/m^3	Milligrams per cubic meter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDEC	New York State Department of Environmental Conservation
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PCB	Polychlorinated Biphenyl
PID	photoionization detector
PPE	personal protective equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
THA	Task Hazard Analysis
TCE	trichloroethene
UFPO	Underground Facilities Protection Organization
USEPA	United States Environmental Protection Agency
UTC	United Technologies Corporation
VOC	volatile organic compound

1.0 Introduction

United Technologies Corporation (UTC) is performing environmental remediation activities at the Carrier Thompson Road Facility (Site) in the Town of DeWitt. AECOM USA, Inc. (AECOM) has been retained by UTC to provide environmental engineering and investigation support services. The work is being performed in accordance with the Corrective Action Order (Order) dated January 4, 2006. The Thompson Road Campus has a substantial number of monitoring wells that have been installed for various reasons, including investigations of areas of concern and establishing a monitoring well network in accordance with the Order. This Sampling and Analysis Plan (SAP) addresses activities to be performed during a proposed Groundwater Monitoring Well Installation Program to supplement the current monitoring well network.

2.0 Site Background

2.1 Site Description

The Carrier Thompson Road Facility is located in the northeast portion of Syracuse, New York, approximately one mile south of the New York State Thruway. As depicted on **Figure 1**, the facility property is bordered by Sanders Creek to the north, Thompson Road to the west, and Kinne Street to the east. A residential area exists to the south of the facility property (not depicted on **Figure 1**). The property slopes slightly north toward Sanders Creek. The facility property covers approximately 175 acres and most is either paved or covered by manufacturing and office buildings.

2.2 Facility History

The Resource Conservation and Recovery Act (RCRA) Facility Assessment Report for the Carrier facility prepared by A.T. Kearney, Inc. (January 6, 1997) describes pre-1950 use of the property as follows: "Prior to the purchase of the facility by Carrier, the existing facility was owned and operated by the General Electric Corporation, which was built in 1942 for defense purposes; Defense Corporation, a government-owned World War II manufacturing facility; and Syracuse University. Prior to World War II, the property was utilized as farmland."

The facility was purchased in the 1950s by Carrier. The Carrier Syracuse facility formerly produced a variety of products associated with the HVAC (heating, ventilation, air conditioning units) industry for home and commercial applications. Operations have included the manufacture and assembly of various components associated with these HVAC units.

Several previous investigations (since 1986) have been conducted at the site to identify and investigate Areas of Concern (AOCs). With the exception of a Consent Order monitoring well network, most of the site wells have focused in and around AOCs.

2.3 Existing Groundwater Monitoring Well Network

A Site-Wide Monitoring Plan (Monitoring Plan) was submitted in April 2009 and later approved by NYSDEC. The groundwater monitoring well network in the Monitoring Plan comprised 16 monitoring wells, which are referred to as the Consent Order wells. Currently, including the 16 Consent Order wells, there are approximately 90 monitoring points (wells and piezometers) located across the Thompson Road Campus. Monitoring points have been installed during investigations of various AOCs including Former Buildings TR-1 and TR-2, Parking Lot R and TR3 North Wall (both former building TR-3), MH3 Soil Source Investigation, and the A&R building. Other monitoring locations have been installed at the AOC-G Landfill; however, the locations addressed in this SAP are focused on the Thompson Road Campus property. The need for additional monitoring locations at the AOC-G Landfill is being addressed under a separate scope of work.

3.0 Scope of Work

3.1 Objective

The objective of this SAP is to specify a sampling and analysis program capable of yielding representative samples sufficient to identify the presence/absence of contaminants in areas outside of the already identified AOCs and to supplement the site-wide groundwater monitoring network. AECOM has identified 15 proposed locations to supplement the site-wide groundwater monitoring network at the Site. The existing monitoring well network and the 15 proposed locations are depicted on **Figure 1**. The rationale for each proposed well location is summarized on **Table 1.** The proposed monitoring wells are being added to the site-wide groundwater monitoring well network to:

- enhance the property perimeter monitoring well network;
- supplement groundwater information to fill in data gaps or provide data were no or limited data exists; and
- provide groundwater data to be used in possible vapor intrusion investigations.

In addition to showing the existing and proposed monitoring locations, **Figure 1** also provides the ranges of trichloroethene (TCE) from samples collected in 2015 as an indication of known groundwater contamination at the Site. The TCE results are provided as a guide to assess potential data gaps associated with existing monitoring locations.

AECOM will provide field staff and subcontractors to implement the field investigation activities in accordance with the approved SAP. Activities are summarized below.

- Collect soil samples from 15 soil borings advanced to depths of 7 feet below the water table at various locations around the Site.

- Complete the 15 soil borings as monitoring wells;

- Collect representative groundwater samples from the 15 new wells; and

- Analyze all soil and groundwater samples for volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs). The PCB analyses will be performed on filtered and unfiltered groundwater samples.

The proposed investigation locations are identified in **Figure 1**. These locations may be adjusted based on Site conditions. **Figure 1** identifies proposed monitoring well locations with letter designations for reference purposes only; once installed, the monitoring well identifications will conform to the overall groundwater monitoring well identification scheme.

3.2 General Field Activities

General field activities include Site meetings, mobilization, geophysical utility location survey, health and safety planning, hand augering, drilling, well installation, well development, soil and groundwater sampling and analytical testing, surveying, groundwater monitoring, decontamination, and handling of investigation-derived waste (IDW).

Site activities will be performed in accordance with the site-specific Generic Site Investigation Protocol (GSIP) and Health and Safety Plan (HASP). Analytical procedures will be performed in accordance with the site-specific Quality Assurance Project Plan (QAPP).

Field work on UTC-owned property will be coordinated with UTC. AECOM personnel and onsite subcontractors will have successfully completed the UTC online training for Environment, Health and Safety Guidelines for Level III Contractors. A community air monitoring program (CAMP) will be performed during all intrusive Site investigation activities.

3.2.1 **Mobilization**

Following approval of the SAP by New York State Department of Environmental Conservation (NYSDEC), the Underground Facilities Protection Organization (UFPO) will be contacted at 1-800-962-7962 to clear exploration locations. Utility clearance requires three working days by UFPO. AECOM will retain a subcontractor to perform a utility location survey using geophysical techniques. AECOM will review available site record and utility drawings and boring locations with Carrier personnel.

3.2.2 **Health & Safety**

Personnel performing work at the job site will be qualified for Hazardous Waste Operations and Emergency Response (HAZWOPER) duty in accordance with 29 CFR 1910.120. Information on hazards specific to the project are presented in the Task Hazard Analyses (THAs) contained in the site-specific HASP.

It is anticipated that the work to be completed will be performed with Level D personal protection equipment (PPE). Should health and safety monitoring during field activities indicate a threat to field personnel or warrant an upgrade beyond Level D protection, work will stop and site conditions will be re-evaluated.

Prior to the commencement of daily activities, a tailgate meeting will be conducted by the AECOM Site Supervisor to review the site-specific health and safety requirements and applicable THAs. Attendance at the daily tailgate meeting is mandatory for all investigation personnel at the Site covered in this plan and will be documented on the attendance form. Safety training documentation will be maintained in the project file by the AECOM Site Supervisor. All field personnel have the right and duty to stop work when, in their opinion, conditions are unsafe and to assist in correcting these conditions. Additional health and safety details are be provided in the site-specific HASP.

3.2.3 **Drilling and Monitoring Well Installation**

Fifteen borings will be advanced into the unconfined water-bearing zone at locations shown in **Figure 1**. Drilling will be accomplished with a track-mounted Geoprobe rig using direct-push and hollow stem auger drilling techniques. Prior to drilling, each boring will be manually pre-cleared to a depth of approximately 5 feet.

Each boring will be advanced approximately 7 feet into the groundwater table, with an approximate total estimated depth of 15 feet below grade. Soil samples will be continuously collected using 4- or 5-foot long, acetate-lined direct-push samplers. Upon retrieval, the soil samples will be inspected for visual and olfactory evidence of contamination and screened for VOCs using a

photoionization detector (PID). One soil sample will be retained from each boring for laboratory analysis. The sample will be selected from the interval of greatest apparent contamination. If no apparent contamination is present, the sample will be retained from the interval just above the water table.

The borings will be completed as 2-inch diameter polyvinyl chloride (PVC) monitoring wells with 10-foot long 0.01 inch slotted screens spanning the water table. Wells will be completed with flush-mount road boxes set in concrete. The well locations and elevations will be surveyed by a licensed surveyor.

The monitoring wells will be properly developed. Development will continue until water quality parameters stabilize. Approximately one week following development, groundwater samples will be collected using the low-flow sampling procedure. Groundwater samples will be collected once water quality parameters have stabilized.

Prior to sampling, a synoptic round of groundwater levels will be recorded from the 15 new wells using an oil/water interface probe.

3.2.4 **Community Air Monitoring**

VOCs and Particulate concentrations will be monitored at the upwind and downwind perimeter of the active Site work area on a continuous basis or as otherwise specified. Upwind concentrations will be measured to establish site-specific background concentrations.

VOC monitoring will be performed using Rae Systems MiniRAE 3000 Photoionization detectors (or equivalent) and capable of integrating over a period of 15 minutes (or less) for comparison to the VOC action level. Each detector will be calibrated daily. Each air monitoring instrument will be downloaded daily and saved electronically to a dedicated computer located on-site.

The New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP) specified action level of 5 parts per million (ppm) above background for will be used to determine whether modifications to given processes are required. If the downwind measurement of VOCs is greater than 5 ppm above the upwind background level for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the VOC level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring. Furthermore, VOCs at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps are taken, work activities will be resumed provided that the VOCs level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet), is less than 5 ppm over background for the 15-minute average or periodic measurement.

All activities will be shut down if the VOCs level is above 25 ppm at the perimeter of the work area (exclusion zone boundary).

The table below describes the action levels for VOC monitoring and the associated responses to each level.

Action Levels for Perimeter VOC Monitoring

Action Level	Response
Downwind VOC concentrations 5 ppm greater than upwind monitor sustained over 15 minute average	Temporarily halt work and continue monitoring, resume work if levels rapidly decrease below 5 ppm threshold.
Downwind VOC concentrations 5 ppm greater than upwind monitor sustained over 15 minute average, but less than 25 ppm	Work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work may resume provided that the VOCs level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet), is less than 5 ppm over background for the 15-minute average or periodic measurement.
Downwind VOC concentrations 25 ppm greater than upwind monitor sustained over 15 minute average	All activities will be shut down.

Particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. Each particulate monitor will be calibrated daily with a filtered air sample. Each air monitoring instrument will be downloaded daily and saved electronically to a dedicated computer located on-site.

The NYSDOH Generic CAMP specified action level of 0.10 milligrams per cubic meter (mg/m^3) above background for particulate matter less than 10 micrometers in size (PM-10) will be used to determine whether modifications to given processes are required. If the downwind measurement of particulates less than 10 micrometers in size (PM-10) is greater than 0.10 mg/m^3 above the upwind background level, or if dust is observed leaving the project area, dust suppression techniques (i.e., misting surfaces with water, or covering open soil piles) will be implemented to reduce the generation of fugitive dust. Furthermore, if the action level of 0.15 mg/m^3 (above background) is exceeded, work activities will be ceased and site work activities will be re-evaluated.

The table below describes the action levels for perimeter particulate air monitoring and the associated responses to each level.

Action Levels for Perimeter Particulate Air Monitoring

Action Level	Response
Downwind particulate concentrations 0.10 mg/m^3 greater than upwind particulate monitor sustained over 15 minute average	Dust suppression techniques are employed
Downwind particulate concentrations 0.15 mg/m^3 greater than upwind particulate monitor sustained over 15 minute average	Work halted and dust suppression techniques evaluated. Work continues once dust suppression techniques are proven successful

3.2.5 **Sample Analyses**

All soil and groundwater samples will be analyzed for VOCs and PCBs as indicated in **Table 2.** The samples will be preserved, handled and shipped following United States Environmental Protection Agency (USEPA) chain-of-custody procedures as identified in **Table 3**. PCB analysis will be performed on filtered and unfiltered groundwater samples. The samples collected for PCB analysis will be filtered in the field using disposable inline 0.45 micron filters.

3.2.6 **Decontamination Procedures and IDW Management**

To avoid cross contamination, sampling equipment will be decontaminated between samples and locations. Decontamination procedures specific to each of the field activities are described in the GSIP.

PPE (e.g., latex gloves) and disposable sampling equipment will be placed in plastic garbage bags for disposal as solid waste. Soil cuttings and water generated during drilling, well development, and groundwater sampling will be placed in 55-gallon drums for offsite treatment/disposal.

Soil cuttings from each well boring will be placed in individual drums for that boring; soil cuttings from multiple borings will not be mixed.

Representative samples of the IDW will be collected for waste characterization analyses.

4.0 Standard Operating Procedures

A compilation of standard operating procedures (SOPs) that identify field procedures to be followed for each work task was presented in the GSIP. Adherence to these procedures ensures that site investigation activities are performed following approved methods that will provide accurate and reproducible results. The following SOPs apply to this program:

- Equipment Decontamination
- Investigation Derived Waste Management
- Groundwater Monitoring Well Development
- Low-Flow Purging and Groundwater Sample Collection
- Soil Classification
- Overburden Well and Piezometer Installation
- Photoionization Detector
- Sample Management and Preservation
- Calibration of Field Instruments
- Field Analytical Parameters
- Community Air Monitoring Program (VOC and Particulate Monitoring)

5.0 Quality Assurance/Quality Control

A site-specific QAPP has been prepared in support of the SAP activities to check the accuracy and precision of data collection during the Site characterization and data interpretation activities. The QAPP specifies the Data Quality Objectives (DQOs) for the project and identifies the principal organizations involved in verifying achievement of data collection goals. Data collected and analyzed in conformance with the DQO process described in the QAPP will be used in assessing the overall level of uncertainty associated with decisions related to this Site. The QAPP has been prepared in accordance with USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations; the USEPA Region II Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Manual, and NYSDEC's Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (May 2010).

5.1 Scope of the QAPP

The QAPP was prepared to provide quality assurance (QA) guidelines to be implemented during the SAP activities. This document may be modified for subsequent phases of investigative work, as necessary. The QAPP provides:

- A means to communicate to the persons executing the various activities exactly what is to be done, by whom, and when;
- A culmination to the planning process that ensures that the program includes provisions for obtaining quality data (e.g., suitable methods of field operations);
- A historical record that documents the investigation in terms of the methods used, calibration standards and frequencies planned, and auditing planned;
- A document that can be used by the Program Manager and QA Officer to assess if the activities planned are being implemented and their importance for accomplishing the goal of quality data;
- A plan to document and track project data and results; and
- Detailed descriptions of the data documentation materials and procedures, project files, and tabular and graphical reports.

The QAPP is primarily concerned with the QA and quality control (QC) aspects of the procedures involved in the collection, preservation, packaging, and transportation of samples, field testing, record keeping, data management, chain-of-custody procedures, laboratory analyses, and other necessary matters to assure that the investigation activities, once completed, will yield data whose integrity can be verified.

5.2 Objectives for Measurement Data

DQOs for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in the QAPP will be used in assessing the uncertainty associated with decisions related to this Site. The overall objectives and criteria for assuring quality for this effort are discussed in Section 4.2 of the QAPP.

5.3 Data Usability Evaluation

Data validation will be performed by an AECOM chemist in accordance with the site-specific QAPP and the guidelines in the following USEPA Region II documents (most recent version):

- *Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry*, SW-846 Method 8260B, SOP HW-24, Rev. 2, August 2008;
- *Polychlorinated Biphenyl Aroclor Data Validation*, SOP HW-37, Rev. 3, May 2013;

All sample analytical data for each sample matrix shall be evaluated. The data validator will also evaluate the overall completeness of the data package to determine whether deliverables specified in the QAPP are present. The reviewer will request copies of any missing deliverables from the laboratory. The data validation results will be presented in a Data Usability Summary Report (DUSR) prepared following the guidelines provided in NYSDEC Division of Environmental Remediation *DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B - Guidance for Data Deliverables and the Development of Data Usability Summary Reports*, May 2010.

6.0 Reporting and Schedule

AECOM will prepare an investigation report summarizing the findings of this investigation. The report will include results associated with the data collection and field investigation efforts. The report will include, but not be limited to, the following components:

- Purpose and scope of the investigation;
- Organization(s) involved;
- Amount and type of data collected;
- Quality (reliability) of data collected;
- Methods of investigation/equipment employed;
- Methods of analyses and interpretations;
- Figures showing locations of all field investigative activities;
- Tabulated analytical results;
- Boring, well development, and sampling purge logs;
- Evaluation of field investigative results and data;
- Figures showing analytical results and groundwater flow direction; and
- Conclusions and recommendations.

A draft report will be provided to UTC for review and comment. Following receipt and incorporation of UTC comments, AECOM will submit the report for NYSDEC review and comment. AECOM will then finalize the document following receipt of NYSDEC comments.

Tables

Table 1
Proposed Monitoring Well Rationale
UTC/Carrier Site-wide Well Network

Well Designation*	Zone	Rationale
A	Shallow Groundwater	Enhance perimeter monitoring well network
B	Shallow Groundwater	Enhance perimeter monitoring well network
C	Shallow Groundwater	Supplement groundwater data for building TR-2
D	Shallow Groundwater	Enhance perimeter monitoring well network
E	Shallow Groundwater	Supplement Parking Lot R and A & R groundwater data and data for vapor intrusion assessment for building TR-19
F	Shallow Groundwater	Supplement A & R groundwater data and data for vapor intrusion assessment for building TR-19
G	Shallow Groundwater	Provide groundwater data and data for vapor intrusion assessment for building TR-20
H	Shallow Groundwater	Enhance perimeter monitoring well network
I	Shallow Groundwater	Enhance perimeter monitoring well network
J	Shallow Groundwater	Supplement groundwater data and data for vapor intrusion assessment for buildings TR-5 and TR-6
K	Shallow Groundwater	Supplement groundwater data and data for vapor intrusion assessment for buildings TR-4 and TR-5
L	Shallow Groundwater	Supplement groundwater data and data for vapor intrusion assessment for buildings TR-5 and TR-19
M	Shallow Groundwater	Enhance perimeter monitoring well network
N	Shallow Groundwater	Supplement groundwater data and data for vapor intrusion assessment for nearby buildings
O	Shallow Groundwater	Supplement groundwater data and data for vapor intrusion assessment for nearby buildings

* - Once installed, well identfication will be consistent with current site monitoring well nomenclature.

Table 2
Summary of Proposed Investigation Samples
UTC/Carrier Site-wide Well Network

MATRIX/ANALYSIS	Analytical Method	Field Sample Quantity	Matrix Spike (MS) or LCS	MS Duplicate or Matrix Duplicate	Field Duplicate	Equipment/ Field Blank	Trip Blank	Total Analyses
Well Boring Soil Samples								
Volatile Organics	SW-846 8260C	15	1	1	1	1	0	19
Polychlorinated Biphenyls	SW-846 8082A	15	1	1	1	1	0	19
Groundwater Samples								
Volatile Organics	SW-846 8260C	15	1	1	1	0	1	19
Polychlorinated Biphenyls	SW-846 8082A	15	1	1	1	0	0	18

Notes:
PCBs = Polychlorinated Biphenyls
LCS = Laboratory Control Sample

Table 3
Sample Bottle, Volume, Preservation, and Holding Time Summary
UTC/Carrier Site-wide Well Network

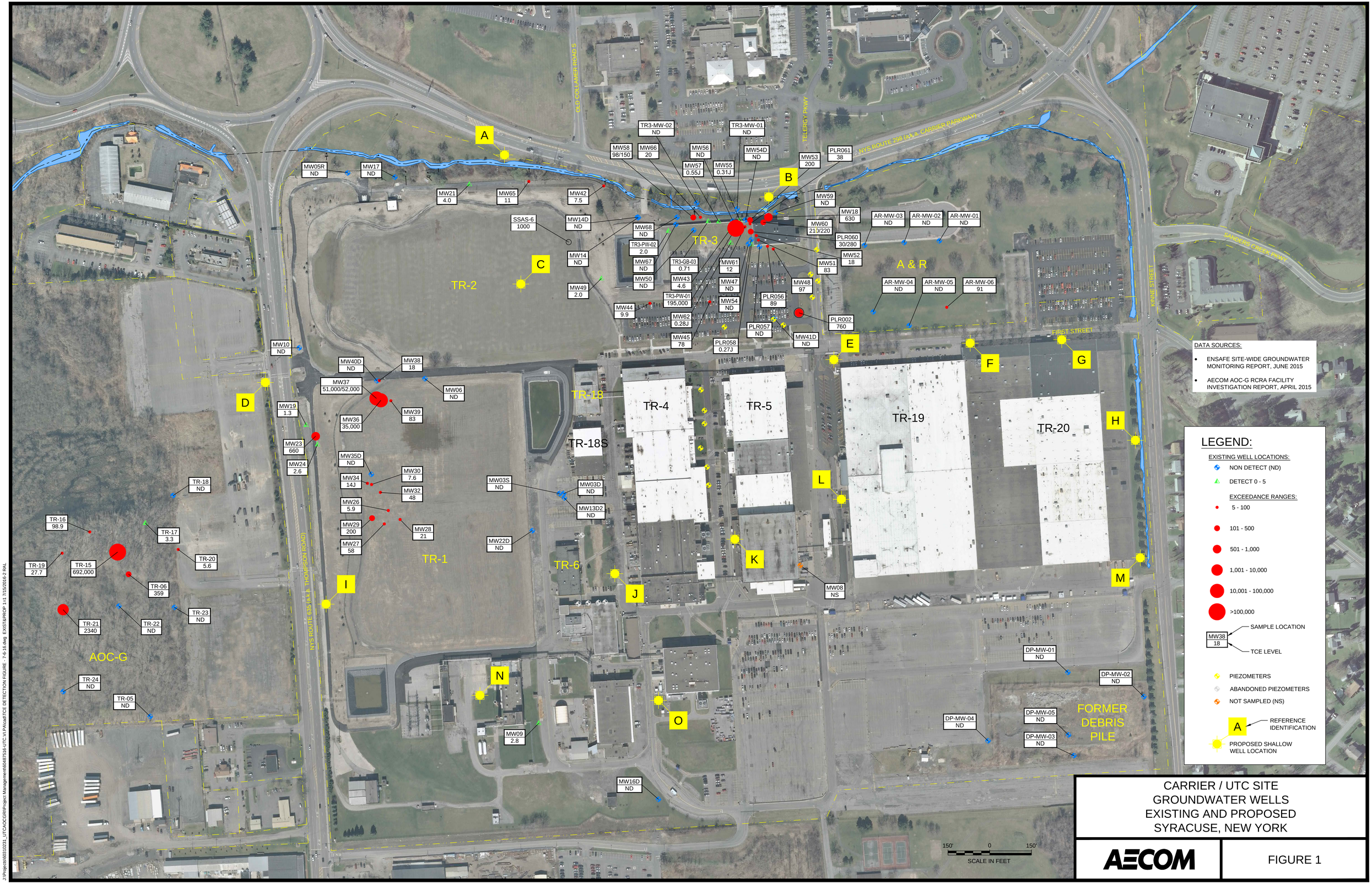
MATRIX/ANALYSIS	Sample Prep Method (1)	Analytical Method (1)	Sample Bottles		Preservation	Holding Time	
			Mat'l	Size		Extraction	Analysis
Soil Samples							
Volatile Organics	SW-846 5035A	SW-846 8260C	TerraCore	5 or 25 g	None	NA	48 hours
Polychlorinated Biphenyls	SW-846 3541	SW-846 8082A	G	"	None	14 days	40 days from extraction
Groundwater Samples							
Volatile Organics	SW-846 5030B	SW-846 8260C	G	40 mL VOA vial w/ septa	HCl to pH<2	NA	14 days
Polychlorinated Biphenyls	SW-846 3520C	SW-846 8082A	G	1-L amber	None	7 days	40 days from extraction

Notes:

(1) SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.

G = Glass

Figures



CARRIER / UTC SITE
GROUNDWATER WELLS
EXISTING AND PROPOSED
SYRACUSE, NEW YORK

AECOM

FIGURE 1

J:\Projects\60310231_UTCAOCGRI\Project Management\60487516-UTC-VI PA\cad\TCE DETECTION FIGURE - 7-6-16.dwg EXIST&PROP 1=1 7/15/2016-2 RAL